

Horizontal logistics collaboration success factors: expectations versus reality

Horizontal
logistics
collaboration
success

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Abstract

Purpose – This study aims to compare the expectations of non-collaborating professionals and the actual opinions of collaborating professionals regarding success factors of horizontal logistics collaboration (HLC) and investigates the reasons behind the observed differences.

Design/methodology/approach – This study employs a mixed-method approach. First, a survey is conducted to collect data from two samples representing collaborating and non-collaborating industry professionals. Second, confirmatory factor analysis (CFA) is used to compare the measurement models from the two samples and identify their similarities and differences. Third, a Delphi study is conducted to identify factors limiting collaborative behavior.

Findings – The results show that collaborating professionals exhibit lower levels of joint relationship efforts and trust than expected. This is primarily due to inadequate information sharing, poor collaboration formalization and the absence of a clear costs and benefits allocation mechanism.

Practical implications – The findings indicate that, in HLC, managers should give high importance to facilitating timely and complete information exchange, putting in place an acceptable costs/benefits allocation mechanism, formalizing the collaboration and prioritizing integrity over competency when selecting partners.

Originality/value – To the best of the authors' knowledge, this is the first study that shows the existence of differences between industry professionals' pre-collaboration expectations and the actual experiences in HLC. This is also the first study that points to the exact HLC enablers that fail in practice and the barriers responsible for it.

Keywords Horizontal logistics collaboration, Success factors, Confirmatory factor analysis, Delphi study

Paper type Research paper

1. Introduction

Horizontal logistics collaboration (HLC) has been recognized as an important business strategy to improve the performance of logistics activities (Argyropoulou *et al.*, 2022). HLC refers to a situation where two or more firms, operating on the same supply chain level, collaborate on logistics activities to reach mutual goals (Badraoui *et al.*, 2022a). The most common example of horizontal collaboration relationships is collaborative transportation (Crujssen, 2020), which has the potential to reduce both transportation cost and environmental impact. However, despite the high interest for HLC, demonstrated by the multitude of scientific publications studying its application in many contexts, very few successful cases of horizontal collaboration are reported in the literature (Verma *et al.*, 2022). The aim of this paper is to understand why the



enthusiasm around HLC does not translate into successful experiences by analyzing practical issues faced by the partners during the collaboration implementation.

In theory, HLC can generate many benefits, mainly in terms of lesser costs and environmental impact (Aloui *et al.*, 2022). Several operations research-based contributions have quantified these benefits in a variety of contexts (e.g. Aloui *et al.*, 2022; Eirinakis *et al.*, 2022; Vanovermeire *et al.*, 2014). In practice, achieving the expected benefits remains a challenge (Basso *et al.*, 2019; Palmieri *et al.*, 2019; Karam *et al.*, 2021a, 2021b; Verma *et al.*, 2022). Although limited, the literature on horizontal collaboration points to several barriers that can potentially prevent collaboration companies from reaching the desired objectives. Basso *et al.* (2019) identified 14 HLC practical issues, which they categorize into factors relative to the collaboration design (e.g. coalition formation and size), planning and operations (e.g. information flow and knowledge), business/market (e.g. collusion and reputation) and behavior (e.g. trust). Karam *et al.* (2021a) extensive review resulted in 31 HLC barriers, which are categorized into factors pertaining to information sharing (e.g. lack of ICT), the business model (e.g. coordinators, revenues and costs), the collaborative DSS (e.g. system integration), the market (e.g. regulations and governmental support) and the human factor (e.g. fear of change and negative experiences). While these studies provide a holistic view of HLC barriers, they remain limited to factors identification, categorization and eventually prioritization (Karam *et al.*, 2021b), without investigating how they impact the collaboration success factors.

Indeed, there are hardly any studies specifying which HLC enabler or success factors fail in practice and the barriers responsible for it. Identifying the deficient collaboration enablers in HLC and the root causes explaining their deficiency would help companies streamline their efforts by targeting specific rather than general practical issues relative to HLC implementation. By linking collaboration enablers and barriers, this study contributes to the development of an integrative theory of collaboration and responds to Fawcett *et al.* (2015) call for deeper insights on collaboration barriers.

The research design is comprised of two steps. First, based on survey data, the HLC enablers that fail in practice are identified by comparing the expectations of non-collaborating professionals (have never been involved in HLC) with the opinion or collaborating ones (currently or have previously been involved in HLC). This approach is motivated by the difference in the behavior of industry professionals from theoretical predictions in operations management in general (Croson *et al.*, 2013) and supply chain management in particular (Talapatra and Uddin, 2019). Second, by conducting a Delphi study, the collaboration barriers responsible for the observed differences are examined. In doing so, this study answers the following two research questions:

RQ1. Which HLC success factors do not reach the initial expectations of industry professionals?

RQ2. What are the barriers responsible for it?

The contributions of this research to the literature include an increased understanding of the factors that facilitate and impede the development of HLC. While previous studies have examined HLC success and limiting factors, these studies have generally only examined the opinion of collaborating firms. Additionally, collaboration success and limiting factors are generally studied separately. This research expands on such previous studies by comparing pre-collaboration expectations to the opinions of collaborating professionals, allowing the identification of the success factors that fail to reach the desired levels. Such a comparison is highly important because the underlying assumption in HLC is that both parties are willing to engage in collaborative efforts to reach mutual performance improvement, which so far has not been tested (Badraoui *et al.*, 2022b).

In the next section, the literature on inter-firm collaboration is reviewed and HLC success factors are identified. [Section 3](#) describes the research methodology, including instrument development, data collection and data analysis methods. The results of the study are presented and discussed in [Sections 4 and 5](#). Finally, the research implications and limitations are provided in [Sections 6 and 7](#).

2. Theoretical foundations of HLC success factors

The literature on HLC emphasizes the importance of several operational and relational enablers in determining collaboration success. Operational enablers represent collaboration activities that deter opportunism and encourage cooperative behavior, while relational enablers, such as trust and commitment, represent governance mechanisms that favor mutual exchange in the relationship ([Afsan et al., 2018](#)). In this section, we discuss the most recurring horizontal collaboration enablers in the literature are discussed, along with empirical evidence of their impact on collaboration outcomes. Given the scarcity of empirical research on horizontal collaboration ([Badraoui et al., 2022a](#)), insights from vertical collaboration will be discussed as well. Although different in nature, the two strategies share common characteristics ([Basso et al., 2019](#)).

2.1 Inter-organizational trust

The literature on inter-organizational relationships considers *trust* as perhaps the most important collaboration enabler ([Whipple et al., 2013](#)). Trust reflects the degree of a firm belief in the skills and intention of partners to meet their obligations ([Badraoui et al., 2020](#)). Transaction cost economics theory emphasizes the importance of trust in collaborative relationships for its role in mitigating its behavioral risks such as opportunism and bounded rationality ([Um and Oh, 2020](#)). Trust also contributes to reducing transaction costs vis-à-vis monitoring, control and contractual agreements, and result in increase commitment from the partners ([Jain et al., 2019](#)).

The positive influence of competence and goodwill trust on collaboration success has been confirmed by several empirical studies (e.g. [Badraoui et al., 2022b](#); [Nyaga et al., 2010](#); [Lewicka and Krot, 2015](#)), which consider trust as a relational governance mechanism that promotes non-enforced collaboration. In other words, trust provides strong foundations for the partners to share information, make dedicated investments, share resources, and engage in joint efforts ([Collier et al., 2022](#)). Hence, this study considers trust as an important success factor for HLC.

2.2 Commitment

Commitment refers to a situation where group members believe that a relationship is important enough to make sure it endures ([Morgan and Hunt, 1994](#)). According to the social exchange theory, commitment can lead to performance improvement for a group as the collaborating partners are more likely to engage in collaborative efforts when they are committed to the relationship ([Wallenburg and Raue, 2011](#)). However, collaborative behavior will only manifest when all the group members are committed to the relationship ([Talapatra et al., 2022](#)). If one group member exhibits low commitment, it may negatively impact the commitment of the other members ([Schotanus et al., 2010](#)). Empirical studies have demonstrated the positive impact of commitment on collaboration outcomes. [Prahinski and Benton \(2004\)](#) showed that partners' level of commitment has a direct impact on collaboration performance. [Nyaga et al. \(2010\)](#) studied showed that commitment has a direct positive impact on collaboration performance and partners' satisfaction with the relationship. More recently, [Shin et al. \(2019\)](#) demonstrated the positive impact of commitment on the collaboration operational and innovation performance. Based on the above, this study considers commitment as an important success factor for HLC.

2.3 Dedicated investments and resource sharing

Dedicated investments are investments made by the partners to meet the specific needs of the relationship. They enable the partners to gain higher returns from the relationship and achieve competitive advantages (Walker *et al.*, 2013). Dedicated investments are generally associated with collaboration success (Nyaga *et al.*, 2010). They offer tangible evidence of partners' engagement and intentions in the relationship, thus contributing to the success of collaborative relationships (Rokkan *et al.*, 2003). More specifically, dedicated investments are associated with greater commitment to the relationship because of the partners' wish to safeguard their investments (Léger *et al.*, 2006). According to the authors, firms that invest in specific needs of the collaboration tend to bond more closely with their partners to safeguard their investments.

Evidence of partners' involvement and dedication to the relationship can also be identified through *sharing existing complementary resources* (Walker *et al.*, 2013). According to the extended resource-based view, resource sharing enables partners to achieve a competitive advantage (Saha *et al.*, 2022). The numerous contributions on industry clusters and networks are an example of the importance of resource sharing in vertical collaboration. In horizontal collaboration, the partners may share both physical and human resources (Walker *et al.*, 2013). Mutual use of physical resources increases their utilization rate while sharing human resources provides complementary skills and expertise to the partners. By analyzing two case studies, Badraoui *et al.* (2020) report that sharing complementary resources (personnel in the first case; trucks and storage facilities in the second case) has a positive influence on trust and commitment, which in turn increases the success rate of collaborations. Hence, dedicated investments and resource sharing in physical and human resources are considered as potential success factors for HLC.

2.4 Information sharing

Information sharing is defined as the act of exchanging accurate, complete, and relevant information among partners (Cao and Zhang, 2011). The possibilities created through sharing information are endless, from risk reductions to enabling collaborative efforts by reducing information asymmetry and facilitating accurate planning and execution of activities (Liu *et al.*, 2021). As such, it contributes to synchronization of collaborative activities and helps avoid opportunity cost relative to sub-optimizations (Crujissen, 2020). It is also believed to be essential for trust and commitment building in a relationship as it helps partners to better understand each other's processes (Agarwal and Narayana, 2020), thus contributing to achieving collaborative benefits and increasing the success rate of collaborations (Zhang and Cao, 2018).

Empirical studies have demonstrated the positive impact of information sharing on collaboration outcomes. Chen (2019) showed that the frequency and intensity of information exchange have a significant positive influence on collaboration performance. Olorunniwo and Li (2010) showed a direct positive impact of information sharing on collaboration in reverse logistics activities. Panahifar *et al.* (2018) also showed that information sharing has a direct positive impact on collaboration effectiveness, and thereby a firm's performance. By comparing buyers' and suppliers' opinions regarding supply chain collaboration antecedent, Nyaga *et al.* (2010) showed that information sharing has a direct positive impact on trust and commitment, which in turn has a positive impact on collaboration outcomes. Therefore, information sharing is retained as a success factor for HLC and consider information quality, completeness and timeliness as its indicators.

2.5 Joint relationship efforts

Joint relationship efforts represent several actions through which partners plan activities and synchronize decisions in the collaboration (Kumar and Nath Banerjee, 2014). These actions

include setting up common objectives, decision synchronization, joint planning, joint performance measurement and incentives alignment (Walker *et al.*, 2013). First, setting up common objectives is believed to decrease transaction costs as less fine-tuning and adaptation is needed (Schotanus *et al.*, 2010) and increase the collaboration performance (Badraoui *et al.*, 2022b). Second, joint planning and decision synchronization represent key activities through which partners ensure the successful implementation of collaborative actions (Zhang and Cao, 2018). Although systematic agreements on decisions reduce partners' flexibility and may result in higher bargaining and enforcement costs, they minimize the chances of conflicts and mitigate uncertainty in a relationship (Schotanus *et al.*, 2010). Third, periodically reporting on collaboration performance has become a standard in collaborative relationships (Fawcett *et al.*, 2008a) as it reduces misunderstandings regarding the state of the collaboration and allows partners to identify problems before they turn into constraints. Finally, joint efforts also include aligning incentives, i.e. agreeing on a fair costs and benefits allocation mechanism. Firms engage in collaborative efforts for financial savings, which if attained, should be fairly allocated among the collaborating partners (Wagner and Lindemann, 2008). An allocation mechanism perceived as unfair may lead to lower commitment levels, negatively affecting collaboration success.

The positive impact of joint relationship efforts on collaboration success has been demonstrated in several empirical studies. Nyaga *et al.* (2010) showed that joint teams, joint planning and joint decision making have a positive impact on trust, which in turn positively influences collaboration outcomes in buyer–seller relationships. Schotanus *et al.* (2010) showed that setting up common objectives contributes to the success of collaboration purchasing groups. Liao *et al.* (2017) also showed that, along with information sharing, decision synchronization and incentives alignment have a positive impact on achieving a competitive advantage. Therefore, joint relationship efforts, including goal congruence, decision synchronization, joint planning, joint performance measurement and incentives alignment, is considered as a success factor for HLC.

2.6 Partner similarity

Through HLC, partners can complement each other by contributing knowledge and assets and reducing duplication of efforts. However, efficient joint efforts necessitate a certain level of similarity and uniformity between partners in terms of internal processes and organizational culture (Gao *et al.*, 2017) and products requirement in terms of logistics equipment and transportation and storage conditions (Pan, 2010). In terms of internal processes, it is argued that transaction costs are lower between similar members as the need for adaptation is low (Schotanus *et al.*, 2010). Product similarity facilitates the execution of operational activities and increases the possibility of using preexisting infrastructure (Pan, 2010). Partner similarity also contributes to reducing the risk of partners developing different perceptions of the value each one brings to the relationship (Schotanus *et al.*, 2010). In the case studies of Badraoui *et al.* (2020), partner similarity in terms of purchasing and manufacturing processes facilitated the execution of collaborative activities in the first case. In the second case, the similarity in terms of product requirements allowed the partners to use existing transportation equipment and storage facilities. Therefore, partner similarity is retained as a success factor for HLC.

Previous empirical research demonstrated the impact of partners' similarity on collaboration outcomes. According to Gao *et al.* (2017), partners' similarity has a direct positive impact on HLC stability and its overall performance. Raue and Wallenburg (2013) showed that organizational similarity reduces the risk of conflict, which contributes to the stability of HLC. Das and Teng (2003) also showed that highly similar partners benefit from their business overlaps to take advantage of economies of scale more easily. Therefore, partners' similarity in terms of organization, product and processes is considered as a success factor for HLC.

Based on the discussion above and given the contrast between the overall enthusiasm regarding HLC and its low success rate, differences in the opinions of non-collaborating and collaborating industry professionals regarding HLC success factors are expected. Therefore, the following proposition is formulated: *The mean scores of HLC success factors are higher for the non-collaborating group vis-à-vis the collaborating group.*

3. Research methodology

In this section, the research methodology followed in this paper, including instrument development, data collection, and data analysis method is presented. The methodology consists of two steps. The first step, which is presented in [Section 3.1](#), involves the measurement and comparison of the above HLC success factors from the perspective of collaborating and non-collaborating industry professionals. This analysis will allow us to identify the factors that create differences between the expectations of non-collaborating professionals vis-à-vis the opinions of collaborating professionals on how the collaboration should work.

The second step, which is presented in [Section 3.2](#), involves the identification of possible barriers to collaboration to explain the differences observed in the first step. The use of the Delphi methodology allows collaborating professionals to reflect on these differences and their possible causes based on their own experiences with HLC.

3.1 Step 1: measuring collaboration success factors

3.1.1 Data collection. Data for this research was collected through a survey. The items used to measure each HLC success factor were either adopted from existing studies (sources in [Appendix 1](#)), or created whenever necessary. Seven-point Likert-scale items were used to measure the extent to which respondents agree or disagree with the given statements, with 1 = strongly disagree, 4 = neutral, and 7 = strongly agree. To ensure content and face validity, the measurement instrument was pretested with an international sample of 20 academic and industry professionals familiar with collaboration to make sure that each item: (i) is clearly formulated, (ii) conveys a clear idea (iii) and reflects the construct it is supposed to measure. They were also asked to evaluate whether redundancies exist or not and if additional items were needed to better measure the constructs. Based on their feedback, items were reformulated when needed or deleted in case of redundancy. After the pre-test, both web and paper questionnaires with 44 items were created ([Appendix 1](#)). After the pre-test, both web and paper questionnaires with 44 items were created ([Appendix 1](#)).

Data were collected from January to May 2018 using face-to-face and self-administered surveys. The survey guide provided a detailed explanation on HLC and guidelines on how to answer the survey in case of active collaboration, collaboration being over, multiple collaboration experiences, and collaboration with multiple partners. In case the respondents have never been involved in a horizontal collaboration experience but wish to be in one, they were asked to fill in the survey based on their expectations on how the collaboration should work. The survey was sent to 9,889 professionals expected to have knowledge or experience in dealing with B2B operations. The survey yielded 364 responses (3.6% response rate). After removing responses with missing data, the final sample consisted of 344 responses. [Table 1](#) shows the distribution of the respondents' designation and collaboration status.

3.1.2 Data analysis method. To compare the collaborating and non-collaborating firms in terms of their scores on the success factors, multi-group confirmatory factor analysis (CFA) was conducted using the R-package LAVAAN ([Rosseel, 2012](#)). A multi-factor model including all the constructs was specified to check for (i) unidimensionality, (ii) internal and composite reliability and (iii) convergent, construct and discriminant validity. Iterative

modifications were conducted based on the model results, each time dropping items with loadings lower than the acceptable values (above 0.5 is acceptable, above 0.7 is preferred (Hair *et al.*, 2010)). Unidimensionality was assessed by checking the size of the items' loadings as well as their significance. Then, the internal consistency reliability of each construct was assessed using Cronbach's α and composite reliability (ρ_c) values (Hair *et al.*, 2010). Then, construct validity was checked using the RMSEA, CFI and NNFI, which provide a sufficient basis for model evaluation (Hair *et al.*, 2010). Subsequently, convergent validity was tested by looking at the statistical significance of the loadings and the average variance extracted (AVE) for each construct. Finally, discriminant validity was examined by comparing each construct's AVE and its shared variance with the remaining constructs. Then, steps were taken to test for common method bias (CMB) using both Harman's single-factor test and the common factor model method described by Podsakoff (2003). Finally, measurement invariance between the collaborating and non-collaborating firms was tested with multifactor models following a four-step procedure: configural, metric, scalar and strict invariance (Van de Schoot *et al.*, 2012).

3.2 Step 2: identifying barriers to collaboration

Data collection and analysis to determine the reasons behind the differences between collaborating and non-collaborating samples was conducted following the Delphi three-phase process described in Okoli and Pawlowski (2004) (see Figure 1). The target respondents, who are professionals with collaboration experiences, participated in the success factors measurement survey (Step 1), and agreed to provide their contact information for any further inquiry. An invitation to take part in the Delphi study was sent to 50 industry professionals in total, out of which 10 expressed their interest in participating as a panelist (Table 2). They operate in different industries (AFSC, Manufacturing and assembly and transportation and logistics), and hold different positions within their firms (director, logistics manager, or production manager), thus providing enough diversity in opinions within a manageable size (Schmidt, 1997). The questionnaires used in the Delphi study are provided in Appendix 2.

In the first phase, panelists were asked to provide a list of potential reasons that can explain the observed differences. The lists were consolidated by removing the duplicates and unifying the terminology. In the case of different reasons, the decision was based on the meaning conveyed by the panelist. The consolidated list was then returned to the panelists for confirmation.

In the second phase, the list of reasons was narrowed down to include only those that are perceived as important. Schmidt (1997) suggested a maximum of 20 elements as a manageable number that can be meaningfully ranked. As such, the respondents were asked to choose at least 10 elements from the consolidated list that they deemed are most important. At the end of the second phase, only the reasons that were chosen by more than 50% of the respondents were retained. The level of agreement among the panelists at this point is accessed by Fleiss' kappa (κ) for multiple raters (Fleiss and Cohen, 1973).

The third phase consisted of ranking the barriers in decreasing order of importance. The consensus among the panelists' ranking was tested using Kendall's W coefficient of concordance, for which values above 0.7 indicate strong agreement (Schmidt, 1997).

Respondents' designation	<i>N</i>	Industry	<i>N</i>	Collaboration status	<i>N</i>
CEO/Director	112	Agri-food	129	Collaborating	138
Production and logistics manager	136	Manufacturing and assembly	104	Non-collaborating	206
Marketing manager	78	Wholesale and retail	60		
Other	18	Transportation and logistics	51		

Table 1.
Respondents'
designation, industry,
and collaboration
status

Figure 1.
Research methodology

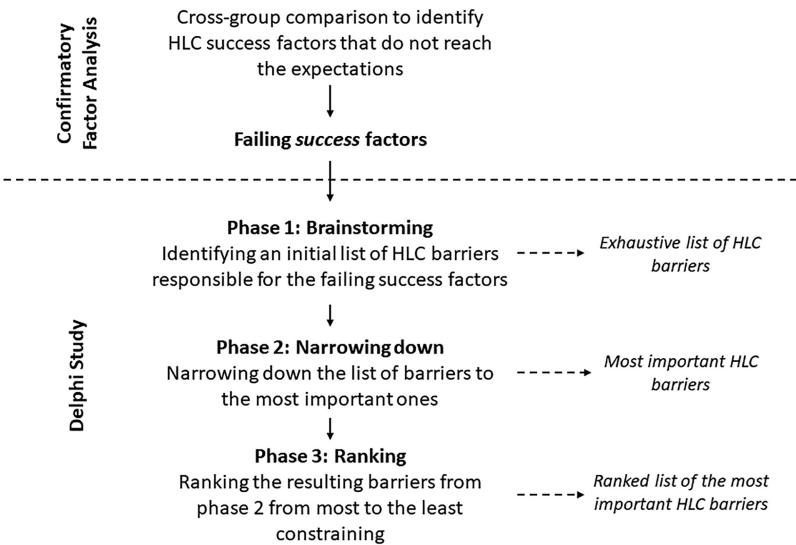


Table 2.
Panel experts' designation and industry

Respondents' designation	<i>N</i>	Industry	<i>N</i>
CEO/Director	1	Agri-food	3
Logistics manager	6	Manufacturing and assembly	2
Production manager	3	Transportation and logistics	5

Two rounds of ranking were conducted before reaching an acceptable level of consensus. To avoid any bias in the ranking, the reasons retained in the second phase were listed randomly for each panelist.

4. Survey results

4.1 Multi-group comparison

4.1.1 Scale properties per sample. A multi-factor model including all the constructs was specified in LAVAAN and tested using both collaborating and non-collaborating professionals' samples. After iteratively dropping items with (completely standardized) loadings lower than 0.5, the final model consisted of 21 items for seven constructs (Table 3). Regarding the "non-collaborating" sample, the fitted multi-factor model shows a good fit (Hooper *et al.*, 2008), indicating that construct validity is achieved: CFI = 0.944 (>0.9), NNFI = 0.930 (>0.9), RMSEA = 0.055 (<0.08), and normed chi-square = 1.63 (<2.0). All item loadings meet the recommended values and are significant at $\alpha = 0.01$, indicating unidimensionality and convergent validity. Moreover, all constructs show good convergent validity with AVE values greater than the recommended cut-off value of 0.5. As of discriminant validity, the AVE of each construct is compared to its shared variance with other constructs (Fornell and Larcker, 1981). The AVE values, ranging from 55 to 68%, are larger than the squared intercorrelations for each construct in the sample (oscillating between 0.000 and 0.261), indicating good discriminant validity. Finally, the constructs' internal and composite reliabilities are sufficient as both Cronbach's α and ρ_c values are above 0.7.

Survey items	Loadings	Collaborating		Cronbach's α	Loadings	Non-collaborating		Cronbach's α
		AVE	CR			AVE	CR	
<i>Information sharing</i>								
<i>is2</i>	0.762	0.69	0.87	0.857	0.825	0.62	0.83	0.817
<i>is3</i>	0.933				0.857			
<i>is4</i>	0.783				0.665			
<i>Joint relationship efforts</i>								
<i>jre1</i>	0.701	0.65	0.85	0.837	0.643	0.62	0.83	0.822
<i>jre3</i>	0.886				0.877			
<i>jre4</i>	0.816				0.829			
<i>Dedicated investments</i>								
<i>dedinv1</i>	0.820	0.56	0.79	0.783	0.701	0.57	0.80	0.796
<i>dedinv2</i>	0.755				0.789			
<i>dedinv3</i>	0.652				0.769			
<i>Resource sharing</i>								
<i>rs1</i>	0.973	0.79	0.92	0.908	0.898	0.68	0.86	0.850
<i>rs2</i>	0.884				0.925			
<i>rs3</i>	0.793				0.617			
<i>Partners similarity</i>								
<i>ps1</i>	0.445	0.59	0.80	0.764	0.560	0.55	0.78	0.758
<i>ps2</i>	0.964				0.889			
<i>ps3</i>	0.796				0.734			
<i>Commitment</i>								
<i>com1</i>	0.869	0.80	0.92	0.919	0.838	0.66	0.85	0.843
<i>com2</i>	0.943				0.887			
<i>com3</i>	0.868				0.690			
<i>Trust</i>								
<i>tr1</i>	0.925	0.76	0.90	0.896	0.807	0.60	0.81	0.804
<i>tr2</i>	0.945				0.854			
<i>tr3</i>	0.729				0.640			

Note(s): AVE: Average variance extracted, CR: Composite reliability

Table 3.
Reliability measures
and factor loadings of
the constructs

As regards the “collaborating” sample, all item loadings are significant at $\alpha = 0.01$ and meet the recommended values. An exception is noted for the first partner-similarity item (ps1), whose loading at 0.445 is below 0.5. Simply removing this item from the list results in a model identification problem. As such, an alternative multifactor model was fitted in which ps1 is removed and the loadings of ps2 and ps3 are fixed to the same values found in the initial model. The alternative model results in a non-significant decrease in chi-square (p -value = 0.28) and a negligible change in the fit indices (<0.001). Therefore, ps1 was kept in the list of items used in this study. The fitted multifactor model shows a good fit, indicating that construct validity is achieved: CFI = 0.961 (>0.95), NNFI = 0.951 (>0.95), RMSEA = 0.054 (<0.08), and normed chi-square = 1.4 (<2.0). All the constructs in the model show good convergent validity, with AVE values greater than 0.5. As regards discriminant validity, the AVE values (ranging from 56% to 80%) are larger than the squared intercorrelations for each construct (oscillating between 0.001 and 0.244). Finally, the constructs’ internal and composite reliabilities are sufficient as both Cronbach’s α and ρ_c values are above 0.7.

4.1.2 Testing for common method bias. The Harman’s single-factor test (Podsakoff, 2003), reveals that the first principal component accounts for only 24.7% of the total variance (compared to 76.5% when considering equal numbers of principal components and

constructs), indicating that CMB is not a major problem in the data. This conclusion was further confirmed by adding a common latent factor (CLF) to the multi-factor CFA model, the latter being uncorrelated with the other model factors. Comparing the models with and without CLF for the whole sample revealed negligible decreases in item loadings, with a mean value of 0.017 and the 90th percentile located at 0.048.

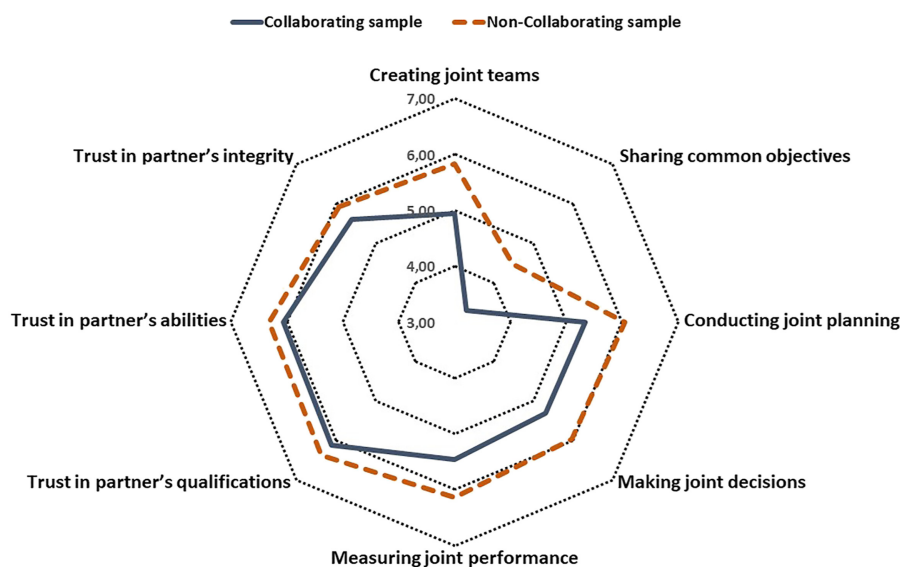
4.1.3 Assessing measurement invariance. A two-group measurement invariance test was performed across the collaborating and non-collaborating samples to check whether the constructs are measured the same way across the samples (see Table 4). First, configural invariance is achieved as the two multifactor models show good fit (see Section 4.1.1). Second, metric invariance was tested by imposing an equality constraint on the factor loadings across groups. The results reported in Table 4 show that this model also exhibits good fit. In comparison to the configural model, the changes in CFI and RMSEA (Δ CFI and Δ RMSEA) are lower than 0.01, thus showing good metric invariance. Third, a scalar invariance test was performed by constraining the item intercepts to be equal across groups. The results indicate that scalar invariance is achieved as: (i) the fit indices show a good model fit, and (ii) Δ CFI and Δ RMSEA are lower than 0.01 compared to the metric invariance model. Fourth, a full strict invariance test was conducted by constraining measurement errors to be equal across groups. Table 4 shows that this model also has acceptable model fit indices but results in Δ CFI being higher than 0.01 compared to the scalar invariance model, suggesting that some measurement errors differ across the two samples. As such, successive models, where each pair of residuals was freed at a time, were tested to improve model fit. The results indicate that, by allowing four residuals to vary across the two groups, partial invariance is achieved. The residuals are relative to the items for joint relationship efforts (jre1, jre4), trust (tr2) and dedicated investments (dedinv3). The partial strict invariance model shows a good model fit and results in acceptable (<0.01) changes in CFI and RMSEA.

Finally, tests were performed to check for significant differences in the means of factors. The results show that two out of seven constructs have significantly different means across the two samples. Compared to the non-collaborating sample, the collaborating sample appears to have significantly lower factor means for joint relationship efforts (Δ mean = -0.429 ; p -value = 0.001) and trust (Δ mean = -0.218 ; p -value = 0.043). This observation is further confirmed by running independent samples t -test on the items measuring joint relationship efforts and trust. As regards joint relation efforts, the test shows that the three items (*having joint teams*, *conducting joint planning* and *making joint decisions*) have significantly different mean values, with the non-collaborating group scoring 18.1%, 13.3% and 12.5% higher across each item, respectively (Figure 2). Two additional items that were used to measure joint relationship efforts, but were not retained in the CFA model because of their low loadings, namely *sharing common objectives* and *performing regular joint performance measurement*, also show significantly different means

Model	X ² (df)	p-value	CFI	RMSEA	Change CFI	Change in RMSEA
Configural invariance	510.34 (336)		0.952	0.055	n/a	n/a
Metric invariance	530.91 (350)	0.11	0.950	0.055	0.002	0.000
Scalar invariance	550.98 (364)	0.13	0.949	0.055	0.002	0.000
Full strict invariance	679.21 (385) *	<0.001	0.919	0.067	0.029	0.012
Partial strict invariance	598.96 (381) *	<0.001	0.940	0.058	0.009	0.003
Factors means invariance	621.44 (388) *	0.002	0.936	0.059	0.004	0.001

Table 4.
Measurement
invariance test results

Note(s): * indicates significantly different chi-square from the previous model



Source(s): Based on t -test at $\alpha = 0.05$

Figure 2.
Significantly different
items means

across the two groups (the non-collaborating group scoring 36 and 12% higher across each item, respectively).

As regards trust, two of the three items used in the CFA model have significantly different means across the two groups (*partners being qualified to fulfill their obligations*; *partners having the skills to improve collaboration performance*), with the non-collaborating group scoring 4.2% higher across each item (Figure 2). Additionally, the perception of the collaborating group regarding trust in their partners' integrity is significantly lower than the expectations of the non-collaborative group.

4.2 Collaboration limiting factors

Ten panelists participated in the first phase of the Delphi study, out of which one-half listed six and the other half listed eight collaboration limiting factors each explaining the difference in factor means for each item of trust and joint relationship efforts, thus resulting in a total of 140 elements (70 for each of joint relationship efforts and trust). After removing duplicates and unifying the terminology, 18 aggregate limiting factors each for joint relationship efforts and trust were identified. These factors range from managerial elements such as top management support and collaborative culture, to operational elements relative to individuals' capacity and desire to collaborate.

In the second phase of the process, where all the 10 panelists participated again, each panelist was asked to select at least 10 factors from the aggregate list. The presented lists covered all 18-limiting factor for joint relationship efforts and only 17 for trust, (none of the panelists selected "weak financial capacities of the partners"). The criterion for reducing the number of limiting factors was to retain the elements selected by at least half of the panelists. Through this process, the number of limiting factors was reduced to 10 for joint relationship efforts and 12 for trust (see Table 5). Few limiting factors fell short of the imposed threshold, namely weak technical skills of one (or all) of the partners to properly do their job, lack of collaborative skills, inadequate internal organization of the partners for collaboration, resistance to sharing expertise, weak support from

Table 5.
Ranking results
per round

Limiting factors	Joint relationship efforts mean ranks (over 10)		Limiting factors	Trust mean ranks (over 12)	
	Round 1	Round 2		Round 1	Round 2
Lack of collaboration formalization (i.e. who does what)	2.60	1.80	Lack of transparency regarding collaboration benefits	1.40	1.40
The absence of costs and benefits allocation mechanisms	2.40	2.00	Resistance to sharing information	3.60	2.40
Resistance to sharing information	4.70	3.80	Lack of integrity of one (or all) partners	4.60	3.80
Objectives misalignment	4.20	4.50	Frequent unilateral decision-making	4.80	4.50
The absence of long-term visibility	4.80	4.90	Lack of commitment of partners	6.70	6.40
Lack of commitment of partners	5.80	5.80	The absence of long-term visibility	6.90	6.90
The complexity of joint planning and execution of collaborative activities	6.60	7.00	Lack of joint performance measurement	7.30	6.90
Resistance to change	6.20	7.70	Power imbalance in collaboration	7.40	7.40
Differences in collaborative culture	9.00	8.60	Absence of conflict resolution mechanisms	6.70	8.50
Lack of similarities between partners	8.70	8.90	Absence of regular face-to-face meetings	8.10	8.60
			Lack of collaboration formalization (i.e. who does what)	9.70	10.00
			High number of decision-makers in one partner firm	10.80	11.20
Kendall's <i>W</i>	0.547	0.710		0.517	0.685

top management, and negative collaborative history of one of the partners. The consensus between the panelists' chosen elements was tested using Fleiss Kappa (κ). The results indicate fair consensus, with $\kappa = 0.3$ for joint relationship efforts and $\kappa = 0.24$ for trust. This result shows the diversity of opinions among the panelists, indicating that a consensus in the ranking phase may not be reached on the first trial.

In the third phase of the process, the panelists were asked to rank the resulting list of factors from phase 2 in descending order of importance. The factors were presented in different orders to each panelist to avoid biases. The consensus in the rankings were tested using Kendall's *W*. The first ranking round gave a *W* of 0.547 for joint relationship efforts and 0.517 for trust, suggesting moderate consensus. As such, a second ranking round was conducted to see if a better consensus could be reached. To help the panelists revise their rankings, they were provided with the following information: (i) the mean rank of each factor, (ii) the panelist's ranking of the factor in the previous round and (iii) an indication of the panelists' current level of agreement. The revised ranking resulted in good consensus among the panelists, with *W* values of 0.710 and 0.685 for the list of limiting factors for joint relationship efforts and trust, respectively. Considering this level of consensus and the panelists' willingness to re-rank the elements for the third time (fifth round for them), the research team decided to terminate the Delphi study at this point. Table 5 presents the ranking results per round.

5. Discussion

In this section, the results obtained in both studies presented above are discussed, which show that differences exist in the factor means for joint relationship efforts and trust due to different barriers identified through the Delphi study.

5.1 Difference in joint relationship efforts

The first observed difference refers to the fact that the non-collaborating group has a significantly higher mean for joint relationship efforts than the collaborating group, implying that professionals' actual engagement is significantly lower than their expectations. This result was further supported by the observed differences in the items measuring joint relationship efforts, which show the intentions to create joint teams, conduct joint planning and make joint decisions do not fully translate into actions. Investigating the observed differences in terms of joint efforts yielded ten factors limiting collaborative behavior, among which lack of collaboration formalization, absence of a costs and benefits allocation mechanism and resistance to sharing information are the most important.

First, lack of collaboration formalization has a direct impact on partners' ability to mutually plan and execute collaborative activities (Fawcett *et al.*, 2015). Formalization represents a fundamental aspect influencing how partners interact with each other (Wallenburg and Raue, 2011). According to Fawcett and Magnan (2001) and Fawcett *et al.* (2012), the absence of formalization creates confusion about who is going to oversee which tasks. Such a situation contributes to the creation of role conflicts, stress and ambiguity, which in turn negatively impacts the partners' ability to work together and reach their objectives (Wallenburg and Raue, 2011). The lack of collaboration formalization has its roots in several resistors embedded in firms' own organizational routines and culture, such as rigid processes, difficulties in managing complexities and opposition to change (Fawcett *et al.*, 2015). These resistors form a wall of resistance to formalizing interfirm relationships, as firms may not have the ability, capacity, or willingness to adapt to collaboration needs. The panelists expressed such difficulties by saying that "*Some partners do not have a flexible organization to adapt to the needs of collaboration*" or "*Sometimes the partner couldn't follow the initial planning, which has an impact on our workflow*".

Second, resistance to sharing information also directly impacts the partners' ability to accurately plan and execute logistics activities as they lack complete information to make decisions (Ramesh *et al.*, 2010). The lack of information sharing is one of the most recurring barriers in vertical collaboration literature (Ramesh *et al.*, 2010; Fawcett and Magnan, 2001; Fawcett *et al.*, 2008b, 2012, 2015). According to Ramesh *et al.* (2010), inadequate information sharing results in behaviors that break down collaborative efforts. Sharing information depends not only on the partners' willingness to push for an open information-sharing relationship, but also on the availability of adequate information technology (Chen, 2019). Poor systems connectivity has been advanced as a major issue in HLC preventing partners from the fluid exchange of information (Basso *et al.*, 2019). Although the adoption of adequate information technology can be costly, it will help mitigate transaction costs relative to uncertainty (Chen, 2019) and opportunity costs relative to unsynchronized operations (Schotanus *et al.*, 2010). A second reason for the resistance to sharing information is relative to the sensitivity of the information (Basso *et al.*, 2019). In case of a competitive collaboration, firms tend to limit information exchange because of high opportunity costs relative to technological leakages for example. Statements from the panelists, such as "*Sometimes the partner hides important data*" or "*Newly developed expertise is not necessarily shared between the partners*" show that there is a limit to what information partners are willing to share. A third reason behind the unwillingness to share information is related to the concept of territoriality, i.e. the situation where siloed mindsets prevail over collective efforts. According

to Fawcett *et al.* (2015), information withholding is as widespread within the firm as with external partners, as managers tend to be more preoccupied with their local goals rather than value co-creation, which represents an anti-collaborative behavior.

Third, the absence of a clearly defined costs and benefits allocation mechanism diminishes the partners' willingness to participate in the collaboration (Basso *et al.*, 2019). In the absence of clear costs and benefits sharing mechanisms, the partners keep questioning each other's fair participation in collaboration activities and collection of adequate benefits, thus hindering the development of collaborative behavior (Fawcett and Magnan, 2001). Nevertheless, fair allocation of costs and benefits remains a challenging task. Despite the existence of a multitude of methods to equitably share costs and benefits, considerable deviations from what is "fair" can occur depending on partners' underlying intentions and their short and long-term perspectives regarding the collaboration (Wagner and Lindemann, 2008). Several panelists pointed to the fact that "*the partners do not necessarily share the same objectives for the collaboration*" and that "*some partners are more focused on short term financial gains rather than a long-lasting relationship*". Additionally, considering that partners only submit to joint efforts as the power balance dictates (Um and Oh, 2020), power imbalance may also explain the failure to agree on costs and benefits sharing. Few panelists said power difference leads to "*lack of respect between the partners*", which ultimately impacts their willingness to agree. In sight of such differences in objectives and power, agreeing on mutually acceptable sharing mechanisms is undeniably a challenging task.

5.2 Difference in trust

The second observed difference is related to the fact that the non-collaborating group has a significantly higher factor mean for trust than the collaborating group. The expectations regarding trust in partners' ability (tr1: partners being qualified to fulfill their obligations, tr2: partners having the skills to improve the collaboration performance) and integrity (tr4: partners' genuine concern about each other's success) are higher than the outcomes of real horizontal collaboration experiences. The Delphi study allowed us to shed light on several factors that have a limiting impact on the trust-building process between partners in collaboration, the most important being the lack of transparency regarding the derived benefits, the reluctance to share information, and partners' lack of integrity.

First, lack of transparency regarding the benefits derived from a collaboration relates to the importance of fairly allocating collaboration benefits, which has a direct impact on partners' willingness to collaborate (Fawcett *et al.*, 2012). Eight out of the 10 panelists explain the lack of trust in HLC by saying that "*it is unclear how much benefit is generated by the collaboration for each partner*". Achieving financial savings is an important reason for firms to join HLC. If achieved, each partner should receive a fair share to improve the quality of the relationship (Wagner and Lindemann, 2008). In case a group member feels under-rewarded, it will attempt to restore equity through uncollaborative behavior manifesting as lack of trust and commitment (Schotanus *et al.*, 2010). One possible reason for this lack of transparency is the reluctance to share confidential data. Partners can sometimes be excessively concerned with protecting their own interests that they decide not to disclose strategic information such as profits (Basso *et al.*, 2019). The panelists said that there is a "*lack of regular exchange of information, especially when it comes to confidential strategic information*", which represents a major barrier to trust development as discussed below.

Second, in addition to its limiting impact on operational activities, the reluctance to sharing information negatively impacts partners' trust in each other. In the absence of information sharing, due to poor system connectivity or to the competitive nature of the relationship, partners cannot develop a good understanding of each other's processes, which negatively impacts their trust in each other (Chen *et al.*, 2011). The lack of efficient information

sharing also negatively impacts the execution of operational activities, which has a negative impact on trust (Badraoui *et al.*, 2020). Promoting the exchange of timely and complete information reduces the risk of opportunism and bounded rationality, which in turn reduces the costs related to monitoring and control.

Third, lack of integrity of one or all the partners, which, according to eight out of 10 panelists, is materialized by the partners being “*more concerned about their own interests and how to take advantage of their partners*”, has also been advanced as one of the most important elements restricting the development of trust. Partners’ integrity refers to honoring pre-established agreements and act according to established norms of justice (Zhang and Cao, 2018). Integrity-based trust has been identified as being more essential in reducing transaction costs compared to ability-based trust (Connelly *et al.*, 2018). According to Shazi *et al.* (2015), the ability was only relevant for partner’s selection when the integrity was perceived as sufficient. This explains why, although present in the overall list of barriers, partners’ ability did not make it to the ranking phase of the study. Several factors contribute to a firm perceiving their partner to lack integrity. The “*lack of respect between the partners due to power differences*”, as stated by the panelists, can take different forms such as taking advantage of a power position to make the least contribution to the collaboration and to perceive the highest share of the benefits. The absence of fair cost and benefits allocation mechanisms can also contribute to a feeling of unfairness, which can be perceived as a lack of integrity.

6. Managerial and theoretical implications

6.1 Managerial implications

By investigating the barriers that prevent partners from fully engaging in collaborative efforts, this paper explains why HLC experiences fail to reach the desired objectives. In this section, the findings are translated into practical implications for firms that wish to engage in HLC.

The *first implication* concerns the importance of promoting and facilitating timely and complete exchange of information. Resistance to sharing information has been identified as a collaboration barrier for both joint relationship efforts and trust. On the one hand, it limits the partners’ ability to plan and coordinate the execution of their activity. On the other hand, it can result in ambiguities that hinder the development of trust. It is important to note that sharing information does not only depend on the partners’ willingness, but also on the availability of adequate information and communication technology (ICT) (Liu *et al.*, 2021). As such, in addition to promoting a culture of information exchange, managers involved in HLC should also work on adopting adequate ICT systems to facilitate it. Although costly, ICT is essential for the long-term profitability of HLC as it results in reduced transaction costs and risks as well as increased operational efficiency (Crujssen, 2020).

The *second implication* is relative to the necessity for the partners to agree on an acceptable costs/benefits allocation mechanism. Human cognitive processes are generally tailored by the principle of fairness, which drives individuals feeling inequality to sacrifice personal resources to move in the direction of a fair outcome (Biella and Sacchi, 2018). Nevertheless, the perception of what is fair can considerably vary from one person to another. Despite the many solutions provided by the available quantitative methods (Guajardo and Rönqvist, 2016), costs and benefits allocation remains a major issue for collaborative relationships to this day (Karam *et al.*, 2021a). In this regard, because of the difficulty to define what is fair and what is not, partners should work toward an “acceptable” rather than “fair” solution, with compromises from each party.

The *third implication* concerns the importance of collaboration formalization. Defining responsibilities and dispatching tasks based on the partners’ complementary competencies is essential for value co-creation (Fawcett *et al.*, 2015). Failure to clarify roles and responsibilities creates ambiguity and can lead to redundancies and tensions (Fawcett *et al.*, 2012).

Formalization does not necessarily need to take the form of formal contracts that generate negotiation and enforcement costs, but rather an agreed-on dispatch of responsibilities covering the areas pertaining to the collaboration, thus supporting the development of a group logic for increased productivity (Ramus *et al.*, 2017).

The *fourth implication* is relative to the importance of prioritizing integrity over competency when selecting partners. The results of the comparative study show that the level of trust in collaborative relationships remains lower than initially expected by the partners. More specifically, integrity base trust was ranked as third most important barrier limiting collaborative behavior. This result is in line with the findings of Shazi *et al.* (2015) who showed that integrity-based trust remains the most important form of trust influencing the selection of potential partners. Considering the difficulty to assess potential partners' integrity, firms can rely on existing interpersonal relationships, shared values, or on the market reputation of the firm (Badraoui *et al.*, 2020).

6.2 Theoretical implications

The results of this research have several implications for theory. First, the research highlights the importance of comparing industry professionals' expectations and actual experiences to understand why collaborative relationships fail to reach the desired objectives. In contrast with the predominant approaches consisting of measuring the impact of collaboration enablers on its outcomes (e.g. Badraoui *et al.*, 2022a), or identifying and categorizing collaboration barriers (e.g. Karam *et al.*, 2021b; Verma *et al.*, 2022), this research points out the exact enablers that industry professionals fail to implement in practice, and the main factors responsible for it. By linking collaboration enablers to its barriers, this research responds to Fawcett *et al.* (2015)'s call to develop an integrated model for collaboration, and provides an empirical basis for the development of new models that simultaneously consider the relationship between collaboration barriers, enablers and outcomes.

Second, the results of this study show that some of the identified barriers, such as the resistance to sharing information and the absence of a costs/benefits allocation mechanism, are to be interpreted as "lack of enablers", which is in line with the findings of Walker *et al.* (2013) and Basso *et al.* (2019). The fact that the lack of information sharing has a limiting effect on joint relationship efforts implies that "information sharing" and "joint relationship efforts", as two collaboration enablers, are not independent of one another as commonly considered in empirical studies (Badraoui *et al.*, 2020). They are rather interweaving elements with continuous cross-influences, raising the importance of explicitly considering the interaction between collaborative activities in empirical models as suggested by (Zhang and Cao, 2018).

Finally, this research highlights the importance of using a mixed method approach, i.e. considering quantitative and qualitative methods simultaneously, in studying collaboration. Adopting this method approach is aligned with current methodological trends in supply chain management research and allows to thoroughly analyze and investigate supply chain strategies (e.g. Zhao *et al.*, 2020; Luthra *et al.*, 2022). According to Whipple *et al.* (2013), multimethod research provides greater insight into today's and tomorrow's challenges and opportunities. By combining survey-based and Delphi research methodologies, this research unveiled the hidden facets of HLC by complementing professionals' general perceptions with a more in-depth investigation of the underlying elements motivating their answers.

7. Future research and limitations

This research indicates several areas that require future work. It identifies the differences between the intentions and expectations and actual behavior and experiences of professionals regarding collaboration at a fixed point in time. However, collaborative

relationships last for long durations, and this may result in different opinions at later points in time. As such, conducting a longitudinal study (e.g. with latent growth models) may reveal changes in behavior that are not captured by our model. Future research can also compare the expectations and actual opinions of only one sample of professionals before and after they have engaged in collaboration. Such an experiment will allow us to observe changes in the individuals' behavior and trace the reasons behind them. The implications of routinized behavior in HLC with the objective of developing practices for breaking organizational routines and developing collaborative skills can also be studied in the future.

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Appendix 1

Instruments for measuring HLC success factors

These items measure the constructs considered in this study using a 7-point Likert-type scale indicating the extent to which the respondents agree or disagree to each statement: 1 = Strongly disagree, 4 = Neutral, 7 = Strongly agree. Inversely scored items are denoted by ^a. Deleted items after the analysis are denoted by ^b.

Collaborating sample	Non-collaborating sample
<i>In this collaboration, the partners:</i>	<i>When collaborating, you believe that you and your partner(s) should:</i>
<i>is1</i> : Share information on a regular basis ^b	<i>is1</i> : Share information on a regular basis ^b
<i>is2</i> : Share all information required for joint decision making	<i>is2</i> : Share all information required for joint decision making
<i>is3</i> : Share correct information for joint decision making	<i>is3</i> : Share correct information for joint decision making
<i>is4</i> : Share any type of information likely to help the partner(s)	<i>is4</i> : Share any type of information likely to help the partner(s)
<i>is5</i> : Do not expect that each party informs the others about any change that is likely to affect them ^{ab}	<i>is5</i> : Not inform each other about any change that is likely to affect them ^{ab}

Sources: Nyaga *et al.* (2010), Zhang and Cao (2018), Abbad (2008)

Table A1.
Information sharing

Collaborating sample	Non-collaborating sample
<i>In this collaboration, the partners:</i>	<i>When collaborating, you believe that you and your partner(s) should:</i>
<i>jre1</i> : Have joint teams	<i>jre1</i> : Have joint teams
<i>jre2</i> : Do not share clear common objectives ^{ab}	<i>jre2</i> : Not necessarily share clear common objectives ^{ab}
<i>jre3</i> : Conduct joint planning to anticipate and resolve operational problems	<i>jre3</i> : Conduct joint planning to anticipate and resolve operational problems
<i>jre4</i> : Make joint decisions about ways to implement operational activities	<i>jre4</i> : Make joint decisions about ways to implement operational activities
<i>jre5</i> : Perform regular joint measurement of performance ^b	<i>jre5</i> : Perform regular joint measurement of performance ^b
<i>jre6</i> : Have agreed on an acceptable cost/benefits allocation mechanism ^b	<i>jre6</i> : Have agreed on an acceptable cost/benefits allocation mechanism ^b

Sources: Nyaga *et al.* (2010)

Table A2.
Joint relationship
efforts

Collaborating sample	Non-collaborating sample
<i>In this collaboration, the partners:</i>	<i>When collaborating, you believe that you and your partner(s) should:</i>
<i>rs1</i> : Have dedicated their own workforce to manage the collaboration	<i>rs1</i> : Dedicate your own workforce to manage the collaboration
<i>rs2</i> : Are not ready to share their workforce for the benefits of the collaboration ^a	<i>rs2</i> : Not share your workforce force for the benefits of the collaboration ^a
<i>rs3</i> : Have shared assets that are beneficial for the collaboration (e.g. facilities, trucks, . . .)	<i>rs3</i> : Share any assets that are beneficial for the collaboration (e.g. facilities, trucks, . . .)

Sources: Zhang and Cao (2018)

Table A3.
Resource sharing

Table A4.
Dedicated investments

Collaborating sample	Non-collaborating sample
<i>In this collaboration, the partners:</i> <i>dedinv1:</i> Have invested substantially in personnel dedicated to this relationship <i>dedinv2:</i> Have provided proprietary expertise and/or technology to this relationship <i>dedinv3:</i> Have made significant dedicated investments in assets (e.g. facilities, trucks, . . .)	<i>When collaborating, you believe that you and your partner(s) should:</i> <i>dedinv1:</i> Invest substantially in personnel dedicated to this relationship <i>dedinv2:</i> Provide proprietary expertise and/or technology to this relationship <i>dedinv3:</i> Invest substantially in assets dedicated to the relationship (e.g. facilities, trucks, . . .)
Sources: Nyaga et al. (2010) , Abbad (2008)	

Table A5.
Partners similarity
(Newly
developed items)

Collaborating sample	Non-collaborating sample
<i>In this collaboration, the partners:</i> <i>ps1:</i> Have similar internal business processes (e.g. purchasing process, hiring process, . . .) <i>ps2:</i> Manage products that require similar logistics handling equipment (e.g. palletes, trucks, racks, . . .) <i>ps3:</i> Manage products that require similar transportation and storage conditions (e.g. temperature, humidity, . . .)	<i>When collaborating, you believe that you and your partner(s) should:</i> <i>ps1:</i> Have similar internal business processes (e.g. purchasing process, hiring process, . . .) <i>ps2:</i> Manage products that require similar logistics handling equipment (e.g. palletes, trucks, racks, . . .) <i>ps3:</i> Manage products that require similar transportation and storage conditions (e.g. temperature, humidity, . . .)

Table A6.
Commitment

Collaborating sample	Non-collaborating sample
<i>In this collaboration, the partners:</i> <i>com1:</i> Expects the collaboration to continue for a long time <i>com2:</i> Believes in the long-term profitability of the relationship <i>com3:</i> Expects the collaboration to strengthen over time <i>com4:</i> Is not willing to make the necessary efforts for the collaboration to continue ^{ab}	<i>When collaborating, you believe that you and your partner(s) should:</i> <i>com1:</i> Expect the collaboration to continue for a long time <i>com2:</i> Believe in the long-term profitability of the relationship <i>com3:</i> Expect the collaboration to strengthen over time <i>com4:</i> Not be willing to make the necessary efforts for the collaboration to continue ^{ab}
Sources: Nyaga et al. (2010) , Abbad (2008)	

Table A7.
Trust

Collaborating sample	Non-collaborating sample
<i>In this collaboration, the partners:</i>	<i>When collaborating, you believe that your partner(s) should:</i>
<i>tr1:</i> Are qualified to fulfill their obligations	<i>tr1:</i> Be qualified to fulfill their obligations
<i>tr2:</i> Are capable of performing their job	<i>tr2:</i> Be capable of performing their job
<i>tr3:</i> Have the skills to increase the collaboration performance	<i>tr3:</i> Have the skills to increase the collaboration performance
<i>tr4:</i> Are genuinely concerned about each other's success ^b	<i>tr4:</i> Be genuinely concerned about each other's success ^b
<i>tr5:</i> Do not Keep each other's best interest in mind ^{ab}	<i>tr5:</i> Not Keep each other's best interest in mind ^{ab}
<i>tr6:</i> Consider each other's welfare as well at their own ^b	<i>tr6:</i> Consider each other's welfare as well at their own ^b
<i>tr7:</i> Do not have sound principles and values that guide their behavior ^{ab}	<i>tr7:</i> Not necessarily have sound principles and values that guide their behaviour ^{ab}

Sources: Nyaga *et al.* (2010), Mayer and Davis (1999)

Appendix 2

Instruments for the Delphi study

Phase 1: Brainstorming

Dear colleague,

Thank you for accepting our invitation to participate in this research. We greatly appreciate your contribution and would like to thank you for your time and input.

In the next two questions, we ask you to list possible collaboration barriers and resistors that can explain why collaborating partners engage in low relationship efforts compared to their initial intentions, and why the level of trust in collaborative relationships is lower than the level the partners would like it to be at.

The table below shows the statistically significantly different items used to measure joint relationship efforts as well as their average scores (on a scale from 1: totally disagree, to 7: totally agree). We asked for the opinion of collaborating respondents (i.e. what they and their partners did) and the expectations of non-collaborating respondents.

Factors	Collaborating professionals	Non-collaborating professionals
<i>Joint relationship efforts</i>		
The partners have joint teams	4.94	5.84
The partners share common objectives	3.30	4.48
The partners conduct joint planning	5.34	6.05
The partners make joint decisions	5.30	5.97
The partners perform regular performance measurement	5.46	6.14
<i>Trust</i>		
The partners are qualified to fulfill their obligations	6.11	6.37
The partners have the skills to increase the collaboration performance	6.06	6.31
The partners are genuinely concerned about each other success	5.61	5.93

Table A8.
Statistically
significantly different
items used to measure
joint relationship
efforts and trust

Phase 1: Brainstorming

- (1) **Question 1:** List at least 6 reasons you think can explain the difference in terms of joint relationship efforts between the expectations of non-collaborating industry professionals and the opinions of collaborating ones.
- (2) **Question 2:** List at least 6 reasons you think can explain the difference in terms of trust between the expectations of non-collaborating industry professional and the opinions of collaborating ones.

Phase 2: Narrowing down

Dear colleague,

Thank you for participating in the first round of the research. The answers you provided us with were combined with responses of other panelists to generate an aggregate list collaboration barriers.

In this phase, we would like you to select at least 10 elements from the aggregate list of barriers that resulted from phase 1 (see attached list). The order in which you select the elements does not matter, as the objective of this second phase is not to rank the elements.

- (1) **Question 1:** From the aggregate list of items resulting from phase 1, choose at least 10 items which you believe are the most important elements limiting joint relationship efforts.
- (2) **Question 2:** From the aggregate list of items resulting from phase 1, choose at least 10 items which you believe are the most important elements limiting trust development in collaboration.

Phase 3: Ranking

Dear colleague,

Thank you for participating in the second phase of this process. Based on your answers and those of the other panelists, we narrowed down the lists of barriers to the ones considered as most important by more than half of the panel members.

In this third phase, we ask you to rank these barriers (see attached list) from most important to least important in terms of their limiting impact on joint efforts and trust.

- (1) **Question 1:** Rank the following elements, from most important to least important, in terms their limiting impact on joint relationship efforts.
- (2) **Question 2:** Rank the following elements, from most important to least important, in terms of their limiting impact on Trust development.

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