The Effects of Behavioural Supply Chain Relationship Antecedents on Integration and Performance

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Biographical Details

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Structured Abstract:

Purpose: To examine the effects of behavioural antecedents of collaboration in supply chain relationships on supply chain integration and performance by developing and empirically validating a model linking these constructs.

Design/methodology/approach: A conceptual model was developed based on Relational Exchange Theory, Social Exchange Theory and Resource-Based View. An international survey with supply chain/logistics managers from manufacturing focal firms based in Europe, US and Asia was conducted; they provided input on upstream and downstream relationships based on their actual interaction and experience with supply chain partners. The collected data, which reflect supply chain managers' perceptions on the above described phenomena, were analysed using the Partial Least Squares (PLS) method.

Findings: Mutuality, reciprocity, trust and commitment are instrumental for the formation of supply chain relationships characterised by higher information integration. In turn, information integration has much stronger impact on the coordination of operational decisions related to production and demand planning than on decisions related to actual production processes but, interestingly, the latter affects supply chain performance much more than the former.

Research limitations/implications: The research could benefit from a) a longitudinal rather than cross-sectional approach, b) incorporating multiple respondents such as representatives of supply chain partners and senior management of the focal firm, to capture potentially varying opinions on the supply chain phenomena under examination.

Practical implications: The results can assist supply chain decision-makers in understanding the importance of behavioural closeness between supply chain partners for the development of collaborative supply chain relationships that lead to higher integration and superior performance. Insight is provided on linkages between examined dimensions of supply chain integration. A process view of intermediate steps needed to translate collaborative relationships into higher supply chain integration and performance across the supply chain is offered.

Originality/value: The development and testing of an integrated model examining linkages between supply chain relationship antecedents, integration and performance is an original contribution. By proposing and confirming a sequential order in the influence of behavioural antecedents, integration dimensions, and their impact on supply chain performance, the paper sets foundations of a roadmap for achieving higher supply chain performance from collaborative supply chain relationships. Finally, the paper contributes to the limited theoretical justification on the development of knowledge for assisting decision-making in SCM/logistics and its integration into models, processes and tasks.

Keywords: Behavioural Supply Management, Supply Chain Integration, Supply Chain Performance, Structural Equations Modelling, Partial Least Squares.

Article classification: Research paper

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1. Introduction

The increase in interconnectedness of global commerce and the constant requirement for higher supply chain efficiency and effectiveness to achieve customer satisfaction in highly dynamic and competitive markets make collaboration between supply chain partners a prerequisite for success. The formation and effective management of long-term collaborative relationships between supply chain partners is considered to lead to improved levels of supply chain integration and subsequently to significant performance improvements, such as reductions in inventories and costs and improvements in delivery speed, service levels and customer satisfaction (Benavides et al, 2012). Substantial business benefits from successful supply chain integration have been reported in corporate practice. Motorola reported a 45% increase in quarterly revenue and 82% increase in units shipped per supply chain employee in just the first year of its successful supply chain integration efforts, as well as reduction in defects, 40% improvement in material expenses, product quality and manufacturing efficiency, and improvements in on-time delivery rates (Cooke, 2007). Sony reported improvements of 40% in forecast accuracy and 18% in in-stock levels at stores from integrating its Sales and Operations Planning (S&OP) and Collaborative Planning, Forecasting and Replenishment (CPFR) functions (Kato, 2011) and Starbucks reported cost savings of $500 million in two years from improving supply chain integration (Cooke, 2010). In all these successful efforts, collaboration in major supply chain operations was a key aspect. However, a survey performed in 2010 reported that

only 2 out of 10 collaboration efforts delivered significant results (Benavides and de Eskenazis, 2012), suggesting that factors affecting the success of collaborative supply chain relationships may have not been adequately investigated.

In this setting, relevant research focuses on two main issues: i) why does the establishment of linkages between supply chain partners lead to performance benefits (e.g., Rungtusanatham et al, 2003; Barratt and Barratt, 2011) and ii) what performance benefits are brought about by these linkages (e.g., Narasimhan and Jayaram, 1998; Frohlich and Westbrook, 2001; Droge et al, 2004; Zailani and Rajagopal, 2005; Fabbe-Costes and Jahre, 2008). A third question that has received limited research attention is 'what factors affect the development of supply chain linkages'. Behavioural antecedents of supply chain relationships constitute an intuitively appealing but not adequately researched set of conditions for developing linkages between supply chain partners that can lead to higher supply chain integration and performance. Tokar (2010; p. 89) suggests that 'little published research in logistics and SCM journals focuses on developing knowledge concerning human behaviour, judgment and decision making and integrating that knowledge into models, processes and tasks'. Human decision making is involved in activities across all levels of a firm as well as in activities between firms. The manifestation of interfirm behavioural factors such as trust and commitment, and subsequently the nature of relationships between supply chain partners, is ultimately characterised by the interactions between the persons involved. Issues such as trust, justice, and relationships both in the firm and with supply chain partners can impact the goals of decision makers but are significantly unaccounted for in logistics and SCM models (Tokar, 2010).

The paper develops and empirically tests an integrated model linking behavioural antecedents of collaboration with supply chain integration and performance, grounded on a

combination of interorganisational theories, with data collected from supply chain managers that reflect their perceptions based on their interaction with the upstream and downstream supply chain partners on the linkages among these constructs. Part of the value of this contribution lies in the fact that some of these constructs and linkages have not been adequately researched in a supply chain context (mutuality/reciprocity, coordination of operational decisions) or have been researched individually (integration and performance, collaboration and performance). In a meta-review of studies on the linkages of collaboration and performance, Kache and Seuring (2014) suggest that supply chain collaboration may be linked to overall supply chain performance but the impact of behavioural antecedents on integration and performance has not been properly examined. Therefore, this paper adds to the body of knowledge concerning the antecedent factors of collaborative supply chain relationships and their integration and performance benefits, as perceived by supply chain managers.

In addition, this model also offers a process view of the effect of behavioural antecedents on integration and performance by identifying intermediate steps between the development of collaborative relationships, the increase of supply chain integration and the translation of integration into higher performance across the supply chain. The lack of associated managerial processes/guidelines has been recognised as a limitation in the research field related to determinants of governance mechanisms (Joshi and Stump, 1999) and their importance is strongly suggested (Rungtusanatham et al, 2003). Therefore, this paper also adds to the limited output for assisting managers/decision-makers in understanding behavioural factors in supply chain relationships and translating them into long-term performance benefits that go beyond immediate cost and investment advantages (Rungtusanatham et al, 2003).

The paper is structured as follows. Section 2 describes the study's theoretical underpinnings and research questions. Section 3 briefly describes the research model and hypotheses and Section 4 presents the research methodology and model operationalisation. Section 5 presents the results of the data analysis and Section 6 provides a discussion of the results and concludes.

2. Theoretical Background and Research Questions

The mechanisms governing the formation of exchanges between business partners can be studied from several theoretical vantage points differentiating in terms of their focus on specific aspects of the exchanges (e.g., transaction costs, resources, relational elements etc.) Selecting the appropriate theoretical approach should depend on i) the study's research objectives and ii) the researchers' appraisal of the capability of alternative theories to explain the actual manifestations of the phenomena under examination. Based on the classification of transactions in terms of their distinguishing characteristics (Ring and van de Ven, 1992), supply chain relationships exhibit the majority of characteristics of relational contracting transactions (authors, 2014) and can therefore be viewed as continuous, long-term relationships. This study examines if the collaborative behaviour of supply chain partners involved in relational exchanges leads to greater integration and performance. The examined behavioural characteristics suggest that the driving force behind the formation of these relationships is the partners' belief that higher performance benefits for the supply chain can be achieved through collaboration. Therefore, a theoretical approach that addresses the association among relational constructs and integration is appropriate.

Theories such as Relational Exchange Theory (RET) (Ring and van de Ven, 1992) and Social Exchange Theory (SET) (Emerson, 1976) provide a strong background for addressing this

relational perspective. RET, as the dominant theoretical basis in this research, suggests that relational norms such as cooperation, flexibility and information sharing are elements of a governance mechanism that can substitute formal contracts as the sole means for an exchange (Vijayasarathy, 2010). These norms pose an internal form of control of the behaviour of exchange partners through internalisation and moral control (Joshi and Stump, 1999). SET adds to this viewpoint by accentuating the importance of "two-sided, mutually contingent and mutually rewarding" (Emerson, 1976, p. 336) transactions, in which the reinforcement of the beneficial behaviour is ensured by the internal forms of control. In this frame of reference, behavioural attributes such as trust, commitment, mutuality and reciprocity are considered as key antecedents of collaborative supply chain relationships because they can consolidate internal control and reinforce partners' beneficial behaviour.

In addition to RET and SET, elements from other theoretical approaches are employed. The use of other interorganisational theories in SCM complementarily to the predominant theoretical underpinnings provides a more comprehensive view of the SCM phenomena under examination and is encouraged (Halldorsson et al, 2007). The Resource-Based View (RBV) theory (Barney, 1991) justifies the relationship between information exchange and supply chain performance improvement. It is argued that the formation of relational exchanges between supply chain partners can create a sustained competitive advantage for the supply chain because it opens access to resources in the forms of information sharing and decision coordination. These resources demonstrate attributes that can lead to competitive advantage (Barney, 1991): they are valuable, rare among the supply chain's competitors, imperfectly imitable and non-substitutable. Access to information among supply chain partners leads to increased information integration

and coordination of operational decisions, thus creating a sustained competitive advantage that can be translated into higher supply chain performance.

A review of extant literature on the relationship between behavioural factors, supply chain integration and supply chain performance highlights several key issues (for a more complete review see authors, 2014):

(1) Behavioural antecedents of supply chain relationships: Trust and commitment are the most commonly examined factors when viewing supply chain relationships as relational contracting transactions. The interorganisational relationships literature identifies additional important factors such as solidarity, flexibility, mutuality and reciprocity; the latter two have not been adequately researched in a supply chain setting. These behavioural factors are seen as relational capabilities which form the basis of long-lasting strategic advantages (Paulraj et al, 2008). It is argued that there is a need to expand the scope of research to include additional behavioural factors.

    The literature also indicates that there might be a sequential nature among behavioural antecedents. Based on Social Exchange Theory (Lambe et al, 2001), trust is reinforced by the establishment of mutual and reciprocal rules in a relationship leading to positive outcomes for both exchange partners. The Commitment-Trust theory (Morgan and Hunt, 1994) proves that trust is a major determinant of relationship commitment. In turn, commitment opens up partners' behaviour to share timely and accurate information in an effort to maintain the relationship. It is argued that this potential sequential nature should be further investigated.

(2) Dimensions of supply chain integration: the majority of the literature examines information sharing/exchange either as the sole dimension of integration affected by

behavioural factors or as one among several dimensions of integration. Other dimensions of integration include joint decision-making, joint relationship effort, collaborative planning. It is argued that there is a need to expand the definition of integration to include dimensions related to collaborative operational decisions.

(3) Conceptualisations of supply chain integration and relation to performance: Ambivalence on the impact of supply chain integration on performance calls for more research. In specific, there is a need to examine how individual dimensions of integration are related to different dimensions of performance (e.g., Flynn et al, 2010) and how the integration of manufacturing and marketing/sales decisions affect organisational performance (O'Leary-Kelly and Flores, 2002). The reviewed literature identifies a research gap on the relationship between integration of information exchange and coordination of key Operations Planning and Control (OPC) processes and the performance of supply chain operations. It is argued that there is a need to further explore linkages between dimensions of supply chain integration and supply chain performance.

(4) Scope and dimensions of supply chain performance: Performance is most often focused on single supply chain actors e.g., focal firm, suppliers. Supply chain-wide performance is not a common construct, and when examined, it is a collection of seemingly unrelated performance dimensions or it is not delineated at all. Operational performance and business/financial performance of the firm are usually the focus of measurement. It is argued that there is a need to conceptualise performance as a supply chain-wide construct and select indicators that can measure performance across the entire supply chain.

These findings show that while industry and academia recognise the impact of collaborative relationships and their behavioural antecedents on supply chain integration and

performance, extant research is characterised by limited examination of behavioural antecedents and lack of systematic conceptualisations of integration and performance. Due to these gaps, supply chain integration and performance outcomes from the formation of collaborative relationships are not clearly discernible. These observations motivated us to develop a conceptual model and empirically test it using the perceptions of supply chain managers, with the aim to answer the following research questions:

i) Does the perceived presence of behavioural factors of collaboration between supply chain partners affect positively the perceived level of integration across the supply chain?

ii) If yes, where should a company begin to foster behavioural factors in order to develop closer collaborative relationships with its suppliers and customers?

iii) Is a higher perceived degree of supply chain integration, fostered by collaborative relationships, positively related to a higher perceived level of performance across the supply chain?

iv) Which operational decisions affect supply chain performance the most and why?

3. Conceptual Model and Research Hypotheses

Details regarding the description of the research model and hypotheses have been previously published by the authors (2014). The research model is shown in Figure 1.

Insert Figure 1 here

This model suggests that collaborative relationships between supply chain partners are positively affected by behavioural characteristics that partners are expected to demonstrate, namely mutuality/reciprocity, trust and commitment. Based on RET and SET, a sequence for establishing these behavioural characteristics is suggested: the agreement of supply chain partners on specific mutual terms and reciprocal conditions of their relationship increases trust, as it enables partners to relax their concerns about potential negative implications of their choices (because of bounded rationality) and focus on the long-term benefits of the relationship; in turn, higher trust reduces the vulnerability attached to committing to a relationship, thereby increasing commitment to the relationship.

These behavioural antecedents, and especially commitment, determine the level of information integration between supply chain partners: commitment ensures that partners accept each other's motives as positive and that they will not be used in ways that undermine the relationship; therefore, partners exchange information more easily throughout the supply chain. In turn, information integration affects positively the level of coordination of decisions for operations planning and control (OPC) activities across the supply chain. These include demand-driven activities (cooperation in demand management and S&OP) and actual production (coordination in planning of resources, materials and capacity). According to RBV, the exchange of proprietary and highly valuable information between supply chain partners is a resource that can bring operational performance benefits (Rungtusanatham et al, 2003). Knowledge shared between partners on customer demand and capacity, materials and resource planning that would otherwise not have been available is a critical resource that improves the quality of decision-making and leads to closer cooperation between partners in deciding on supply chain configuration and operations.

Furthermore, it is hypothesised that coordination of demand-driven activities leads to higher coordination of production activities. Based on the OPC framework, decisions driven by demand (actual or forecast) such as development of S&OP and determination of production volume and mix determine the overall demand for manufacturing output, which in turn is represented by decisions related to actual production (resource planning, materials planning, capacity planning).

Finally, the coordination of demand- and supply-side decisions leads to higher supply chain performance. Coordination in supply chain decisions can increase efficiency (because planning and scheduling of operations according to actual end-customer demand reduces the need for overproduction and leads to lower order fulfilment lead times), flexibility (because the reduction of waste can increase the supply chain's capability to respond to unplanned requirements for higher output), and the balance between supply and demand, which affects the levels of customer service.

A set of research hypotheses can be formulated from this conceptual framework and the associated linkages between the supply chain phenomena described above. The research hypotheses are expressed in a way that clearly states that it is the perceptions of supply chain managers that drive their validation:

Hypothesis 1 (H_1): The higher the level of perceived mutuality and reciprocity in a relationship between supply chain partners, the higher level of perceived trust among partners.

Hypothesis 2 (H_2): The higher the level of perceived trust in the relationship among supply chain partners, the higher the level of perceived relationship commitment.

Hypothesis 3 (H_3): The higher the level of perceived commitment in the relationship among supply chain partners, the higher the degree of information integration among partners.

Hypothesis 4 (H_4): The higher the degree of perceived information integration, the higher the perceived degree of coordination of decisions related to the demand side of the OPC system.

Hypothesis 5 (H_5): The higher the perceived degree of information integration, the higher the perceived degree of coordination of decisions related to the supply side of the OPC system.

Hypothesis 6 (H_6): The higher the perceived degree of coordination of decisions related to the demand side of the OPC system, the higher the perceived degree of coordination of decisions related to the supply side of the OPC system.

Hypothesis 7 (H_7): The higher the perceived degree of coordination of operational decisions related to the demand side of the OPC system, the higher the perceived performance of the supply chain.

Hypothesis 8 (H_8): The higher the perceived degree of coordination of operational decisions related to the supply side of the OPC system, the higher the perceived performance of the supply chain.

The following section describes the operationalisation of the research model.

4. Operationalisation

4.1. Selection of data collection approach and respondents

The purpose of this research was to assess, at a strategic level, linkages between behavioural factors in supply chain relationships, integration and performance. Consequently, the scope of the study covers both the focal firm and its upstream and downstream partners. While this suggests that a multiple-respondent approach should be used for the data collection, the reality for much of the research on collaboration and partnerships (Zacharia et al, 2009) is that the collection and synthesis of the opinions of multiple supply chain partners is a difficult and time-consuming process. Additionally, employing this approach extended beyond the scope and capabilities of the present research effort. To this end, data collection followed the 'single key informant' approach, which involves the use of proxy-reports (Menon et al, 1995) from one respondent (focal firm) about the behaviour and attitudes of other respondents (upstream and downstream partners). Proxy-reports can ameliorate some of the difficulties related to contacting and eliciting responses from multiple supply chain partners. Indeed the difficulty of obtaining data from dyads/triads is suggested in a multitude of studies using proxy-reports (e.g., Anderson and Weitz, 1992; Noordewier et al, 1999; Zacharia et al, 2009).

SC/logistics managers are considered as suitable to act as single key informants for a number of reasons. At the outset, the business description and requirements of SC managers (as reported in several National Occupational Standards and job profiles) includes tasks related to the establishment of strategic relationships in the supply chain (Chartered Institute of Purchasing and Supply, 2009), supply chain synchronisation (achieved through collaboration with SC partners) (APICS, 2014) and performance assessment, monitoring and improvement (Chartered

Institute of Purchasing and Supply, 2009; APICS, 2014; Canadian Supply Chain Sector Council, 2014). Although SC managers may perform only some and not all of these tasks as part of their job profile, based on the above job descriptions, it is reasonable to assume that SC managers are more familiar with these tasks than other managers within the focal firm. Indeed, the knowledgeability requirement (Anderson and Weitz, 1992) suggests that accurate data about organisational properties can be provided by knowledgeable informants; managers of international supply chains constitute such informants and are inclined to have a broader operational and cultural perspective in their answers. Furthermore, this is a common practice in the literature (e.g., Narasimhan and Kim, 2002; Min and Mentzer, 2004; Seggie et al, 2006; Green et al, 2012) related to supply chain relationships, collaboration and integration.

SC/logistics managers were asked to quantitatively assess supply chain relationships and operations based on their perceptions which stem from their real-world experience in managing these specific supply chains and the associated relationships. Thus, the collected data reflect the perceptions (beliefs) of the supply chain managers about the behavioural relationships and operational constructs under investigation, based on their accumulated experience in managing the respective supply chain. The use of perceptions of knowledgeable respondents on subjective phenomena (such as SC relationships) is a common practice in the relevant empirical literature and is considered to reflect the way that the specific supply chain under examination works.

4.2. Modelling and measurement

Relationships between the seven theoretical constructs (mutuality/reciprocity, trust, commitment, information integration, coordination of demand-side, coordination of supply side, supply chain performance) were modelled as a hierarchical component model of the reflective-

formative type (Type II) (Becker et al, 2012). The relationships between second-order constructs are theoretically and empirically modelled as combinations of specific latent dimensions (first-order constructs) that cause a general concept; therefore the second-order constructs and the structural model are formative. The first-order constructs are measured by specific indicators that are interchangeable, not exhaustive components of the construct and have the same antecedents and consequences (Jarvis et al, 2003); therefore, the first-order constructs and the measurement model are reflective.

Trust consists of two first-order constructs: benevolence and credibility. These were measured after Ganesan (1994), whose scale was adapted to the context of upstream and downstream supply chain relationships. Commitment consists of two first-order constructs, affective commitment and continuance commitment; they belong to the three-dimensional conceptualisation of organisational commitment (Meyer and Allen, 1991) and are the most relevant for interorganisational relationships (Geyskens et al, 1996). Measures were adapted from Allen and Meyer (1990) and Meyer and Allen (1991) to fit the context of supply chain relationships. Mutuality consists of procedural, distributive and interactional justice as first-order constructs (Clemmer and Schneider, 1996). These were measured using the relevant six-item scale of Ivens (2005) following context adaptations. Reciprocity consists of three first-order constructs and items based on van Tilburg et al (1991) and Coyle-Shapiro and Kessler (2002).

Information integration includes two first-order constructs: visibility and timeliness, each consisting of five items. Coordination of operational decisions follows the basic operational processes as suggested by the Operations Planning and Control (OPC) concept of Vollman et al (2005). Operational decisions are classified into demand-side and supply-side operational decisions. Coordination of demand-side operational decisions includes demand management and

S&OP as first-order constructs and coordination of supply-side operational decisions includes resource planning, materials planning and capacity planning as first-order constructs. Indicators for first-order constructs were developed after Heide and John (1990), who measure the extent of joint activities between buyers and suppliers, and Subramani and Venkatraman (2003), who measure joint decision making in asymmetric interorganisational relationships.

Supply chain performance includes efficiency and effectiveness as first-order constructs (Caplice and Sheffi, 1994; 1995). In selecting performance indicators, the following conditions were considered:

i) Metrics should represent performance across the supply chain and should be relatively common.

ii) A focal firm should be able to assess the metrics as proxy for the supply chain.

iii) Focal firm respondents should be able to formulate a subjective/perceptual assessment of these metrics based on objective data.

Two indicators were selected for assessing efficiency: 'supply chain cycle efficiency', which assesses the use of the supply chain cycle time for value-adding activities, and 'supply chain flexibility' which measures the time required for the supply chain to respond to an unplanned increase in demand without service or cost penalty. A high degree of supply chain cycle efficiency reduces supply chain idle time and decreases costs through higher capacity and resource utilisation and a high degree of flexibility allows the supply chain to continue providing a given level of end customer service even under irregular circumstances.

Two indicators were selected for assessing effectiveness: 'order fulfilment lead time", which measures the time between order entry and order delivery, and 'perfect order fulfilment', which measures the ratio of perfectly completed orders over the total number of orders. The

order process may constitute the only interaction between the customer and the firm and determines the customer's experience and service level. Moreover, it requires communication and coordination among customers, suppliers and functional areas within the firm (Croxton, 2003). Indicators for all first-order constructs were measured using a 5-point Likert scale.

4.3. Modelling with Partial Least Squares

The research model suggests relationships among a set of first- and second-order latent variables (constructs) measured with multiple observed indicators. The existence of such relationships justifies the use of a structural equations modelling (SEM) approach for testing the proposed model.

Covariance-based SEM (CB-SEM) is the dominant structural equations modeling technique (Chin and Newsted, 1999) but its use presents several inherent restrictions. Typically, it requires reflective rather than formative indicators (Chin and Newsted, 1999) and its use suggests the existence of relevant theory and the objective of theory testing rather than theory building (Chin, 1995). Small sample sizes used with CB-SEM may lead to poor parameter estimates and model test statistics and Type II errors. Various lower bounds on sample size are recommended, suggesting samples of 200 or more responses for complex models (Hulland et al, 1996). On the other hand, the variance-based PLS (PLS-SEM) method shifts the focus from confirmatory theory testing to predictive research models which emphasise theory development than confirmation (Barclay et al, 1995) and include newly or not well developed measures (Chin, 1995). In addition, PLS-SEM poses limited sample demands (Chin and Newsted, 1999) and is considered more efficient in estimating large-scale models (Chin, 1995).

PLS-SEM was chosen for testing the hypothesised relationships, as it is suitable for testing complex structural models that employ both reflective and formative constructs and can overcome potential identification problems. Hair et al (2011) suggest that if formative constructs are part of the structural model, then PLS-SEM should be used, which is the case in the present model. Moreover, a substantial part of the present model is inclined toward theory development. While some the constructs and linkages have been identified in supply chain research (trust, commitment, information integration, performance), others (mutuality, reciprocity, coordination of operational decisions) have not been examined empirically. Furthermore, new multi-dimensional indicators were developed for measuring the concepts of information integration and coordination of operational decisions. Finally, the limited sample requirements of PLS-SEM in comparison to CB-SEM are an additional advantage of PLS-SEM which, however, comes after the selection of PLS-SEM.

Based on this discussion, it appears that this study satisfies most of the conditions (Hair et al, 2011) for selecting PLS-SEM.

4.4. Sample size determination

Sample size determination has followed the rule proposed by Green (1991), according to which, the minimum sample size is determined by power analysis as a function of the number of independent variables (predictors) and the desirable effect size, under the assumption of α=.05 (probability of Type I error) and of power set at .80 (i.e., probability of not making a Type II error). Effect size is selected among three potential alternatives (small, medium, large) and typical studies in the behavioural sciences select a medium effect size (Green, 1991). Based on the number of predictors, the level of α, the power and the effect size, the corresponding

minimum sample size for the model is 66 cases. The sample size of the present study (N = 162), is approximately 2.5 times larger than the minimum sample size.

4.5. Survey design and profile of respondents

The basic research design was a cross-sectional field study of supply chain / logistics managers of manufacturing companies operating worldwide. The research unit was the manufacturing company and its supply chain and the survey was performed with manufacturing companies based in Europe, USA and Asia. The supply chain / logistics managers contacted were derived from partial member databases of the Institute of Supply Management (ISM) and the European Organisation for Logistics Collaboration (ELUPEG) and from supply chain related groups in the business-oriented social network LinkedIn.

Building on the premises that: i) SC managers can provide a holistic and strategic view of relations with their upstream and downstream supply chain partners and ii) the perceptions of SC managers (from their actual collaboration experience with major suppliers and customers and from their knowledge and experience on the performance of supply chains in which they collaborate) can provide a reasonable assessment of the supply chain phenomena under investigation, the survey invitees were asked to provide their perceptions on:

- the degree of presence of behavioural factors in the relationship with a) their major supplier and b) their major customer,
- the degree of information integration and coordination of operational decisions with their suppliers and customers, and
- the performance of the integrated supply chain.

The respondents' profile (Table 1) shows that the surveyed manufacturing companies represent a variety of industrial sectors. Moreover, the respondents have substantial professional experience (average experience of the entire sample is 13 years), further strengthening the argument on their knowledgeability and relevance to the issues asked.

insert Table 1 here

A web-based survey instrument was developed following the Tailored Survey Design approach (Dillman, 2007). A preliminary version of the instrument was pre-tested by five logistics managers and six academic researchers who were asked to provide comments on the wording, presentation and face validity of the items, the overall structure of the survey instrument and the appropriateness of the selected supply chain performance measures; their suggestions were incorporated in the final version of the instrument. Both a word processor-based version and a web-based version of the survey instrument were developed.

Three e-mails were sent to survey invitees. The first introduced the research and included the questionnaire. Two follow-up reminders were sent to non-respondents two and six weeks after the initial contact respectively. In total, 1,921 survey invitations were sent out and a total of 162 complete responses were received. The response rate was 8.43%, which, although not as high as desired, did produce a sufficient sample size to perform a SEM-based analysis. This response rate is higher than already published research (e.g., 7.4% in Braunscheidel and Suresh, 2009) in the field of supply chain relationships and integration and close to the average response rate of 9% for electronic surveys in this research field (Vijayasarathy, 2010).

5. Analysis

5.1. Data preparation

Prior to the estimation of the measurement and structural models, the data was screened for: i) normality, ii) common method variance, iii) non-response bias, and iv) factorial validity.

5.1.1. Data normality

Despite the fact that PLS-SEM does not consider normality assumptions, the data were screened for normality. All 53 items demonstrate an absolute value of skewness <1 and 4 items demonstrate an absolute value of kurtosis slightly higher than 1. Given that PLS-SEM does not assume any distributional form for measured variables (Chin and Newsted, 1999) and that the results do not reveal extreme skewness and kurtosis of the data, no additional non-parametric normality tests were performed.

5.1.2. Common method variance

The presence of common method variance was examined following the recommendations of Podsakoff et al (2003). Procedural remedies related to survey instrument design involved a) improvement of scale items, and b) counterbalancing question order. Special care was taken during the questionnaire design to avoid vague concepts, keep questions simple and concise, avoid double-barrelled questions, decompose questions relating to more than one possibility, and avoid complicated syntax. Counterbalancing of question order was performed by including the questions on mutuality and reciprocity (independent variables) after the questions on trust and

commitment (dependent variables). Response anonymity was adhered to in as many ways as possible and the use of different response formats in the form of different scales for measuring items pertinent to different constructs, was also introduced.

Finally, Harman's single-factor test was performed by applying a factor analysis with oblimin rotation to the entire data set. Substantial common method variance is present if one dominant factor emerges from the factor analysis or if the factor analysis reveals one factor that accounts for the majority (i.e., more than 50%) of total variance. The factor analysis revealed 11 factors accounting for 73% of the total variance explained, and the first factor accounted for 30.6% of the total variance explained. Therefore, it can be said that common method variance does not constitute a problem for the additional analysis of the data.

5.1.3. Non-response analysis

An early vs. late respondents analysis using a time trends approach was used for assessing non-response (Armstrong and Overton, 1977). The early respondents subsample included 35 questionnaires that were received on the same day that the invitation and questionnaire were sent out. The late respondents subsample included 35 questionnaires that were received between 28 and 140 days after the initial invitation and questionnaire. 10 out of the 52 variables were randomly selected and an independent samples t-test was performed in SPSS. The t-tests produced no statistically significant differences among the 10 survey items tested, suggesting that non-response bias might not be a problem in this study.

5.1.4. Factorial validity

Factorial validity in PLS-SEM is assessed by Confirmatory Factor Analysis (CFA), in which the pattern of loadings of the indicators on the respective latent variables is pre-specified and then the fit of the pre-specified model is examined to determine its convergent and discriminant validity (Gefen and Straub, 2005). Convergent validity is present when each of the indicators loads with a significant t-value on its latent construct (where $\alpha = 0.05$ at least). Discriminant validity is shown when a) an appropriate pattern of loadings is present, i.e., when the indicators load highly on their theoretically assigned construct and not highly on other constructs and b) when Average Variance Extracted (AVE) is appropriate. In this model, all indicators loaded substantially (at least 0.50) on their first-order constructs except for one, which presented a low loading (0.158) and was removed. All loadings were significant at $\alpha=0.05$ level. Thus, convergent validity is ensured.

With regards to discriminant validity, all indicators loaded at least one order of magnitude (Gefen and Straub, 2005) higher on their assigned first-order latent variable than on other constructs (differences between first and second highest loading ranged between 0.103 and 0.615) except for one which loaded almost equally on two first-order constructs and was also removed. In addition, the AVE of 17 out of 18 first-order constructs is higher than 0.50 (the AVE of one construct is 0.468) and the AVE of each first-order latent variable is larger than the squared correlations among it and the other first-order latent variables, thus satisfying the Fornell-Larcker criterion (Henseler et al, 2009). Therefore, it can be said that the model has adequate discriminant validity.

5.2. Measurement and structural model

The structural and measurement model under PLS-SEM consists of the following three types of relations: i) the inner (structural) model, which specifies relationships between latent variables, ii) the outer (measurement) model, which specifies relationships between latent variables and their unobserved variables and iii) the weight relations upon which the case values for the variables have been estimated (Braunscheidel and Suresh, 2009). The SmartPLS software was used (Ringle et al, 2005) for setting up and running the PLS-SEM model.

Reliability in PLS-SEM is traditionally assessed by Cronbach's alpha and composite reliability (CR). Typically, an acceptable minimum value of Cronbach's alpha for scales that have not been established in previous research is 0.60 (Narasimhan and Jayaram, 1998) and a "modest" CR has a minimum value of 0.70 (Nunnally, 1978). Table 2 shows the quality criteria (item loadings, AVE, CR) of the reflective first-order constructs.

insert Table 2 here

To estimate the outer and inner model, the two-stage approach for hierarchical component analysis (appropriate for reflective-formative models such as the present) was followed (Ringle et al, 2012). In the first stage (estimation of the outer model), the repeated indicators method was used: measurement items were loaded both on the first-order latent variable to which they theoretically belong and the associated second-order latent variable. Then, the scores of the first-order latent variables produced by the execution of the model were used as manifest variables in the measurement model of the second-order latent variables.

Prior to reporting the structural model results, it is important to assess potential collinearity. In a Type II model, collinearity is not estimated for the reflective measurement model but only for the structural model (Hair et al, 2014). It can be estimated through a multiple regression of the variable scores of the second-order constructs; a value of Variance Inflation Factor (VIF) higher than 5.00 provides an indication of collinearity (Hair et al, 2014). The multiple regression results did not show a VIF > 5.00 for any of the second-order constructs, thus suggesting that collinearity does not appear to be a problem for interpreting the standardised path coefficients of the structural model and their significance levels.

The results of the initial structural model are reported in Table 3.

insert Table 3 here

The relationship between mutuality/reciprocity and trust (H_1) is strong (0.706) and statistically significant. Thus, the hypothesis that mutual and reciprocal relationships between supply chain partners are prerequisite for the development of trust in the relationships is validated. Following, the relationship between trust and commitment (H_2) is strong (0.410) and statistically significant, thus lending substantial support to the hypothesis that there is a positive relation between the existence of trust in supply chain relationships and the commitment of partners to these relationships. Subsequently, the link between commitment and information integration (H_3) is moderately strong (0.177) and statistically significant, also lending support to the hypothesis that when commitment is present in supply chain relationships, partners are more likely to share information in a timely manner. This set of hypotheses confirms a sequential path between behavioural antecedents of supply chain relationships and integration of information

exchange, and that their existence can set the foundations for sharing of timely and accurate information across the supply chain.

The relationship between information integration and coordination of demand side (H_4) is strong (0.753) and statistically significant, while the link between information integration and coordination of supply side (H_5) is moderate and statistically significant (0.195). In addition, there is a strong (0.705) and statistically significant relationship between coordination of demand side and coordination of supply side (H_6). This is a significant finding which shows that the impact of sharing of timely information across a supply chain is significantly stronger on the coordination of activities related to the general direction setting for the supply chain based on the demand generated by its downstream tiers (demand side activities). In contrast, the impact of information integration on the activities that involve the supply side OPC activities is not very strong. However, there exists a strong link between the coordination of demand side activities and the coordination of supply side activities. This suggests that to translate the benefits of sharing of timely information across the supply chain into improved coordination of operational activities, it is essential to share information on the planning of the overall direction of the supply chain which in turn affects the coordination of the core activities of the production system.

The strength of the relationship between the coordination of demand-side decisions and supply chain performance (H_7) is moderate (0.179) but not statistically significant, whereas the strength of the relationship between the coordination of supply-side decisions and supply chain performance (H_8) is moderate (0.263) and significant at .10 level. Taking into consideration that collinearity does not appear to exist between coordination of demand-side decisions and coordination of supply side, the model was re-executed without the non-significant relationship in order to identify the total effect of supply side decision coordination on supply chain

performance. Indeed, the strength of this relationship increased substantially (0.416) and became statistically significant at .05 level.

The above result suggests that the coordination of supply-side decisions and activities related to actual supply chain manufacturing process (materials, capacity, resources) has higher impact on supply chain performance as compared to the coordination of decisions related to demand management and S&OP development. This suggests that in order to translate increased coordination of operational decisions into performance benefits for the entire supply chain, it is important to start with coordinating the decisions related to the strategic operation direction of the supply chain. When this is achieved, the coordination of decisions related to core production activities can lead to higher performance for the entire supply chain.

Overall, this model provides support for the hypotheses linking the proposed behavioural antecedents of supply chain relationships with information integration but it also shows that there is a sequence in their appearance: mutuality and reciprocity in the relationship breed trust, and trust leads to increased commitment in the relationship, which is a prerequisite for partners to share critical and often proprietary information. Moreover, the proposed model provides support to the suggestion that information integration across the supply chain affects to a high degree the coordination of the decisions providing the overall production direction of the supply chain. These in turn lead to increased coordination of actual production decisions and subsequently to higher supply chain performance.

The final model and its results are illustrated schematically in Figure 2.

insert Figure 2 here

5.3. Alternative Models

To further explore linkages between mutuality/reciprocity, trust and commitment and strengthen the validity of the postulated relationships (Anderson and Gerbing, 1988), alternative models were tested. The first model views Trust, Commitment, and Mutuality/Reciprocity as direct, unlinked antecedents of Information Integration. In this model only two behavioural antecedents (Mutuality/Reciprocity and Commitment) load significantly on Information Integration, reinforcing the idea of a sequential relationship between behavioural antecedents and information integration. Taking this into account, an alternative model with Trust as an antecedent of Commitment and Mutuality/Reciprocity was then examined. This model supported the impact of Trust on Commitment and Mutuality/Reciprocity but did not identify a significant impact of Mutuality/Reciprocity on Commitment and was therefore rejected.

An alternative model that also appeared interesting during the testing process involved splitting the Mutuality/Reciprocity construct in two separate constructs (Mutuality, Reciprocity) which load on Trust. The motivation behind this model was based on the treatment of mutuality and reciprocity as two different factors in the scarce literature available (e.g., Dabos and Rousseau, 2004) and the subsequent interest to examine this treatment in the present research setting. Indeed, the results show that both Mutuality and Reciprocity have statistically significant loadings on Trust but the impact of Mutuality is much higher than that of Reciprocity (0.515 and 0.265 respectively), signifying that relationship mutuality is a more important determinant of trust between supply chain partners than relationship reciprocity. This result is in line with extant theory, which suggests that in the context of relational exchanges reciprocity is a more complicated phenomenon than mutuality, appears less often in exchanges involving balanced obligations and its relational benefits may be more difficult to capture (Dabos and Rousseau,

2004). In practical terms, this result suggests that supply chain decision-makers should instigate collaboration by developing relational contracts with supply chain partners that bind together the contracting parties through mutual obligations and benefits. This may in turn lead to the development of behaviours that are aligned with the relational commitment that results from the mutually agreed position. It also suggests that reciprocal equal contributions to a relationship are more difficult to achieve, thus necessitating clearer communication of relationship expectations between the contracting partners.

5.4. Model Evaluation

PLS-SEM does not provide an overall test of goodness-of-fit (Anderson and Gerbing, 1988) allowing for global validation of a model. As PLS-SEM does not make a distributional assumption in estimating parameters, traditional parametric-based techniques for the basic model evaluation are inappropriate (Chin and Newsted, 1999). Chin (1998a) suggests that the most appropriate prediction-oriented, non-parametric evaluation measures are: i) R^2 for dependent latent variables (see Figure 2), ii) the Average Variance Extracted of Fornell and Larcker (1981) (see Table 3) and iii) the Stone-Geisser (or Q^2) test for predictive relevance.

In this model, R^2 for dependent second-order latent variables ranges between acceptable (0.17 - Commitment) and very strong (0.75 – Coordination of Supply Side). One notable exception is Information Integration which presents a weak R^2 of 0.03. The overall model explains 17.3% of the total variance in supply chain performance, which is an acceptable result.

Q^2 represents a measure of "how well observed values are reconstructed by the model and its parameter estimates" (Chin, 1998b). A value of $Q^2 > 0$ for each second-order latent variable implies predictive relevance. The Stone-Geisser test for this model produced values of

$Q^2 > 0$ for all second -order latent variables, indicating acceptable predictive relevance of the basic structural model.

6. Discussion and Concluding Remarks

A sequential relationship was found between the three behavioural antecedents of supply chain collaboration, providing evidence that the development of supply chain relationships requires supply chain decision-makers to plan contracting and collaboration with partners in mutually beneficial and reciprocal ways, so that trust and commitment can be fostered among them. In specific, the strong influence of mutuality and reciprocity on trust lends support to the assertion of Dabos and Rousseau (2004) on their core importance in the formation of relational exchanges. Despite the fact that Dabos and Rousseau (2004) view mutuality and reciprocity in the context of employer-employee relations, the findings show that this fundamental concept is also applicable in inter organisational and supply chain relationships. Moreover, the impact of mutuality and reciprocity on trust lends indirect support to the hypothesis of Morgan and Hunt (1994) on the negative relationship between opportunistic behaviour and trust: the state of mutual and reciprocal interdependence that supply chain partners enter precludes opportunistic behaviour, which in turn would lead to decreased trust. Furthermore, the relatively strong influence of trust on commitment confirms the fundamental hypothesis of the commitment-trust theory of Morgan and Hunt (1994). In the supply chain context, the model also confirms the relationship between trust among supply chain partners and commitment to their relationship (as examined e.g., by Kwon and Suh, 2005).

The impact of commitment on information integration supports the hypothesis that when supply chain partners exhibit commitment to a relationship, they are more likely to exchange

sensitive and proprietary information on their business processes. It is true that the authors expected a stronger relationship between these two constructs. A more detailed analysis of the relationships between the first-order constructs of commitment (affective commitment, continuance commitment) on specific constructs of information integration (information visibility, information timeliness) could provide some explanation for this intuitive discrepancy. Indeed, Zhao et al (2008) suggest that not all types of relationship commitment may have a positive impact on supply chain integration.

The results of the impact of information integration on the coordination of operational decisions are interesting. At the outset, the difference between the strong and moderate impacts of information integration on the coordination of demand side and supply side OPC activities respectively has (to the authors' knowledge) not been reported previously. The strong relationship between coordination of decisions for demand-side and supply-side OPC activities acts as the missing link between information sharing and coordination of manufacturing processes. This result supports conclusions in the same line of thinking but at different levels of analysis. For example, Ralston et al (2015) report that strategic customer and supplier integration has been predicted to have a positive relationship to demand responsiveness, which in turn has a positive effect on operational and financial performance. Gimenez et al (2012) ask "how positive intentions and trust toward the supply chain […] contributes directly to improving service" (p. 601) and argue that cooperative behaviour acts as a prerequisite for various types of integration, such as planning integration and joint improvement; this argument is investigated and confirmed in this research.

Finally, the non-significant relationship between demand-side decision coordination and supply chain performance and the strong and significant impact of supply-side decision

coordination on performance when the non-significant relationship is omitted lends statistical support to a logical step in the production process: demand coordination affects production coordination which in turn affects supply chain performance. An interesting insight can be derived from a resource-based viewpoint of this set of relationships. In production activities, the resource attributes creating a sustained competitive advantage are more prominent that in demand-related activities. Indeed, coordination of production decisions is valuable since it allows the supply chain to conceive production strategies that improve its efficiency and effectiveness, rare because it is a resource not readily available to a large number of supply chains, imperfectly imitable due to the unique and complicated relationships between specific supply chain partners, and non-substitutable because no strategically equivalent resources exist for production coordination. The result which states that such activities have stronger impact on supply chain performance lends further support to the basic tenet of RBV on the impact of firm resources demonstrating these attributes on the formation of competitive advantage.

From a theoretical perspective, the modelling approach and results provide significant evidence for the development of supply chain relationships characterised by collaborative behavioural factors as a means of achieving superior supply chain performance. The results strengthen the relational and social exchange aspect of supply chain relationships. The relational viewpoint is strengthened by the results showing that supply chain integration based on collaborative relationships positively affects performance. The social exchange viewpoint is strengthened by the incorporation of mutual and reciprocal rules of exchange in the development of collaborative relationships and their positive impact on integration and performance outputs. The results also provide support for viewing information and decision coordination as factors that can lead to competitive advantage in the form of higher supply chain performance.

Demonstrating how mutual and reciprocal rules in collaborative relationships can be effective in increasing supply chain integration and performance can help build theory on collaborative supply chain relationships.

From a managerial perspective, decision-makers still struggle to reap the performance benefits of developing collaborative relationships with supply chain partners and few firms have succeeded to collaborate in a way that leads to a distinctive competitive advantage (Fawcett et al, 2015). Reasons may include reluctance to organisational transformation, structural inertia and unwillingness of decision-makers to expose themselves to risks required to create a collaborative environment. The results reported here suggest that decision-makers can ameliorate the unwillingness to undertake collaboration risks by agreeing upon and adhering to mutual and reciprocal rules and relational norms that will reduce risks of expropriation of benefits by their counterparts and lead to greater trust and commitment. This collaborative relationship environment positively affects practical operating contingencies related to information sharing , decision coordination and, ultimately, higher supply chain performance.

This study does not go without limitations:

i) The use a single key informant approach, due to the inherent difficulty and objective constraints in employing a multiple respondent approach in the survey.

ii) The selection of SC/logistics managers as representatives of the supply chain under examination, which may not incorporate the knowledge and perceptions of other supply chain professionals that help create an integrated supply chain. However, it is appropriate to bear in mind the caveat that, according to their profile and job description attributes, supply chain managers are in a good position to act as single informants for the issues under consideration.

iii) A longitudinal survey would be more helpful in assessing causality between collaborative supply chain relationships, integration and performance in a more consistent way.

It is indeed a challenging and interesting task to design a survey that can incorporate multiple stakeholders without requiring excessive data collection effort and at the same time achieving an acceptable response rate.

Issues for further research include: a) a more detailed, standalone examination of the relationships represented by the paths that did not turn out as important as expected by the authors or statistically significant, namely commitment – information integration and coordination of supply side decisions – supply chain performance, b) determinants of information integration (e.g., integration of information technology applications throughout the supply chain), as the proportion of the variance explained by the behavioural antecedents is low ($R^2 = 0.03$), and c) impact of integration on an expanded concept of supply chain performance which includes dimensions and indicators related to ethical performance and environmental sustainability.

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FIGURE 1: Conceptual Model for Examining the Relationship between Behavioural Antecedents of Supply Chain Relationships, Supply Chain Integration and Performance

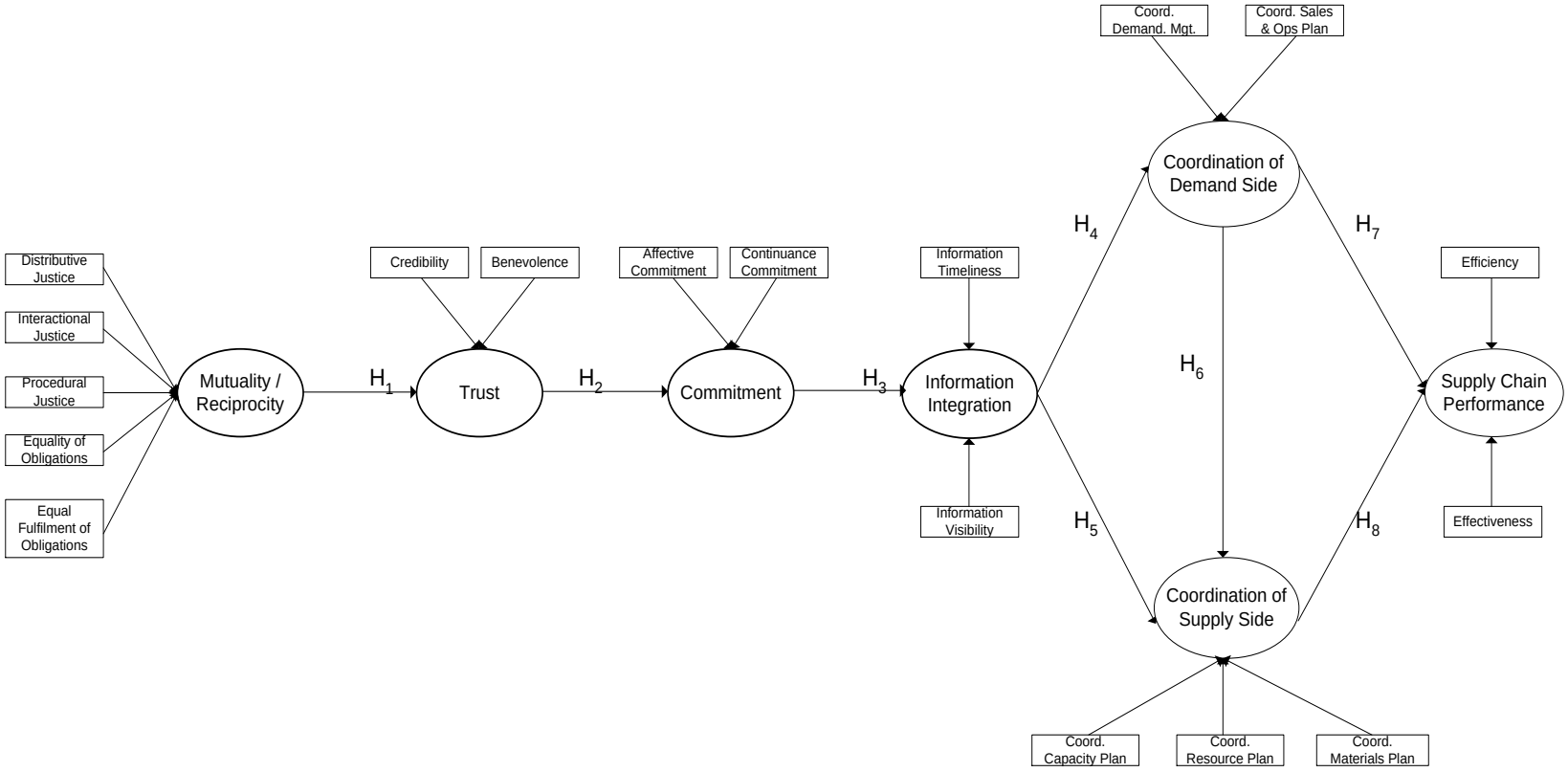

FIGURE 2

Estimates of Final Structural Model

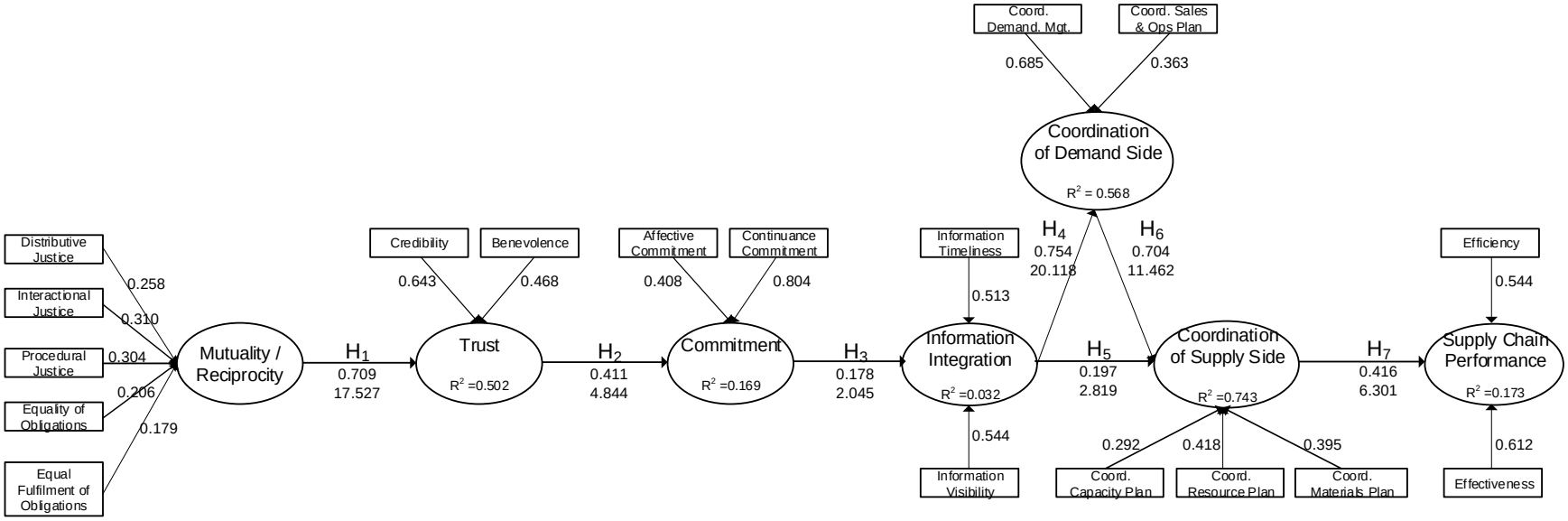

TABLE 1: Profile of survey respondents (N = 162)

Profile characteristic	Categories	Responses	Percentage
Industry	Chemicals and allied products	23	14.2
	Food and beverages	22	13.6
	Electric / electronic equipment	19	11.7
	Transportation equipment	14	8.6
	Fabricated metal products	12	7.4
	Consumer goods	11	6.8
	Machinery, except electrical	8	4.9
	Pharmaceuticals	6	3.7
	Instruments and related products	6	3.7
	Aerospace and defense	6	3.7
	Paper and allied products	5	3.1
	Rubber and misc. plastics	4	2.5
	Tobacco	3	1.9
	Other	23	14.2
Geographical location	Europe	84	51.9
	USA	52	32.1
	Asia	23	14.2
	N/A	3	1.9
Employment of respondents	Supply Chain / Logistics	88	54.3
	Procurement / Purchasing / Sourcing	31	19.1
	Planning	6	3.7
	Materials Management	4	2.5
	Operations	3	1.9
	Other	30	18.5
Professional experience in SCM	10-20 years	79	55.2
	1-10 years	45	31.5
	20+ years	19	13.3

TABLE 2: Quality criteria for reflective first-order constructs

Construct	Loadings	AVE	CR
Distributive Justice		0.803	0.891
Both our company and the major supplier / customer want this relationship to be mutually profitable	0.886		
Both our company and the major supplier / customer are convinced that the concessions they make will be compensated for in the long run	0.906		
Procedural Justice		0.840	0.913
Our company and the major supplier / customer try to explain to each other their decisions that concern the business within their relationship	0.907		
In negotiations, our company and the major supplier / customer always show a fair behaviour	0.926		
Interactional Justice		0.879	0.936
In this relationship, both our company and the major supplier / customer always treat each other the way they expect to be treated	0.940		
In this relationship, both our company and the major supplier / customer treat each other with respect	0.935		
Equality of Obligations		0.795	0.886
In this relationship, both our company and the major supplier feel that they do not undertake more or less obligations than the other	0.887		
Both our company and the major supplier are comfortable in undertaking the amount of obligations brought about by this relationship	0.896		
Equality of Fulfillment of Obligations		0.552	0.701
Long-term benefits from entering such a relationship do not outweigh the disadvantages that both our company and the major supplier bear from entering this relationship	0.565		
In this relationship, our company provides as much support to its major supplier as vice versa	0.886		
Benevolence		0.608	0.821
In the past, both our company and the major supplier / customer have made sacrifices for the sake of preserving the relationship	0.666		
Both our company and our major supplier / customer care for the well-being of this relationship	0.876		
If problems arise in the relationship, our major supplier / customer is not understanding	0.782		
Credibility		0.592	0.850
Both our company and the major supplier / customer are frank when doing business with each other	0.792		
Promises (e.g., delivery dates, order placements etc.) made by the major supplier / customer are not reliable	0.545		
If problems arise in the relationship, our company and the major supplier / customer are honest about them	0.876		
We feel that our major supplier / customer will not let us down	0.823		
Affective Commitment		0.468	0.720
A strong sense of belonging in this relationship does not exist neither for our company nor for the major supplier / customer	0.635		
If needed, both our company and the major supplier / customer could become as easily attached to a relationship with another similar partner as they are in the current relationship	0.565		
Our company and the major supplier / customer have a strong emotional attachment to this relationship	0.827		
Continuance Commitment		0.631	0.837
It would be very hard for our company or the major supplier / customer to leave this relationship right now, even if they wanted to	0.800		
Right now, maintaining this relationship is a matter of necessity as much as desire for our company and the major supplier / customer	0.807		
A serious consequence of our company or the major supplier / customer leaving this relationship would be the scarcity of available alternatives for our company	0.776		
Information Timeliness		0.747	0.937
Timeliness of sharing demand management information	0.815		
Timeliness of sharing sales and operation planning information	0.858		
Timeliness of sharing resource planning information	0.919		
Timeliness of sharing materials planning information	0.855		
Timeliness of sharing capacity planning information	0.872		

Construct	Loadings	AVE	CR
Information Visibility		0.822	0.958
Visibility of demand management information	0.877		
Visibility of sales and operation planning information	0.901		
Visibility of resource planning information	0.935		
Visibility of materials planning information	0.916		
Visibility of capacity planning information	0.902		
Coordination of Demand Management (justify selection of constructs)		0.759	0.926
Joint coordination of forecasting of demand	0.824		
Joint coordination of determination of safety stock levels	0.925		
Joint coordination of determination of replenishment frequencies	0.885		
Joint coordination of determination of desired customer service levels	0.848		
Coordination of Sales and Operations Planning		0.865	0.928
Joint coordination of development and update of sales and operations plan	0.933		
Joint coordination of decisions on product volume and mix	0.927		
Coordination of Capacity Planning		0.961	0.980
Joint coordination of production capacity estimation	0.981		
Joint coordination of allocating production capacity to confirmed and forecast demand	0.980		
Coordination of Resource Planning		0.822	0.933
Joint coordination of supply chain event management	0.905		
Joint coordination of supply chain performance assessment	0.901		
Joint coordination of collaborative replenishment planning	0.914		
Coordination of Materials Planning		0.788	0.918
Joint coordination of determination of lot sizes	0.884		
Joint coordination of determination of safety lead times	0.932		
Joint coordination of determination of the demand for service parts	0.846		
Efficiency		0.756	0.861
Supply chain cycle efficiency	0.876		
Supply chain flexibility	0.862		
Effectiveness		0.816	0.899
Order fulfilment lead-time	0.908		
Perfect order fulfilment	0.899		

TABLE 3: Results of initial structural model

Hypothesis		Standardised path coefficient	t-value	Result
H_1	Mutuality / Reciprocity → Trust	0.706	17.001	Supported
H_2	Trust → Commitment	0.410	4.756	Supported
H_3	Commitment → Information Integration	0.177	2.051	Supported
H_4	Information Integration – Coordination of Demand Side	0.753	19.701	Supported
H_5	Information Integration → Coordination of Supply Side	0.195	2.803	Supported
H_6	Coordination of Demand Side → Coordination of Supply Side	0.705	11.076	Supported
H_7	Coordination of Demand Side → Performance	0.179	1.451	Not supported
H_8	Coordination of Supply Side → Performance	0.263	1.848	Supported *