INTERNAL AND RELATIONAL PERFORMANCE OF SUPPLY CHAINS IN THE TRANSITIVE SERVICE TRIADS

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ABSTRACT

The goal of the study is to examine the contribution of the internal operational performance of three actors and the relational performance of three dyads to the overall supply chain performance. To achieve this goal, survey-based research is conducted. The empirical results suggest that out of three actors, the internal performance of suppliers has no significant impact on supply chain performance. The buyer has a significant, but roughly neutral impact on supply chain performance, while the internal operational performance of the customer demonstrates the highest impact of supply chain performance. Likewise, the relational performance of two dyads (buyer-customer, and supplier-customer) demonstrate a positive effect on the overall supply chain performance, while the relational performance of the third dyad (buyer-supplier) indicates a negative impact on the dependent variable.

Keywords: Blockchain, shadow system, formal system, supply chain

INTRODUCTION

Triad is a ubiquitous phenomenon in the supply chain management literature, taking two basic forms of intransitive triads, established by either two dyads, and transitive triads, constituted by three dyads [8]. While the intransitive triads are more characteristic for a manufacturing setting, the transitive triads are more distinctive for a service industry [23]. In the service transitive triads, each actor has a direct link with two others [10] and can take different roles in the supply chain [33] [42]. As indicated by [17], the transitive triad is more likely to be formed when actors (e.g. the buyer and the customer) establish a relationship with a common third party. Correspondingly, when the transitive triad is formed, the third party may act as a conciliator, stabilizing and sustaining the relationship over time [21]. Our study is particularly conducted within the transitive service triads formed by three interconnected actors: buyer, supplier (service provider), and customer. Through the conceptualization of the buyer-supplier-customer triad, the paper refers to the theory of supply chains. As the service triad is embedded within a wider scope of the supply chain structure [12], the link between them can be provided by the ultimate supply chain. According to [26], the ultimate supply chain represents the final stage of the supply chain evolution. More precisely, as the result of employing different service providers, the linear structure of the supply chain becomes more complex and it turns into the ultimate supply chain with network connections. Hereby, the excerpt of the ultimate supply chain is represented by the service triad. In such a triad, the buyer and its

customer both act as primary supply chain members while the supplier (service provider) plays the role of supporting member [3]. The effective supply of servitized offerings is a collective effort made by product suppliers (e.g. manufacturers) and their external partners. The independent supplier (e.g. service provider) that takes over-delivering services to the customers, becomes the active player of the newly developed structure referred to as a "service triad" [19]. As services are inseparable, it is necessary for the service provider to interact with the customer when delivering the services [14] [42]. Hence, service triads in B2B contexts are transitive by nature - all three triadic actors form and maintain direct ties between themselves [19]. The concept of transitive service triads provides the research context of this paper. The study seeks to examine the contribution of the internal operational performance of three actors and the relational performance of three dyads to the overall supply chain performance. As the issue of relational benefits yielded in dyads within the transitive service triad has been poorly investigated, in this paper, we particularly concentrate on the relational performance of dyads. To date, the prior studies mostly focus on relational performance within intransitive triads, typical for the manufacturing setting [35], and thus use relational performance as the component to yield the network benefits [34] [36]. These studies, however, are usually anchored within the Relational View, as the offshoot of Resource-Based View. Likewise, the past studies usually conceptualize the phenomenon of relational performance at the dyadic level as the theoretical construct, with no empirical evidence [7]. To challenge these shortcomings, this research employs the concept of Supply Chain Practice View (SCPV) to empirically evaluate the contribution of relational performance to supply chain performance, and thus to examine variation in relational performance among the supply chain dyads across the entire range of performance [7] [4]. Accordingly, the conceptual lens of SCPV provides the theoretical grounding for this research in two major aspects. First, it concentrates on mutual benefits yielded together by the actors in dyads that cannot be produced by either individual actor. Second, the research seeks to empirically explain variation in relational performance across the entire range of supply chain performance. In the next sections of the paper, the literature review is presented, followed by a description of the research methodology, and preliminary results. In the ensuing sections, the conclusions and future research directions are discussed.

LITERATURE REVIEW

When studying the concept of supply chain management, an increasing number of studies appears to appreciate the importance of Supply Chain Practice View (SCPV). In general, the SCPV, which traces its roots to the Practice-Based View (PBV), suggests that ordinary practices can be sources of superior performance [4]. Consequently, the Practice-Based View (PBV) has become a prominent concept of firm competitiveness [2], as it argues that performance can be shaped with management practices [4]. Therefore, when extending the PBV within the supply chain context, the Supply Chain Practice View (SCPV) emerges and acknowledges that the practices (which may be inimitable or not), affect supply chain performance, and thus extend beyond the four walls of the individual company, and span to the triadic arrangements [32]. In line with the SCPV, imitable inter-organizational supply chain management practices can explain performance differences across the entire range of performance [7].

Building upon the study of [7], we argue that the dependent variables of supply chain performance in the transitive triads is determined by individual performance of three actors, and appropriated relational

performance of three dyads. Figure 1 depicts the two types of performance yielded by three actors in the transitive service triads.

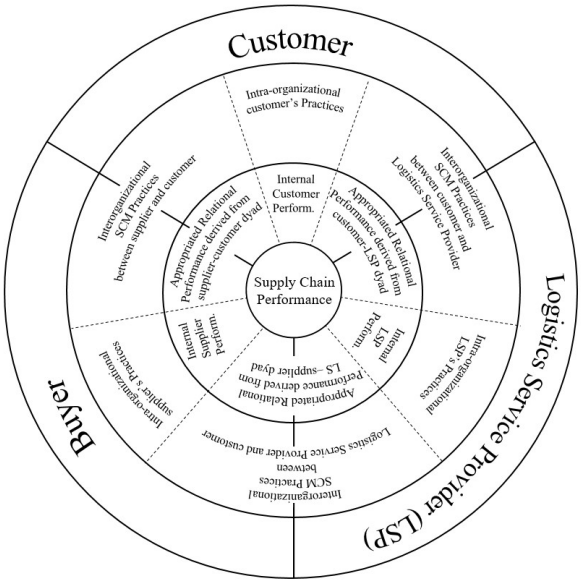

Figure 1. Performance types in the transitive triads within the SCPV.

As shown in Figure 1, supply chain performance is the sum of the internal performance of three actors (buyer, supplier, and customer), and the appropriated relational performance of three dyads (buyer-customer, buyer-supplier, supplier-customer).

Following [22], we argue that internal performance denotes private benefits enjoyed exclusively by the individual company. There are several ways to conceptualize the individual actor's performance, that might refer to its market, operational, investment, and financial activity [15] [16] [24] [37]. Nevertheless, since this study particularly deals with companies operating in the three-tier structures, in which operations have a profound impact on supply chain performance, the internal operational performance is highlighted in Figure 1. The operational performance can be considered on two levels, as the internal and external performance dimensions [[1]. This directly links to the intra- and inter-organizational practices that can be used by the company to leverage the value of its intra-organizational practices. In doing so, the companies can combine these intra-organizational practices with complementary practices that span the firm's boundaries [7]. This will then bring benefits, the individual company can enjoy, which increase the overall supply chain performance. In the light of the aforementioned, the following hypothesis is postulated:

H1: The internal operational performance of three actors, within the transitive service triads, contributes to the supply chain performance.

The relational performance of three dyads in the investigated transitive triads refers to the need of capturing an extra profit, produced as the interplay between the inter-organizational practices performed

by two actors in a dyad. The relational performance of dyad yields stronger effects that cannot be explained by the simple sum of outcomes yielded separately by individual actors [38]. Therefore, apart from simply capturing performance separately produced by each actor, one should also simultaneously grasp how the practices undertaken by one actor in a dyad, affect the practices of another actor in this dyad. It will provide an understanding of the interplay and relational dynamics of dyadic relationships [25]. Accordingly, when combined, inter-organizational practices of two actors in a dyad generate effects stronger than these actors would ever produce individually. In other words, a supernormal profit yielded by the relational performance of a dyad is unattainable by either actor in isolation.

According to [10], in the transitive triads, all actors enjoy superior benefits, as they obtain better coordination, mutual trust, and develop better communication skills. Consequently, following [9], to calculate the supply chain performance in the transitive triads, one should capture the relational performance of three dyads. If these dyads are examined together, they paint one picture of three companies dealing with one another. The concept of relational performance underscores that the supply chain actors join together in long-term relationships and combine resources (assets, knowledge, and capabilities) to deliver a superior profit [6], and thus increase the overall supply chain performance. In the light of the aforementioned the following hypothesis is postulated:

H2: The relational performance of three dyads, within the transitive service triads, contributes to the supply chain performance.

In line with the SCPV, through testing the postulated hypotheses, the study will also show variation in the relational performance of three dyads across the entire range of supply chain performance in the transitive service triad.

RESEARCH METHODOLOGY

Data Collection and Sample

Data for this study were collected from January thru March 2021. The research sample covered the transitive service triads operating in several European countries. The triads were formed by both the buyer, and the customer on one hand, and the supplier of logistics services (logistics service provider) on the other hand. The latter company served a wide spectrum of logistics services to connect both the buyer and the customer.

To gather data in our study, we performed a two-step approach, as recommended by [28], combining the random and non-random selection. A random method was applied to select the companies acting as the primary contact in their triads. Depending on their roles served in triads, the information from the group of 121 suppliers, 70 logistics service providers, and 159 customers was received. In the second step of the data collecting process, a non-random method to select two other companies forming a certain triad [30]. These companies were indicated by a primary contact in their triads. For instance, the buyer indicated the logistics service provider and customer, while the logistics service provider indicated both the buyer and the customer.

The sample covers triads operating in the European countries, mainly from Poland (roughly 25%), Germany (15.7%), France (10.3%), Spain (roughly 7%), Finland, and Italy (6% both), and Hungary (6.3%). It is worth noting that all three companies in almost all triads operated in the same country. Likewise, the sample included small, medium, and large companies. Within the group of small companies, the sample contained the share of 66.3% buyers, 86.9% of suppliers, and 98.0% of customers. In the group of medium-sized companies, the sample encompassed 23.7% of buyers, 9.7% of suppliers, and 0.6% of customers. Finally, in the group of large firms, the sample included 10.0% of buyers, 3.4% of suppliers, and 1.4% of customers.

Measures

The measures for supply chain performance, internal operational performance, and relational performance were derived from the literature.

Supply chain performance: In line with [5], supply chain performance is rather used than a sustained competitive advantage as the dependent variable. As per [35], the construct of supply chain performance contains the measures that manifest the customer-focused performance to seize the role of the market as the ultimate mechanism for determining the supply chain performance. It thus reflects the customer satisfaction derived from the overall service offered by the triadic supply chain. Accordingly, the customer in a triad responded to the questions in this construct as it has direct contact with the market and ultimate consumers. The measures of supply chain performance were derived from [43].

Internal operational performance: This construct measured individual performance generated by each of three actors in a triad, namely: buyer, supplier, and customer, and covered the issues of product quality, customer satisfaction in terms of price, cost reduction, product customization ability, volume flexibility, delivery speed, delivery reliability, as per [40] and [29].

Relational performance: This construct measured the extent to which both parties in a dyad generate combined effects. The six opinion-based measures were inquired from respondents separately for three dyads in a triad. The responses covering relational performance were averaged for each of the three dyads. For instance, to measure the relational performance of the buyer-customer dyad, the responses obtained from the buyer and customer on this dyad were averaged to get the overall relational performance. In the result, the three constructs of relational performance were obtained covering three dyads (buyer-customer, buyer-supplier, supplier-customer). The measures of relational performance were derived from [41] [39] [20] and [31].

Research Methods

To conduct the research, a two-step analysis was employed. First, the Principal Component Analysis (PCA) was carried out, followed by the regression analysis (RA). PCA was carried out to reduce a large number of variables manifesting the internal operational performance of three actors, the relational performance of three dyads, and supply chain performance. The factor scores obtained from PCA were then applied as dependent and independent variables in the regression model (second step of the analysis).

Principal Component Analysis (PCA)

To obtain the underlying dimensions of internal operational performance of three actors, relational performance yielded by three dyads, and supply chain performance, the Principal Component Analysis was performed. Specifically, PCA was conducted originally in three sets of 22 variables (separately for the buyer, service provider, and customer), which demonstrated the internal operational performance of three actors (Table 1), three sets of 24 variables (separately for the buyer-service provider dyad, supplier-customer dyad, and service provider-customer dyad) manifesting the relational performance (Table 2), and 9 variables for supply chain performance (Table 3). To simplify calculations and then ease the interpretation, a one-factorial solution for each set of variables was determined. Consequently, in the result of PCA, a group of 7 factors was obtained. To ensure a robust factorial structure, only variables with a loading of .65 (or higher) on the factor were kept for further analysis, as depicted in Table 1-3.

Table 1. The Results of PCA on the Internal Operational Performance of Three Actors

Variables	**Buyer**	**LSP**	**Customer**
Quality is the most important criterion that customers use to choose my company as their supplier	0.770		0.774
Customers trust my company regarding a product's quality	0.775	0.820	0.844
My company is selected by customers because of a product's quality reputation	0.707	0.766	0.777
Customers ask my company to join in the quality improvement effort			
Low price is the most important criterion that customers use to choose my company as a supplier		0.686	
Customers ask my company to join in the cost reduction effort			
Customers trust my company regarding low-cost production		0.803	
My company is selected by customers because of the low-cost product reputation		0.716	
Customers are satisfied with the product customization ability offered by my company		0.754	0.803
Customers are satisfied with the volume flexibility offered by my company	0.814	0.762	0.845
Customers are satisfied with the delivery speed offered by my company	0.843		0.821
Customers are satisfied with the delivery reliability offered by my company	0.842		0.837
Customers are satisfied with the procurement cost offered by my company	0.837		0.840

Likewise, three components containing responses from buyers, logistics service providers, and customers explain 63.97, 57.63, and 66.89 of the total variance, respectively. The coefficients of Cronbach's alpha are satisfactory and indicate the levels of .905, .877, and .929 for buyers, logistics service providers, and customers, respectively.

Table 2. The Results of PCA on the Relational Performance of Three Dyads

Variables	**Buyer-LSP**	**Buyer-Customer**	**LSP-Customer**
My company is more profitable or more competitive through the relationship in the dyad	0.674	0.705	
The benefits derived from the relationship in the dyad are greater than the capabilities of each individual			
Sharing opinion and discussion between firms often leads to increased benefits for both actors in the dyad	0.750	0.762	0.776
The ongoing costs of the coordination of dyadic relationship are balanced by the resulting benefits	0.769	0.788	0.777
Working with the partner has allowed to overcome some problems, and thus to derive substantial benefits for the dyad	0.754	0.740	0.737
My company and its partner the dyad can accomplish a lot more by working together as opposed to working independently	0.759	0.755	0.682
Differing views between my company and its partner in the dyad have often led to discovering better ways of solving problems	0.670	0.699	0.745
My company and its partner in the dyad complement each other well in terms of capabilities	0.703	0.741	0.677
Working with the partner in the dyad allowed my company to overcome some problems it could not solve alone			
Sometimes my company slightly alters the facts presented to its partner in the dyad to get what it needs			
My company always provides its partner in the dyad with a completely honest picture of its business activities			
My company often selectively withholds information when working with its partner in the dyad			

Sometimes my company presents facts to its partner in the dyad in a way that makes it look good			
My company acts very quickly to take advantage of any business opportunities with its partner in the dyad	0.750	0.692	0.717
Both partners' order cycles times have been greatly reduced through the relationship in the dyad	0.740	0.697	0.735
Both partners' inventories have been greatly reduced through the relationship in the dyad	0.765	0.652	0.701
Both partners' order processing accuracy has been improved through the relationship in the dyad	0.797	0.806	0.808
Both partners' on-time delivery has been improved through the relationship in the dyad	0.747	0.782	0.778
Both partners' product availability has been improved through the relationship in the dyad	0.766	0.785	0.783
Both partners' costs have been reduced through the relationship in the dyad	0.776	0.821	0.816
Both partners' responsiveness has been improved through the relationship in the dyad	0.769	0.777	0.781
Both partners' risk has been reduced through the relationship in the dyad	0.766	0.772	0.804
Both partners' geographic coverage has been expanded through the relationship in the dyad	0.779	0.729	0.669
Both partners' specialized logistics expertise has been developed through the relationship in the dyad	0.786	0.790	0.769

The components derived in Table 2, containing responses from three dyads (buyer-service provider dyad, supplier-customer dyad, and service provider-customer dyad) explain 56.53, 56.38, and 56.50 of the total variance, respectively. The coefficients of Cronbach's alpha are satisfactory and indicate the level of .954, .954, and .951 for the buyer-service provider dyad, supplier-customer dyad, and service provider-customer dyad, respectively.

Table 3. The Results of PCA on the Supply Chain Performance

Variables	**Factor loadings**
Compared to our competitors, the triad is able to rapidly change production volume	0.694
Compared to our competitors, the triad is able to deliver products quickly with short lead-time	0.823

Compared to our competitors, the triad is able to provide on-time delivery to our customers	0.835
Compared to our competitors, the triad is able to produce consistent quality products with low defects	
Compared to our competitors, the triad is able to produce products with low inventory costs	
Compared to our competitors, the triad is able to respond more quickly and effectively to changing customer and supplier needs	0.843
Compared to our competitors, the triad is able to respond more quickly and effectively to changing competitor strategies	0.837
Compared to our competitors, the triad is able to develop and market new products more quickly and effectively	0.818
The relationship with the triad has increased its responsiveness to market changes through collaboration	0.810

Finally, the component shown in Table 3, including responses for supply chain performance explains 65.65 of the total variance. The coefficient of Cronbach's alpha for this component is satisfactory and indicates the level of .912, which is above the threshold of 0.7 indicating the internal consistency.
The factor scores obtained from the Principal Component Analysis for 7 constructs were used to develop the multi-variate regression model.

Multi-variate Regression Analysis

The factor scores obtained from PCA were used to perform the multivariate regression analysis. It was performed to test whether and how the internal operational performance of three actors, and the relational performance of three dyads in the transitive service triads contribute to supply chain performance. Specifically, the model shows that supply chain performance in the investigated triads is the product of internal operational performance of three actors, and relational performance yielded by three dyads individually. In the regression model, the supply chain performance acted as the dependent variable (Y), while the remaining variables/factors (X_1, X_2, X_3, X_4, X_5, X_6) served as the independent variables. The model equation is provided below:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Y – supply chain performance,

α - intercept (constant),

$\beta_{1\ldots6}$ - standardized regression coefficients (or betas),

X_1 - internal operational performance of buyer,

X_2 - internal operational performance of service provider,

X_3 - internal operational performance of customer,

X_4 - relational performance of the buyer-service provider dyad,

X_5 - relational performance of the buyer-customer dyad,

X_6 - relational performance of the service provider-customer dyad,

ε - error (captures unobserved effect specific for supply chain performance).

The basic results of multivariate regression analysis are depicted in Table 5. The correlation coefficient (R) of .806 shows that there is a strong positive relationship between the study variables. Likewise, based on the coefficient of determination (R square = .650), factors not studied in this research contribute 35.0% of supply chain performance. Based on the adjusted coefficient of determination (Adjusted R Square), there is a variation of .643 on supply chain performance due to changes in the internal operational performance of three actors and the relational performance of three dyads in the investigated triads. In other words, 64.3% of changes in supply chain performance are accounted for by the investigated independent variables.

Table 5. Results of Multi-variate Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
	.806	.650	.643	.59717544	2.108

Based on the ANOVA statics in Table 6, the study established the regression model had a significance level of .000 which is an indication that the data is sufficient for making a conclusion on the population parameters as the value of significance (p-value) is less than 5%. The calculated *F* value of 105.939 is greater than the critical value of 37.780 which indicates that the independent variables affect the supply chain performance.

Table 6. Analysis of Variance (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	226.680	6	37.780	105.939	.000
	Residual	122.320	343	.357		
	Total	349.000	349			

As shown in Table 7, one independent variable X_2 (internal operational performance of service provider) appears to be insignificant for the supply chain performance at $p < .05$. The remaining set of 5 variables significantly affect supply chain performance. Out of then, one variable X_1 (internal operational performance of supplier) is significant at $p < .05$, while the rest 4 variables from X_3 to X_6 (internal operational performance of customer, the relational performance of the buyer-service provider dyad, relational performance of the buyer-customer dyad, relational performance of the service provider-customer dyad) are significant at $p < .000$.

To make sure the problem of multicollinearity is absent in the model the variance inflation factor (VIF) was computed. As shown in Table 7, the VIFs for all 6 variables are below the threshold of 5 [27], demonstrating an acceptable level. Consequently, multicollinearity is not the issue of this research [18]. Likewise, a Durbin-Watson statistic estimated for the model is 2.108 and demonstrated a very low level of autocorrelation between variables [13].

Table 7. Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.000	.032		.000	1.000		
X_1	-.090	.043	-.090	-2.097	.037	.561	1.784
X_2	-.033	.040	-.033	-.815	.416	.637	1.569
X_3	.374	.039	.374	9.569	.000	.667	1.498
X_4	-.299	.053	-.299	-5.617	.000	.360	2.776
X_5	.485	.056	.485	8.658	.000	.326	3.069
X_6	.318	.048	.318	6.594	.000	.439	2.276

DISCUSSION

Our study reports that the contribution of internal operational performance of three actors, and relational performance of three dyads to the supply chain performance is differential. Specifically, the internal operational performance of three actors forming the investigated triads has both significant and insignificant effect on supply chain performance. Out of three actors, the internal performance of suppliers has no significant impact on supply chain performance (at $p < .05$). On the other hand, the internal performance of both the buyer and the customer has a significant impact on supply chain performance at ($p < .05$ and at $p < .01$, respectively). This may stem from the fact the buyer and customer belong to the group of primary supply chain members, while the supplier is a supporting company, serving a wide range of logistics activities for the sake of the primary members [3]. This may partially explain the various significance of internal performance yielded by three actors for supply chain performance in the investigated triads. Likewise, employing the supplier of services tends to decrease the cost of operations, and thus enhance supply chain performance. This is due to the fact that the suppliers act as experts that perform activities better and cheaper. Interestingly, in line with the analyzed model, the supplier does not significantly contribute to supply chain performance, nevertheless, the obtained savings might be a share customer's performance. It is also worth mentioning that the buyer has a significant, but roughly neutral impact on supply chain performance (β=-.09). One of the reasons is that the buyer, as the first actor in a triad, has no direct relationships with the market and final consumer, and thus takes more care on its own benefits than the overall supply chain performance. Finally, the internal operational performance of customers demonstrates the highest impact of supply chain performance (β=.374). It appears to mostly create the value of a dependent variable in our regression model.

The obtained results also enable us to explore to what extend relational performances yielded by three dyads contribute to the entire supply chain performance. Consequently, to respond to the opinion of [4],

the use of the competitive advantage that is difficult to measure in practice, we applied supply chain performance as the dependent variable in the regression model. Interestingly, our study reports a different contribution of relational performances yielded by three dyads across the entire supply chain performance. The results suggest that the relational performance of three dyads in the investigated transitive triads has a significant impact on the supply chain performance (at $p < .01$), nevertheless it differs regarding the direction and strength of the impact, as demonstrated by a specific dyad. More specifically, the relational performance of two dyads (buyer-customer, and supplier-customer) demonstrate a positive effect on the overall supply chain performance, while the relational performance of the third dyad (buyer-supplier) indicates a negative impact on the dependent variable. Notably, as reported in our study, the largest contribution of relational performance is indicated by two dyads (buyer-customer dyad: β=.485), and supplier-customer dyad: β=.318), which suggests that these two dyads have the highest impact on creating overall supply chain performance. Interestingly, the buyer-supplier dyad has a diminishing impact on the construct of supply chain performance (β=-.299). The results may suggest that the participation of the customer makes the impact of relational performance on supply chain performance positive. Likewise, the relational performance yielded by the buyer-supplier dyad might be negative due to two factors. First, the supplier is supporting supply chain members, while the buyer has a more distant position to the market and ultimate consumer. For these two reasons, the relational performance of this dyad might have a negative impact on supply chain performance. Consequently, summing up, in line with SCPV, this study corroborates that performance variation can be distinguished among the supply chain dyads (i.e. buyer-customer, buyer-supplier, supplier-customer) in the investigated triads.

CONCLUSIONS AND FURTHER RESEARCH DIRECTIONS

The goal of this study is to examine the contribution of internal operational performance of three actors, and relational performance of three dyads to the overall supply chain performance, and thus to explore variation in relational performance among the supply chain dyads across the entire range of performance. The study shows that out of three actors, the internal performance of suppliers has no significant impact on supply chain performance. The buyer has a significant, but roughly neutral impact on supply chain performance, while the internal operational performance of the customer demonstrates the highest impact of supply chain performance. Likewise, the relational performance of two dyads (buyer-customer, and supplier-customer) demonstrate a positive effect on the overall supply chain performance, while the relational performance of the third dyad (buyer-supplier) indicates a negative impact on the dependent variable.

The study also shows the potential avenues of future research directions. In particular, it would be worthwhile to find a more objective formula for calculating the supply chain performance. In the current study, the dependent variable is indicated by the final actor of the triad, positioned close to the market and ultimate consumer. Although the customer is usually well informed on the final performance, the product offering is not addressed to this actor, and thereby it may have an unreliable opinion on the actual customer service. Likewise, when estimating supply chain performance, one should keep in mind that each company, directly and indirectly, affects the productivity of the other supply chain members [11], which might blur the overall picture of supply chain performance. Consequently, as this study is limited to the relational performance at the dyadic level, another issue for the research can be to empirically investigate

the synergistic effect of three actors in the triad. This is particularly interesting, as the results also indicate that the loading tables show cross loadings among the factors. As such, one cannot ascertain that these factors are indeed different. Consequently, a confirmatory factor analysis (CFA) would help to further ascertain the validity of the constructs. Finally, as the methodology of ordinary least squares estimation in the multi-variate regression analysis was applied, the issue of potential reverse causality, confounding the relationships among constructs, should be further explored.

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REPOSITORY LINK TO DATASET

https://data.mendeley.com/datasets/9v7v8ttn63/1

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