Journal of
*Risk and Financial Management*

MDPI

*Article*

# What Makes Management Control Information Useful in Buyer–Supplier Relationships?

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Received: 18 May 2018; Accepted: 18 June 2018; Published: 21 June 2018


**Abstract:** Extensive research results in inconsistent findings regarding the advantages and risks of exchanging management control information in collaborative relationships between buyers and suppliers. This inconsistency is due, in part, to ignoring whether the information shared is useful. This study analyzes the influence of transaction characteristics (asset specificity, opportunistic behaviors, and resource control) on the usefulness of the format and the content of such sharing. Samples of purchasing and sales managers differ in how their assessment of this usefulness reflects the influence of transactional characteristics, as well as the format (timeliness, aggregation, and integration) and content (scope and symmetry) of the management control information itself.

**Keywords:** collaborative buyer–supplier relationships; management information sharing; management control systems; transactional characteristics

## 1. Introduction

Globalization and outsourcing have provided the means for companies to create vast networks of suppliers, distributors, logistics and transportation providers as they search for the efficiency promised by supply chains (Lee and Wu 2014). The combination of collaboration among firms with management control systems is considered a source of creation value in relationships and alignment strategies (Kruis and Widener 2016; Ramon et al. 2017). In a collaborative buyer–supplier relationship (CBSR), partners must make investments that allow mutual adaptation. CBSRs involve working together for a long period of time and to the benefit of both participants (Nyaga et al. 2010; Anderson et al. 2014). As a result of collaborative relationships, partners can improve their operational performance by reducing costs, increasing quality, or improving fill rate, cycle time, and lead time (Ramon et al. 2017). Transaction cost theory (TCT) argues that in collaborative relationships between firms, when one partner makes specific investments and commits resources to the relationship, this partner is vulnerable to opportunistic behaviors by the other partner and uses governance mechanisms to safeguard these relationship-specific investments (Geyskens et al. 2006). A successful CBSR leads partners to establish control mechanisms to coordinate processes in order to establish common objectives and evaluation procedures (Ryu et al. 2007; Liu et al. 2010).

In CBSRs, information sharing refers to the extent to which a firm communicates critical, often proprietary, information to its partner (Mohr and Spekman 1994; Velez et al. 2015). As the tightness (or strength) of relations between partners increases, asset specificity increases; then, opportunistic behaviors emerge from one party, and finally, resource control is necessary (Artz 1999). However, the resources that a firm expends on these specific assets might produce an advantage to one partner over the other, facilitating opportunistic behavior (Heide and Stump 1995; Horton and Wanderley 2018). In order to elude such behaviors and safeguard their investments, partners establish mechanisms to control the resources (Geyskens et al. 2006). The value of specific assets,

opportunistic behavior, and control over resources determine the way in which the parties coordinate (Heide and Stump 1995; Birnberg 1998; Geyskens et al. 2006). These characteristics will affect management control information sharing as a coordination mechanism inside management control systems (Anderson and Dekker 2005).

Management control systems provide management control information that helps the planning processes, facilitates decision-making, and motives employees. Additionally, it is used to observe, evaluate, measure, and plan the firm strategy and coordinate products design, production processes, and commercial policies. Management control information is a business mechanism necessary to make decisions on concrete actions, both within a company (Larcker and Lessing 1980; Kruis and Widener 2016) and between independent firms. Management control information sharing (MCIS) might arise from the development of management control systems, which permits coordination with suppliers and industrial clients, or alternatively, it might arise from the process when the boundary between firm and partner is not totally delimited. Some examples of providing and receiving management control information are found in production costs budgets, inventory cost, and budgetary data (Fiala 2005; Velez et al. 2015; Ramon et al. 2017). Even though transaction characteristics (such as asset specificity and safeguard mechanisms) and the parties' features (such as opportunistic behaviors) importantly affect governance models, the tightness of management control systems and coordination processes (Heide and Stump 1995; Liu et al. 2010) and the effect of these factors on management control information sharing (MCIS) receive little or no empirical examination.

Organizations see in this exchange of management information an opportunity to increase the effectiveness of operations and processes that may reduce transaction costs, inventory costs, or lead times, improving coordination between buyer and supplier firms. However, if partners exchange useless information, they will not reduce costs or increase performance (Fiala 2005; Pernot and Roofhood 2014). As Williamson (1975) points out, incomplete or asymmetric information sharing could generate high transaction costs as well. These problems should diminish if partners share data about all fields of knowledge. MCIS could provide a greater closeness between partners, generating commitment and understanding, with the aim of mitigating deficiencies observed in management control systems (Anderson and Dekker 2005; Kang and Tan 2009; Ramon et al. 2017).

Most scholars consider MCIS as a control mechanism to coordinate joint tasks among partners (Anderson and Dekker 2005); however, its perceived usefulness decreases if purchasing and sales managers ignore the determinants of management information or cannot predict the influence of MCIS. Indeed, decisionmakers attempt to save costs associated with information searching. However, this might result in control misalignment (Reusen and Stouthuysen 2017). So, this paper addresses the impact of relationship characteristics on the usefulness of MCIS, specifically, the impact of asset specificity, opportunistic behavior, and resource control. Although other transactional characteristics could influence the usefulness of MCIS, TCT research recognizes these three factors as determinants of governance mechanisms and design (Geyskens et al. 2006). The model proposed here adapts the classical characteristics of information used in the design of management control systems—timeliness, aggregation, integration, and scope (Chenhall and Morris 1986; Velez et al. 2015)—and adds symmetry because of its importance in transactional relationships (Williamson 1975). This study attempts to shed light on the usefulness of management control information beyond intraorganizational relationships, by analyzing the transactional determinants of relationships between firms (e.g., customer and supplier). Thus, the questionnaire addressed both purchasing and sales managers. The purchasing managers answered questions on their relationship with a supplier with whom they collaborate and the sales managers on their relationship with an industrial client. This process facilitated analysis of the perceptions from both standpoints, assessing both similarities and differences (Anderson and Narus 1990). This procedure contributes solid evidence on the role of MCIS usefulness in buyer–supplier relationships, thus allowing generalization and comparability of the results.

In the remainder of the paper, first, a theoretical discussion leads to a statement of the hypotheses. Subsequent sections present the research method and results. Discussions and limitations round off the paper.

## 2. Literature Review

Industrial firms need to collaborate with suppliers in order to guarantee the supply of resources critical to production (Mohr and Spekman 1994). In a CBSR, each firm must adapt machinery, human resources, and production processes to the other partner (Artz 1999). Information sharing and collaboration between partners mainly concern the degrees of communication, trust, and interdependence for their willingness to work together in a joint manner, which can result in more stable transactions and reduction of uncertainty in market (Kumar and Van Dissel 1996). Control information characteristics influence on the development and the improvement of long-term relationships, identifying which characteristics are important in the alignment of partners (Velez et al. 2015).

To establish common objectives and their evaluation, both partners need to share management control information (Kruis and Widener 2016). In buyer–supplier relationships, information sharing refers to the extent to which the firm communicates critical, often proprietary, information to its partner, and information sharing relates positively to the level of closeness in the relationship (Mohr and Spekman 1994). The usefulness of shared management information is critical to cooperation (Mohr et al. 1996; Li et al. 2006), and the characteristics of the interfirm relationship will affect this usefulness. The perceived usefulness (relevance) of information depends on its content and format (Larcker and Lessing 1980; Kruis and Widener 2016).

Although the timely exchange of information seems to be the key source of operational and financial value, the exchange of disaggregated information generates additional strategic advantages in partnerships (Ramon et al. 2017).

### *2.1. Management Information Sharing*

Information sharing is often necessary in a relationship. Firms see in this exchange an opportunity to increase the effectiveness of operations and processes and to reduce transaction costs, inventory costs, or delay (Nyaga et al. 2010). One key initiative that is commonly mentioned is information sharing between partners in a supply chain (Lee and Tang 2000). Not sharing information could lead to disadvantages such as allegations of unfair treatment of suppliers, along with perceptions that profit and value are not shared equitably and that systems are unsustainable (Jack et al. 2018).

Information characteristics can be classified into four dimensions:scope, integration, aggregation, and timeliness. Although there is potentially some overlap (Velez et al. 2015), distinguishing between them enables us to sort out their influences. The present research model defines the usefulness of MCIS as the convenience perceived by each partner to the CBSR in terms of timeliness, aggregation, integration, scope, and symmetry. Timeliness relates to responses to requests for information and to the frequency of the flow of data between partners. Aggregation describes how reports summarize information across periods of time or functional areas or departments. Integration reflects the impact of each party's decisions on the other, and scope relates to the content of the information, external or internal, past- or future-oriented. This study defines scope as broad when the information relates to possible future events, population growth, technological developments, customer preferences, employee attitudes, and/or labor relations (Chenhall and Morris 1986). Broad-scope information also plays an important role, directly reinforcing commitment, cooperation, trust, and understanding. Moreover, as this information is used to support new business strategies, previous studies have found that the integration dimension allows for increased commitment and adaptability among supply chain members (Velez et al. 2015). Lee and Tang (2000) characterize this phenomenon as demand distortion, which can create problems for suppliers, such as grossly inaccurate demand forecasts, low capacity utilization, excessive inventory, and poor customer service. Demand information sharing is often discussed in conjunction with electronic data interchange (EDI). EDI is an enabler of demand

information sharing, but demand information can also be transmitted through other communication means, such as by faxes (Lee and Tang 2000). There are two kinds of information sharing in the supply chain: connectivity and willingness. Connectivity represents the technological capability of connections in the supply chain, and willingness refers to the level of openness to sharing relevant information in the supply chain (Fawcett et al. 2007). The goal of these programs is to better match supply with demand so as to reduce the costs of inventory and stockouts (Lee and Tang 2000).

The usefulness of these four management control information characteristics comes from managerial decision-making, strategic business units, and organizational performance (Chenhall and Morris 1986). No work relates these information characteristics outside the organization. This paper adds the symmetry characteristic that is specific to the CBSR context (Kang and Tan 2009). Symmetry refers to the capacity of the firm to quantify and evaluate any information that exchanges (Artz 1999). The model presented here captures these two factors by including an additional characteristic named symmetry, defined as the increase in the flow and value of confidential information exchanged, commonly defined in prior literature about supply chains (Fiala 2005; Li et al. 2006; Nyaga et al. 2010).

### 2.2. Asset Specificity Value

Asset specificity, usually defined as the extent to which investments made to support a particular transaction have a higher value than the transaction than the value they would have if the firm redeployed these assets for any other purpose (Kang and Tan 2009), includes investments in buildings, tools, learning, or brand name capital that are specific to a particular relationship (Heide and Stump 1995).

The value of specific assets refers to the investment that each partner must support in order to adapt itself to the other, measured in time or economic sacrifice (Wuyts and Geykens 2005), and also refers to the difficulty of finding another partner such as this one (Artz 1999). When a firm supplies a product to another company, the supplier usually makes permanent investments in assets that the supplier cannot redeploy outside the relation. These investments in specific assets signal a willingness to continue the relationship (Ryu et al. 2007). Artz (1999) provides a monetary value definition in which asset specificity measures the investments in physical assets, costs of employees, or worker training dedicated to the relationship with a specific partner.

Because of this monetary value, firms engaged in a CBSR employ safeguard mechanisms (Joshi and Stump 1999b) such as coordination and monitoring devices within management systems (Ryu et al. 2007; Liu et al. 2010). Nevertheless, Dyer (1997) shows that transaction costs do not necessarily increase with investments in specific assets, because firms can also use safeguard mechanisms to reduce opportunistic behaviors.

John and Weitz (1988) show that an increase in specific assets causes closeness among partners within a distribution channel. Likewise, Heide and John (1990) analyze CBSRs from a buyer firm's point of view and find that high asset specificity increases levels of joint operation and continuity expectations, leading partners to build CBSRs (Artz 1999).

The increase of the investment in specific assets is a measure of dependency and proximity between partners (John and Weitz 1988; Artz 1999), because firms that make such investments believe that the relation is long-term oriented (Ganesan 1994). This expectation of continuity foresees an increase in investment in specific assets over time and therefore in their value and the efficiency of the relationship (Heide and John 1990).

As the value of the assets increases, so will the usefulness of the management information shared, because the party that makes the investment requires useful control mechanisms that allow him/her to know what the other party is doing (Artz 1999). Thus, the management information shared will be more useful if that information arrives promptly, reflects the impact of the other party's decisions, and takes aggregated form or contains information relevant to the future.

**Hypothesis 1.** *Asset specificity relates positively to the usefulness of management control information sharing in terms of timeliness, aggregation, integration, broad scope, and symmetry.*

### 2.3. Opportunistic Behavior

Opportunistic behavior is self-interest seeking with guile and includes behaviors such as lying and cheating, as well as more subtle forms of deceit, such as violating agreements. Opportunism poses a problem to the extent that a relationship receives support from specific assets that have limited values outside of the focal relationship (Williamson 1985). Opportunism might appear because one partner desires to behave in this manner or because the other partner cannot categorize that this one might behave opportunistically (Horton and Wanderley 2018). Williamson (1985) proposes not that all people continuously behave opportunistically, but rather that some partners will behave opportunistically at some moments and that it is not possible to predict who will behave in an opportunist way and who will not (Jack et al. 2018).

The resulting leap of trust indicates that trust does not always need to be built gradually. Otherwise, the importance of increasing control will be underestimated when risks increase or trust is damaged, and valuable time will be lost (Pernot and Roofhood 2014).

Once firms make investments in anticipation of a product exchange, these investments become sunk costs, which are nonreusable outside the relation; incentives for opportunism then emerge (Hunt and Morgan 1994), and CBSR participants may design mechanisms to limit each other's ability to act on these incentives (Williamson 1985). High interdependence between partners is likely to reduce the potential for opportunistic behavior, because firms have a disincentive to engage in activities that place at risk their ability to extract value from the relationship (Pernot and Roofhood 2014). On the other hand, Heide and John (1990) point out how the expectation of further exchanges provides an opportunity to stimulate good attitudes and reduce opportunistic behaviors, because the growth of these behaviors jeopardizes the CBSR (Joshi and Stump 1999a).

Opportunistic behavior is a guilty manner in which one partner acts for its own profit or gets an advantage over the other partner; as a consequence, the other partner must use mechanisms or norms to protect its interests and investments. Relational norms mitigate opportunistic behaviors, but they require resources such as money, time, and personnel (Joshi and Stump 1999a; Horton and Wanderley 2018). If firms establish these norms or behavior protocols by controlling resources, the norms' structure is weak, and the presence of opportunistic behaviors breaks their effectiveness (Dwyer and Oh 1987; Nyaga et al. 2010).

In a CBSR, a partner can act for its own temporary benefit (Narayandas and Rangan 2004) while harming the other (Birnberg 1998). The supplier acts opportunistically by increasing prices, reducing quality, or falsifying cost information (Stump and Heide 1996; Houston and Johnson 2000). The buyer acts opportunistically by seeking alternative suppliers in order to force price reductions (Dyer 1997) or improve its position in future negotiations (Houston and Johnson 2000).

The appearance of opportunistic behaviors will reduce information symmetry, because the party who acts opportunistically will not provide information useful for decision-making or task coordination (Morgan and Hunt 1994).

Reusen and Stouthuysen (2017), found a link between purchasing strategies and share management control information and postulated that open book accounting might only be successful if accompanied by a collaboration strategy. Furthermore, two conditions are necessary for success: (1) the supplier must trust that the buyer will not use cost and similar data to the supplier's disadvantage; and (2) the buyer must demonstrate that disclosed data are necessary to achieve joint benefits (Jack et al. 2018).

No cooperative behaviors can form where one partner receives private information from the other but does not give the same contribution in return (Anderson and Dekker 2005). Stump and Heide (1996) show that when opportunistic behaviors appear, the victim firm loses its capacity to respond to exceptional problems, because the supplier does not provide useful information that allows the reduction of transaction costs. Dyer (1997) confirms that opportunistic behaviors decrease only if both parties provide private and adequate information. Wathne and Heide (2000) add that firms cannot always eliminate opportunistic behaviors but must keep them within tolerance levels by creating disincentives for them.

In general, then, the presence of opportunistic behavior decreases the usefulness of MCIS by reducing coordination among partners (Anderson and Narus 1990; Heide and John 1992; Morgan and Hunt 1994).

**Hypothesis 2.** *Opportunistic behaviors relate negatively to the usefulness of management control information sharing in terms of timeliness, aggregation, integration, broad scope, and symmetry.*

### 2.4. Resources Control

Even if partners cannot agree on the use of safeguard mechanisms during the relationship, because of contract limitations, they must interact throughout the contract duration in order to make the necessary adjustments to these mechanisms (Heide 1994; Hart 1995; Pernot and Roofhood 2014). These adjustments develop through resource controls, such as ownership substitutes, because it is not important who makes the investments or who finances them; what is essential is who controls the specific assets (Koss and Eaton 1997). Even a partner that does not own these resources can control them by means of formal control mechanisms (Liu et al. 2010).

Vertical control may be a normal substitute for property in nonintegrated relations between independent firms (Heide and John 1992; Pernot and Roofhood 2014). If the buyer or the supplier firm takes all decisions, the hybrid model will disappear and the relationship will evolve into a hierarchical model (Hart 1995); as a consequence, one partner will control all the resources (Ouchi 1980). The establishment of norms serves to safeguard the specific resources involved in the relation (Williamson 1985).

Firms carry out resource control in order to obtain some individual or mutual results and with the hope of obtaining a common benefit in the future (Anderson and Narus 1990). The usefulness of the information exchanged reflects the way partners jointly solve problems and adapt to changes, restraining the potential for hierarchical control (Nyaga et al. 2010). MCIS permits interdependence between buyer and supplier, avoids total integration, and generates commitment and understanding between both partners (Ouchi 1980; Anderson and Dekker 2005).

**Hypothesis 3.** *Resource control relates positively to the usefulness of management control information sharing in terms of timeliness, aggregation, integration, broad scope, and symmetry.*

### 2.5. Purchasing and Sales Managers' Positions

In interfirm relations between original equipment manufacturers, firms can act in a double way, as purchasing managers that negotiate with suppliers and also as sales managers that deal with industrial clients. Particularly, both relationships in CBSR involve a negotiation of the broader aspect of their respective roles and resolve contingencies and uncertainties as they arise (Ramon et al. 2017). In the buying or selling process of the transaction, control problems often arise and jeopardize the stability of and the collaboration in the interfirm relation (Reusen and Stouthuysen 2017).

Although the importance of transaction control problems could differ between managers' viewpoints (purchasing and sales managers), both managers have to solve the problems taking into account the partner (Jack et al. 2018). As partners, manufacturers firms might coordinate efforts, share information, and are focused on satisfying the requirements of the customer marketplace, independently of the role that they assume (buyer or seller) (Artz 1999; Nyaga et al. 2010).

## 3. Research Method

### 3.1. Design

This study focuses on the relationship between buyers and suppliers of intermediate products—principally component parts or processed intermediates—because these relationships are increasingly important in the business world, as competition increases and companies need

innovation, cooperation, and collaborative relationships (Mohr et al. 1996; Anderson and Dekker 2005). Industrial relationships typically show uncertainty, asset specificity, opportunism, and the presence of commitment or control mechanisms, which cause a need for partners to share useful information. Therefore, CBSR partners expend resources on adapting the production process in order to satisfy consumers' desires through more collaboration and coordination between them (Birnberg 1998; Anderson and Dekker 2005).

Data were collected via a survey questionnaire adapted to sales and purchasing managers working for original equipment manufacturers. The questionnaire was directed at purchasing and sales managers, because, as Cannon and Perreault (1999) point out, even though other people within the company might have ample knowledge of the client or the supplier, the sales department managers are the ones who pool more information and whose knowledge covers the majority of the points asked about in the survey.

Beginning with the 50,000 biggest Spanish companies included in two-digit standard industrial classification (SIC) codes 35, 36, and 37 (general machinery, electrical and electronic machinery, and transportation equipment), the survey excluded firms with 20 or fewer employees, those that had ceased to exist, and those that had merged with or been purchased by another firm with the same brand or by a firm group, for a final sample of 1380 firms. These restrictions ensured a certain amount of variance in the theoretical variables, while limiting extraneous sources of variation.

The survey development was based on Dillman's (2000) recommendations and organized into five successive stages: (i) literature review and content analysis of previous field research in order to identify feasible variable constructs; (ii) initial questionnaire design and pretest by preliminary field interviews, which were conducted with four sales managers and purchasing managers. On the basis of these discussions and previous empirical research, two questionnaires were constructed to be as parallel as possible, one for purchasing managers and one for sales managers; (iii) survey refinement to guarantee both completeness and comprehensibility of the instrument. Indeed, both versions of the questionnaire were pretested with eight scholars and six commercial managers (three purchasing managers, two sales managers, and one technical manager). The interviews confirmed that MCIS can also be present in other, less cooperative interfirm relationships. However, in Spanish firms the flow of information between buyer and supplier in such relationships concerns only price and quality, and only rarely do they share management control information. For this reason, this study was restricted to collaborative relationships; (iv) initial letter of presentation being sent by email to potential responders, where anonymous responses and aggregated data use were guaranteed; (iv) survey online administration, followed by several reminder calls. Thus, sales managers were requested to complete the mailed questionnaire with respect to one cooperative industrial client, and purchasing managers were asked about one cooperative supplier. Follow-up questionnaires were sent by letter, email, or fax. Purchasing managers returned 102 completed, usable questionnaires (7.4%); sales managers returned 89 (6%).

### *3.2. Variable Measurement*

Purchasing and sales managers were asked to rank on a seven-point scale the importance attached to each item. The scale ranged from "strongly disagree" to "strongly agree" except for the MCIS scales, which ranged from "not useful at all" to "very useful". To assure that the managers' answers addressed the usefulness of MCIS, several questions asked what management control information they received from or gave to their buyers or suppliers (inventory management, supply management, cost budgets, budget data, standard performance, and "other"). Both samples purchasing and sales managers are considered by model comparisons across samples (see Table 1).

#### 3.2.1. Usefulness of MCIS

The usefulness of MCIS was measured with an adapted version of an instrument from Chenhall and Morris (1986), designed to capture the timeliness of information (six items) and its aggregation, integration, and broad scope (four items each) (see Table 2 for adapted questions). This instrument has been widely tested in previous research. Because this instrument has been used only in analyzing

intraorganizational relations (departments, strategic business units, etc.), purchasing and sales managers were asked about the usefulness of the information transmitted and received, except for broad scope, where they were asked to compare the information content (narrow versus broad), because scope refers to information content, not to the manner of the information exchange. In the case of symmetry, an instrument was adapted to capture the usefulness of increasing the volume of flow and the exchange of confidential information (Li et al. 2006)—terms commonly used in prior supply chain studies (Fiala 2005; Nyaga et al. 2010).

#### 3.2.2. Asset Specificity Value

Asset specificity was measured via items taken from the scales used by Wuyts and Geykens (2005) (item 1), Ganesan (1994) (item 2), and Heide and Stump (1995) (item 3) (see Table 2 for adapted questions).

#### 3.2.3. Opportunistic Behavior

The scale for opportunistic behavior describes the degree to which one party shrewdly pursues its own interest, providing erroneous or incomplete information, breaking promises, or exaggerating its needs in order to obtain what it desires (see Table 2 for adapted questions). The four items have been adapted from the work of Wuyts and Geykens (2005).

#### 3.2.4. Resource Control

The scale for resource control, which was adapted from the work of Heide and Stump (1995), describes the formal influence that the other party has on the specificity of the respondent's productive process (see Table 2 for adapted questions).

### *3.3. Preliminary Analysis: Metric Invariance*

Because the data came from two different sources, purchasing and sales managers, the first step is to check whether the two samples can be pooled. Additionally, because the concept measurements use seven-point Likert scales, error measures must be taken into account. Structural equation model (SEM) analysis is a powerful tool to solve this problem, because they allow consideration of error measures using latent factors (Busemeyer and Jones 1983) and metric invariance across different samples using multigroup analysis (Steenkamp and Baumgartner 1998). The present analysis uses the cross-national approach proposed by Steenkamp and Baumgartner (1998). Parameters are estimated using maximum likelihood and EQS software. Because normality cannot be accepted, tests of robustness are conducted.

The first procedure is to compare covariance matrices and mean vectors across groups and accept or reject that they are equals to determine whether data can be pooled. As Table 1 shows, the test of equality of covariances and means yielded a chi-square value of 932.968 and a Satorra–Bentler chi-square of 866.1 (df: 527 $p < 0.05$). The statistics for the test of equality of covariances were also significant: chi-square (496): 823.675 ($p < 0.05$) and Satorra–Bentler chi-square: 741.8744 ($p < 0.05$), while the statistic for the test of equality of means was chi-square (31): 108.948 ($p < 0.05$). It is apparent that the item means rather than the item covariances are the major determinant of the overall lack of invariance of the covariance matrices and mean vectors. For this reason, metric invariance is taken into account in a multigroup analysis.

**Table 1.** Model comparisons across samples.

| Model | Chi-Square | Satorra–Bentler Chi-Square | Degrees of Freedom | RMSEA | CFI | Robust RMSEA | Robust CFI |
|---|---|---|---|---|---|---|---|
| Equality of Σ and μ | 932.97 | 866.70 | 527 | 0.064 | 0.87 | 0.058 | 0.87 |
| Equality of Σ | 823.67 | 741.87 | 496 | 0.059 | 0.87 | 0.051 | 0.87 |
| Equality of μ | 108.95 | _ | 31 | 0.115 | _ | _ | _ |
| Configural invariance | 424.89 | 389.77 | 301 | 0.047 | 0.91 | 0.040 | 0.92 |
| Metric invariance | 441.02 | 396.30 | 314 | 0.046 | 0.91 | 0.037 | 0.93 |

Metric invariance exists when loading factors are equal across groups. Because the purpose of the study is to relate the constructs, partial metric invariance is enough, because scale intervals of the latent constructs are comparable across groups. Scalar invariance is not required, because no absolute comparisons of scale scores are conducted. Lack of error variance invariance does not create a problem as long as differences in measurement error are explicitly taken into account. Partial metric invariance exists when at least one of the scale items measuring the latent construct, in addition to the marker variable, is invariant (Steenkamp and Baumgartner 1998).

First, it is necessary to check configural invariance—that is, whether the items composing the measurement instrument show the same configuration of salient and nonsalient factor loadings and whether discriminant validity exists across groups between the factors composing the model under investigation. Table 2 shows loading factors from two measurement models: model 1 includes all items proposed, while model 2 contains those items that were common across groups. All correlations between factors are below unity, indicating discriminant validity between the model variables. The average variance extracted (AVE) values for each factor were acceptable and higher than the squared correlations, supporting discriminant and convergent validity (see Table 2). The reliability values, shown in Table 2, are over 0.6 (Fornell and Larcker 1981). Model 2 is not rejected (chi-square: 424.89, p-value: 0.00, df: 301, GFI: 0.83, CFI: 0.91, RMSEA: 0.047, Satorra–Bentler chi-square: 389.77, p-value: 0.00042, robust CFI: 0.92, robust RMSEA: 0.04), so configural invariance is achieved using model 2.

Configural invariance does not indicate that people from the two groups responded to the items in the same way. Steenkamp and Baumgartner (1998) requires testing metric invariance while constraining each factor loading to be equal across groups. The scaled difference chi-square test statistic (Satorra and Bentler 2001) shows whether the model fit of the model with equal factor loadings differs significantly from the fit of the base model with all factor loadings set free (configural invariance model). Chi-square does not increase significantly between the two (Satorra–Bentler scaled difference: 9.84 df: 13, chi-square probability: 0.71). Metric invariance is consequently accepted.

**Table 2.** Metric invariance assessment across groups.

| Factor | Standardized Loading Factors | | | | Test of Invariance |
|---|---|---|---|---|---|
| | Purchasing Manager (Model 1) | Sales Manager (Model 1) | Purchasing Manager (Model 2) | Sales Manager (Model 2) | |
| **Opportunistic behavior** | | | | | |
| 1- This partner often exaggerates its needs to get what it desires | 0.58 | 0.73 | 0.58 | 0.73 | Marker |
| 2- This partner often alters the facts to get what it wants | 0.70 *** (4.63) | 0.84 *** (8.23) | 0.71 *** (4.82) | 0.84 *** (8.25) | Invariant |
| 3- This partner often promises to do things, even though it actually has no intention of following through | 0.79 *** (5.30) | 0.88 *** (7.60) | 0.77 *** (5.27) | 0.88 *** (7.62) | Invariant |
| 4- We have reason to believe that this partner hides important information from us | 0.76 *** (4.96) | 0.74 *** (6.95) | 0.78 *** (5.04) | 0.74 *** (6.87) | Invariant |
| **Reliability** | 0.80 | 0.88 | 0.81 | 0.88 | |
| **AVE** | 0.51 | 0.65 | 0.51 | 0.64 | |
| **Asset specificity** | | | | | |
| 1- If we ended our relationship with this partner, we would need to invest a lot of time and effort redeploying those of our people who are presently serving this partner | 0.998 | 0.74 | 0.85 | 0.83 | Marker |
| 2- It would be difficult for us to replace this partner | 0.75 *** (9.51) | 0.85 *** (7.37) | 0.89 *** (10.55) | 0.794 *** (10.99) | Invariant |
| 3- We have made significant investments in tooling and equipment dedicated to our relationship with this partner | 0.36 *** (3.91) | 0.56 *** (5.76) | | | |
| **Reliability** | 0.77 | 0.86 | 0.86 | 0.80 | Invariant |
| **AVE** | 0.57 | 0.68 | 0.76 | 0.66 | Invariant |
| **Resource control** | | | | | |
| 1- Our production system has been tailored to using the particular items bought from this partner | 0.346 | 0.999 | | | |
| 2- Our production system has been dictated by this partner | 0.94 * (1.66) | 0.59 *** (7.95) | | | |
| **Reliability** | 0.63 | 0.73 | | | |
| **AVE** | 0.51 | 0.46 | | | |

**Table 2.** *Cont.*

| Factor | Standardized Loading Factors | | | | Test of Invariance |
|---|---|---|---|---|---|
| | Purchasing Manager (Model 1) | Sales Manager (Model 1) | Purchasing Manager (Model 2) | Sales Manager (Model 2) | |
| **Timeliness** | | | | | |
| 1- Requested information arrives immediately upon request | 0.63 | 0.75 | 0.78 | 0.83 | Marker |
| 2- There is no delay between an event occurring and relevant information being reported to you | 0.68 *** (5.11) | 0.67 *** (5.84) | 0.82 *** (5.48) | 0.71 *** (5.57) | Invariant |
| 3- Reports are received frequently | 0.65 *** (3.65) | 0.70 *** (5.77) | 0.62 *** (3.74) | 0.74 *** (5.95) | Invariant |
| 4- Information requested from the partner is provided immediately upon request | 0.76 *** (6.38) | 0.72 *** (4.56) | 0.61*** (5.00) | 0.63 *** (4.09) | Invariant |
| 5- There is no delay between an event occurring and relevant information being provided to the partner | 0.7 *** (4.16) | 0.69 *** (6.81) | | | |
| 6- Reports are given frequently | 0.68 *** (4.11) | 0.64 *** (3.53) | | | |
| **Reliability** | 0.84 | 0.85 | 0.81 | 0.82 | |
| **AVE** | 0.47 | 0.49 | 0.51 | 0.53 | |
| **Aggregation** | | | | | |
| 1- You receive from the other party information in forms that enable you to conduct what-if analysis | 0.54 | 0.65 | | | |
| 2- Costs information received from this partner is separated into fixed and variable components | 0.68 *** (4.23) | 0.61 *** (4.66) | 0.96 | 0.84 | Marker |
| 3- You provide information in forms that enable the other party to conduct what-if analysis | 0.68 *** (5.06) | 0.56 *** (5.03) | | | |
| 4- Costs information provided to this partner is separated into fixed and variable components | 0.67 *** (3.95) | 0.63 *** (4.81) | 0.79 *** (6.23) | 0.79 *** (8.26) | Invariant |
| **Reliability** | 0.74 | 0.71 | 0.87 | 0.80 | |
| **AVE** | 0.42 | 0.37 | 0.77 | 0.67 | |
| **Integration** | | | | | |
| 1- We receive from our trading partners information that helps in business planning | 0.63 | 0.72 | 0.73 | 0.73 | Invariant |
| 2- We receive information that relates to the impact that partner decisions have on our firm's performance | 0.77 *** (4.15) | 0.61 *** (5.97) | 0.76 *** (4.18) | 0.66 *** (5.82) | Invariant |
| 3- We provide to our trading partners information that helps in business planning | 0.71 *** (4.19) | 0.56 *** (3.86) | 0.69 *** (4.41) | 0.47 *** (3.49) | Invariant |
| 4- We provide information that relates to the impact that our decisions have on our partner's performance | 0.49 ** (2.54) | 0.44 *** (3.34) | | | |
| **Reliability** | 0.75 | 0.68 | 0.77 | 0.66 | Marker |
| **AVE** | 0.43 | 0.35 | 0.53 | 0.40 | Invariant |
| **Symmetry** | | | | | |
| 1- Increase in volume of information received from our partner is | 0.79 | 0.92 | 0.89 | 0.80 | Invariant |
| 2- For our partner to share proprietary information with us is | 0.60 *** (5.81) | 0.62 *** (5.76) | 0.52 *** (5.19) | 0.74 *** (8.71) | Invariant |
| 3- Increase in volume of information provided to our partner is | 0.65 *** (4.93) | 0.56 *** (5.28) | 0.61 *** (4.46) | 0.54 *** (4.45) | Invariant |
| 4- To share our proprietary information with our partner is | 0.45 *** (3.44) | 0.22 * (1.87) | | | |
| **Reliability** | 0.72 | 0.69 | 0.72 | 0.74 | |
| **AVE** | 0.40 | 0.40 | 0.48 | 0.50 | |
| **Broad Scope** | | | | | |
| 1- Information that relates to possible future events (if historical information is most suitable for your needs, mark the lower end of the scale) | 0.63 | 0.78 | 0.65 | 0.81 | Marker |
| 2- Information on broad factors external to your organization, such as economic conditions, population growth, technological developments, etc. (if internal information is most suitable for your needs, mark the lower end of the scale) | 0.70 *** (5.73) | 0.44 *** (3.25) | | | |
| 3- Noneconomic information, such as customer preferences, employee attitudes, labor relations, attitudes of government and consumer bodies, competitor, etc. (if economic information is most suitable for your needs, mark the lower end of the scale) | 0.51 *** (3.34) | 0.43 *** (4.27) | | | |
| 4- Information oriented to the long term (if short-term information is most suitable for your needs, mark the lower end of the scale) | 0.64 *** (4.52) | 0.57 *** (4.60) | 0.65 *** (3.17) | 0.60 *** (3.35) | Invariant |
| **Reliability** | 0.72 | 0.69 | 0.59 | 0.67 | |
| **AVE** | 0.39 | 0.33 | 0.42 | 0.51 | |

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The values presented in Table 2 correspond to the standardized loadings ($t$-values appear in parentheses). AVE = average variance extracted ($t$-values are in parentheses).

### 3.4. Test of Hypotheses

The metric invariance results shown in the previous section necessitate the use of multigroup analysis. This technique is also used to test the hypotheses. Although the resource control factor appears in Table 3 as an independent variable, this variable did not achieve metric invariance;

so, resource control is not included in the model with the rest of the factors, and its effect on the dependent variables is estimated by building a different model. In this model, the purchasing and sales manager datasets are introduced, and factor loadings are constrained to the values estimated in the metric invariance measurement model, except those referring to the resource control factor, for which measures are different for every dataset. As different measures were used in each group, the analysis introduces those with values of 0.6 or higher as follows: for purchasing managers the second proposed item and for sales managers the first. The significance of the remaining relationships included in the model does not change, and model fit is not rejected (Satorra–Bentler scaled chi-square: 477.49, df: 378 $p < 0.05$; robust RMSEA: 0.037; and robust CFI: 0.92). The fit of the multigroup model shown in Table 3, not considering control resources, is also acceptable (Satorra–Bentler scaled chi-square: 501.28, df: 377 $p < 0.05$; robust RMSEA: 0.042; and robust CFI: 0.897).

**Table 3.** Results of the Structural Models.

| Dependent Variable | Independent Variables | Purchasing Manager | Sales Manager |
|---|---|---|---|
| Timeliness | Opportunistic behavior | −0.34 ** (−2.55) | −0.20 * (−1.67) |
| | Asset specificity | 0.06 (0.51) | 0.21 * (1.72) |
| | Resource control | 0.04 (0.40) | 0.20 * (1.79) |
| | Duration | 0.06 (0.68) | −0.02 (−0.19) |
| | % sales/purchasing | 0.11 (1.14) | 0.08 (1.24) |
| Aggregation | Opportunistic behavior | 0.07 (0.50) | 0.19 (1.61) |
| | Asset specificity | 0.15 (1.20) | −0.03 (−0.25) |
| | Resource control | 0.26 ** (2.31) | 0.145 (1.16) |
| | Duration | 0.15 * (1.72) | −0.049 (−0.49) |
| | % sales/purchasing | −0.03 (−0.24) | 0.13 (1.24) |
| Integration | Opportunistic behavior | 0.12 (0.91) | −0.08 (−0.72) |
| | Asset specificity | 0.13 (0.92) | 0.25 * (1.89) |
| | Resource control | 0.23 ** (2.12) | 0.25 ** (2.04) |
| | Duration | −0.13 (−1.07) | −0.07 (−0.53) |
| | % sales/purchasing | 0.20 * (1.78) | 0.15 (1.13) |
| Symmetry | Opportunistic behavior | 0.18 (1.42) | 0.01 (0.10) |
| | Asset specificity | 0.04 (0.33) | 0.38 *** (2.87) |
| | Resource control | 0.10 (0.91) | 0.25 * (1.91) |
| | Duration | 0.05 (0.58) | −0.09 (−0.73) |
| | % sales/purchasing | 0.07 (0.66) | 0.07 (0.56) |
| Broad scope | Opportunistic behavior | −0.22 (−1.50) | −0.05 (−0.42) |
| | Asset specificity | 0.15 (0.86) | 0.34 * (2.31) |
| | Resource control | −0.16 (−1.19) | −0.15 (−1.29) |
| | Duration | −0.15 (−1.50) | 0.10 (0.77) |
| | % sales/purchasing | −0.11 (−1.04) | −0.02 (−0.14) |

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Note: The solution reported is the common metric completely standardized solution ($t$-values are in parentheses).

The results (see Table 3) show differences among sales and purchasing managers. First, asset specificity has a positive and significant effect on four of the five dimensions of the usefulness of MCIS in the sample of sales managers. Asset specificity does not significantly affect aggregation, and the relation is even negative. This result largely supports Hypothesis 1, but only for the sample of sales managers. As the value of relationship-specific assets increases, sales managers in firms that develop cooperative relationships (such as CBSR) will consider as most useful data with an external, future, and long-term orientation and nonfinancial data, and they want to receive this information frequently and when an important event occurs. Also, the information will be more useful if it reflects the influence of the decisions taken by the other partner. Finally, sales managers want to increase the volume of management control information, considering it useful to share confidential and private information.

On the other hand, opportunistic behavior shows a negative and significant effect on perceived timeliness; nevertheless, the effect of this variable on the rest of the dimensions of the usefulness of MCIS is not significant and, in some cases, is positive. This result partially supports Hypothesis 2. As far as the presence of opportunistic behaviors is concerned, the firm must design management control systems taking into account that these behaviors do not reduce the information's usefulness, except for its timeliness as perceived by purchasing managers. These results indicate that the party that behaves opportunistically considers the exchange of information more useful than the party that does not behave in this way.

The third hypothesis proposed that resource control has a direct and positive influence on the usefulness of MCIS. This hypothesis can be accepted for integration, but for the other dimensions, the results are different. In the sample of sales managers, resource control has a significant relation to timeliness and symmetry, whereas in the sample of purchasing managers, aggregation is the only dimension affected by resource control. Remarkably, the relation between resource control and broad scope is negative; even though this relation is not significant, it might suggest that parties perceive that resource control increases the usefulness of information with narrow scope. In sum, resource control has a positive and significant effect on integration in both models. Also, resource control is related to aggregation in the purchasing model and to timeliness and symmetry in the sales managers' model, giving partial support to Hypothesis 3. The results show that as control increases, the firm exerting control will have to establish management control systems that permit it to evaluate the influence of decisions taken by each partner on the other. Information must include private data and may also contain external information or information that favors decision-making in aggregated budgets.

The models also include two control variables, the sales or purchases rate for this CBSR compared with the total firm sales or purchases and the duration of the relationship with this partner; however, these variables do not significantly influence any dimension of MCIS, except for the purchasing sample, where the duration of the relationship affects aggregation and the purchasing rate influences integration.

## 4. Discussion

Purchasing and sales managers needed separate consideration, because they did not always understand the questions in the same way. In the case of resource control, they employed different items to define the concept, so one must consider the invariance metric in order to compare the results. Also, purchasing and sales managers explained the usefulness of management control information sharing (MCIS) differently. The results concerning the usefulness of timeliness also differ across types of managers: for purchasing managers, timeliness is more useful when opportunistic behavior decreases; for sales managers, it is more useful in the presence of specific assets and resource control.

Resource control positively and significantly influences aggregation only in the purchasing model; in the sales model, aggregation shows the same result but is not significant. Contrary to the hypothesis proposed, opportunistic behaviors positively influence aggregation, perhaps because the party who intends to behave opportunistically also intends to hide relevant information from the other party (Wuyts and Geykens 2005; Horton and Wanderley 2018). The results also differ with respect to specific assets. In the sample of purchasing managers, the sign is as expected. In contrast, sales managers consider that an increase in the value of specific assets reduces the usefulness of aggregation, perhaps because the use of safeguard mechanisms reduces transaction costs and the need to aggregate the information (Dyer 1997; Velez et al. 2015).

Asset specificity in the sales manager model and resource control in both models positively affect integration. In the other cases, the signs of relations are those proposed by the hypothesis, but none is significant except for the influence of opportunistic behaviors, where the results show a positive influence in the purchasing manager sample. This result might ensue because in future negotiations, the buyer can take advantage when the information shared covers matters such as raw materials price reductions enjoyed by the supplier or future delays due to a transport strike (Stump and Heide 1996).

In the sales model, the usefulness of symmetry increases when asset specificity and resource control increase, and this relationship shows the same sign for purchasing managers. Nevertheless, in the presence of opportunistic behaviors, symmetry presents a positive effect, in opposition to the sign predicted by theory, perhaps because confidential information is more useful in the presence of opportunistic behaviors (Anderson and Dekker 2005).

Finally, asset specificity influences scope only in the sales managers' model. The influence of resource control has a negative (although not significant) sign, perhaps because as safeguard mechanisms increase, purchasing and sales managers consider historical and financial information more useful than ex-ante data or market information (Anderson et al. 2014).

## 5. Conclusions

The study of the design of management control systems to assist in managing buyer–supplier relationships within the supply chain has been popular and important over the past 10 years. The results reported here indicate that the usefulness of the characteristics included in MCIS reflects the characteristics of the transaction and the partners; thus, this usefulness will differ for purchasing and sales managers, depending on the information that they provide and receive about the product, costs, or budgets. A similar effect also occurs in governance models and management control systems that depend on the characteristics of transactions and partners (Geyskens et al. 2006; Anderson et al. 2014). Using TCT literature, this paper has extended and adapted the characteristics proposed by Chenhall and Morris (1986) to interfirm relationships and has shown how they reflect the transaction characteristics in industrial CBSRs. The study differs from much of the recent research as it uses generic conceptualizations of MCIS rather than practices such as open book accounting, value-chain accounting, target costing, integrated information systems, informal controls, Enterprise Risk Management or issues related to trust. The study also considers whether the relationships differ depending on whether one assumes the perspective of the buyer or the supplier.

Another contribution of this study is the simultaneous analysis of the buyer and supplier perspectives by two samples (purchasing and sales managers); both viewpoints increase the consistency of the results. This multigroup analysis supports the expectation proposed by our hypotheses, buyer and supplier firms, by their purchasing and sales managers, respond in the same way against control problems when they seek collaborative and stable relations with their partners. Manufacturer firms respond that the usefulness of the management control information will be determined by the transaction characteristics.

For management practice, these results show the importance of the characteristics of shared management control information for companies that develop collaborative relationships with their partners. In addition, it is shown that it is not only important to share information, but that it should be useful, and that consideration should be given to the influence that the specificity of assets, possible opportunistic behavior and the manner in which resources are controlled have on this usefulness.

This research faces a number of limitations. As with any SEM analysis, concerns may exist about the direction of causality between exogenous and endogenous variables. In addition, collaborative relationships evolve over time. Buyer and supplier perspectives on relationship risks, continuity, and equity vary across relationship stages, and attention to this variation could yield some insights not captured in this research. A logical extension of this research would be to consider dynamic relationships between organizational constructs using longitudinal data.

**Author Contributions:** All authors contributed equally to this work. J.M.R.-J. conceived the paper and reviewed related studies; R.F.-L. drafted the paper and designed the empirical analysis; J.M.R.-J. performed the data analysis. All authors wrote, reviewed and commented on the manuscript. All authors have read and approved the final manuscript.

**Funding:** This research was funded by Andalusia Regional Government (projects SEJ111, SEJ1933) and the Spanish Ministry of Education and Science (project ECO2014-57023-P).

**Acknowledgments:** The authors would like to thank the academic editor and the anonymous referees for their constructive and helpful suggestions on early versions of the paper.

**Conflicts of Interest:** The authors declare no conflict of interest.

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