Upstream Supply Chain Coordination on Performance of Zimbabwean Agro Processing Sector: A Transaction Cost Theory Approach

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Abstract: **The purpose of the study was to establish the effect of trust, communication and relationship transaction-specific investments on the coordination of upstream supply chain activities and assess its impact on the performance of the Zimbabwean agro-processing sector. The conceptual framework of the study was drawn from Williamsons' (1975, 1985) transaction cost theory of coordination and seven hypotheses were developed. The study adopted a cross-sectional survey of the Zimbabwean agro-processing sector. Data were collected from fifty-nine stratified randomly sampled Zimbabwean agro-processing organisations and twenty purposively sampled supplier organisations. A self-administered questionnaire containing 7 points Likert scale ranging between (1) representing strongly disagree and (7) representing strongly agree was used. Descriptive statistical measures were used to analyze and present the quantitative data leading to the formulation of a theoretical model which was tested using structural equation modelling. From the model five hypothesis affect supply chain coordination i.e.; trust among supply chain players has a positive influence on supply chain coordination, communication has a positive influence on supply chain coordination, supply chain coordination has a positive impact on organisational performance, trust among supply chain players has a positive impact on organisational performance and transaction-specific investments have a positive impact on organisational performance. However, the study revealed that transaction-specific investments do not influence supply chain coordination while communication has no impact on organisational performance. The study, therefore, concluded that trust and communication among supply chain players have a positive influence on supply chain coordination. The findings also conclude that supply chain coordination, trust among supply chain partners and transaction-specific investments have a positive impact on organisational performance.**

Keywords: **Trust, Communication, Transaction specific investments, Supply chain coordination, Organisational performance, Agro-processing**

I. INTRODUCTION

The purpose of coordination is to achieve collective goals that individual companies cannot achieve. The need for coordination is evident in supply chains, as companies forming a supply chain are dependent on the performance of other organisations. There has been an emphasis on supply chain coordination as a strategy through which firms can achieve competitive advantage in markets (Collins 2003). There is very little coordination between Zimbabwean farmers, training and extension institutions and agro-processors which have resulted in poor research prioritisation, outdated training materials and extension messages. This paper focuses on the influence of trust, communication and relationship transaction-specific investments on coordination of upstream supply chain activities and assess its impact on the performance of the Zimbabwean agro-processing sector.

The Zimbabwean agro-processing sector relies heavily on the agricultural sector for raw materials since agriculture is the backbone of the Zimbabwean economy (Mahofa 2007). Before the land reform in the year 2000, resources have been concentrated on improving the performance of agriculture in the communal land through supporting cotton and maize production (Mahofa 2007). Before the year 2000, the major raw materials such as grain, meat (beef and pork), fruits and vegetables, sugar, oilseeds such as soybean and sunflower and milk have traditionally been produced in Zimbabwe. The commercial area, which before and after 1980 has highly contributed to the production of cotton, grain and other products has shrunk significantly as a result of the Fast Track Land Reform Programme (FTLRP). Since 2001 agricultural output has been on a negative trend and this has impacted negatively on the performance of the agro-processing sector. Availability of raw materials has a huge bearing on productivity in this sector. Since the year 2000, Zimbabwe, being an agro-based economy has been affected by the land redistribution, leading to many white farmers who were the sole suppliers to the agro-processing sector, leaving the country. Production has gone down in the last few years due to a lack of continuity on the farms after the land reform programme and the shortage of inputs like seed and fertilisers. The amount of rainfall received during the cropping season has also affected the quantity and quality of the inputs for the sector. This land grabbing, still in progress has also affected the coordination that used to exist between companies and their upstream suppliers who were mainly white commercial farmers. There seems to be a lack of proper coordination of

activities among Zimbabwean agro-processing organisations, which has culminated in local producers charging exorbitant prices that are beyond the reach of the customers.

II. LITERATURE REVIEW

According to Balkik et.al. (2010) coordination involves the relationship and interactions among different actors operating within the business environment. For this study, Coordination is conceptualised as the management of upstream and downstream activities and processes that enable SC participants to achieve common goals and objectives of customer satisfaction through cost reduction activities. As a result, companies share resources and work together to achieve their objectives. Christopher (2011) notes that competition is no longer among companies but supply chains, thereby forcing members to work together to improve their performance. This view is corroborated by Chopra and Meindl (2003), who note that coordination is vital for the achievement of consensus at all levels where supply chain members respond to market requirements in proper ways. Hai et al. (2012), also support this argument by noting that coordination provides cooperation among chain participants by facilitating improvements in communication, integration and teamwork. Chen et al. (2009) also suggest that coordination of efforts and resources are essential in the integration of all functional areas such as marketing, logistics, financial, human resources to achieve supply chain goals. It results in the ability of companies to gain control over the production and processing of products to ensure consistency in quality standards. On agro-processing supply chains, Taylor and Fearne (2006) are of the view that coordination in the agricultural and agro-processing sectors is critical since agro-chains depend on value creation throughout the supply network. March and Simon (1958) cited by Ulf and Karin (2005) suggest that there are three activities necessary to perform coordination, i.e. coordination through standardisation, planning, and feedback, activities that seem not to be considered important by local agro-processing companies. These three activities call for a common unity of purpose, where organisations in the chain have to agree on industry standards and procedures, coordinated planning and useful feedback for all actors in the supply chain.

Coordination can be used as a way of reducing transaction costs by shortening the supply chain. Arshinder et al. (2006), argue that supply chain members are dependent on each other for resources and information, so actors in the supply chain need to be coordinated by efficiently managing dependencies between each other. Kim et al. (2005), support this view by arguing that supply chain coordination can be achieved with the joint decision-making of all processes of the supply chain which include procurement, production, distribution, warehousing and economic allocation of the requirement of resources among supply chain members. Supply chain coordination for agro-processors will be successful if all participants valued the trust, shared resources and business relationship established together with the business. Chopra

and Meindl (2003) view supply chain coordination as an effective approach to streamlining operations or processes between supply chain members. Ballou et al. (2000), suggest that coordination is the central lever of supply chain management while Lee (2000), view it as a vehicle for redesigning decision rights, controlling workflow, and resources between supply chain members to improve performance. Supply chain coordination encompasses the integration of information exchange during the development, production and deliverance of a product or service to the end market (Cao et al. 2008). The argument by Cao *et al*. (2008) is also supported by Malone and Crowston (1994) who suggest that coordination can be viewed as a combination of many objects to achieve supply chain objectives. Therefore coordination of the supply chain involves aligning and harmonising many activities such as decision-making, information sharing, financial exchange, and knowledge exchange for the sole purpose of achieving chain goals and objectives. It also involves adjusting and adapting to the organisational culture of chain members.

To achieve coordination within an organisation, companies need to adopt mechanisms that support interaction and information exchange among the actors in the supply chain. Written contracts are used to achieve coordination through regulating the relationship between upstream and downstream firms (Hammoudi *et. al*.2009). Tighter coordination could change bargaining power within the supply chain which may result in tensions in the relation between actors (Ibid). Bohlje et al. (1999), notes that coordination improves information flow along the supply chain and enhances the ability of companies to identify and adjust to consumer changing demands, preferences and tastes. It results in the ability of companies to gain control over the production and processing of products to ensure consistency in quality standards. According to Haghighat (2008), coordination mechanisms are tools to address particular coordination problems, which could be used by every member of a supply chain to achieve benefits. Spekman *et al*. (1998) and Cao *et al*. (2008) are of the view that a coordination system is essential in bringing interdependent activities of organisations together through coordination of tangible and intangible assets and also aligning resources with the coordinated assets, and sharing benefits and risks equally. De Ruyter et al. (2001) identified two components of improving relationships as trust and commitment, a view corroborated by Spekman et al. (1998) who suggest that trust and commitment are antecedents of cooperative behaviour which have an impact on supply chain practice and supply chain performance. Mayer et al. (1995), note that trust is an important social resource that facilitates cooperation and enables better coordination of interactions. Claro et al. (2004), are of the view that in every transaction there is an element of trust although the trust varies across the transacting partners. Trust allows organisations to have a reasonable level of dependence on the supply chain partner's word. Dwyer et.al. (1987), highlights that trust is important in building long-term relationships, promotion of effective

communication and information sharing. Ganesan (1994), notes that trust is an important aspect of relationships as it binds parties and has a future orientation, a view supported by Smith and Barclay (1997) who note that trust influences the attitude of suppliers towards buyers. Through trust, organisations develop common beliefs which can assist in creating goal congruence thereby reducing the risk of free-riding opportunistic behaviour (Bradach and Eccles 1989). In a study by Fawcett et al. (2004), it was found out that there was a lack of significant trust in many supply chain relationships. Trust facilitates inter-organisational communication at all levels. Communication is considered a fundamental condition for supply chain management and the management of logistics capabilities across the supply chain. (Fugate, Sahin, and Mentzer 2006, Lee, Padmanabhan, and Whang 1997). On the other hand, Williamson's (1985) Transaction Cost Theory stipulates that firms determine which activities should be performed by the firm and which activities should be performed outside the firm by examining the situation's efficiency when production and transaction costs are considered. Communication allows companies to determine which activities to be performed by outside parties thereby increasing the need for integration with supply chain members that have the potential to lower the company's costs. Communication plays an important role as actors in the relationship have to come together to find ways of minimizing transaction costs. Communication among actors reduces asymmetric information and conditions of asset specificity are widespread (Williamson, 1986b). Communication has an impact on trust as continuous engagement builds trust which will enable organisations to effectively coordinate their supply chain activities.

Theoretical framework

The transaction cost theory was used to explain transactions among players in the Zimbabwean agro-processing industry and its role in enhancing relationships between partners through learning, knowledge sharing and the trust-building process (Boyce 2001). The theory was used to assess the effects of transaction factors on coordination in the Zimbabwean agro processing sector. The study also sought to assess the applicability of the transaction cost theory in the Zimbabwean agro processing sector. The theory addressed the economic environmental factors and uncertainty in the operating environment which may lead to bounded rationality during the transactions. Transaction costs could be described as the costs of acquiring and handling the information about the quality of inputs, the relevant prices, and the supplier's reputation. In this study, the costs identified included those related to inputs supply, searching information on prices, delivery of inputs and related costs.

Williamson (1971) identified three determinants of transaction cost theory which include: a) the agents' bounded rationality that emanates from incomplete contracts due to lack of foresight, in the contracting moment and future contracts. In support of this view, Grover and Malhotra (2003), suggest that

managers in organisations are affected by uncertainty in the operating environment which limits their rationality decision-making, (b) Opportunism originates when one of the partners pursues his/her short-term self-interest. On the aspect of opportunism, management behaviour such as cheating, lying and violating agreements could increase transaction costs through monitoring and safeguarding specific assets against such conceivable practices (Grover and Malhotra, 2003), (c) the assets specificity that originates from the owners of production factors which will incur costs if they deviate the assets to another use, and leads to the conclusion that the best use is improved by internalisation.

The theory also maintains that many transactions are characterised by imperfect information, either incomplete information or asymmetric information and conditions of asset specificity are widespread (Williamson, 1986b). Williamson, (1985) suggests that there are costs to "drafting, negotiating, and safeguarding any exchange or transaction" that are impeding smooth transactions. Transaction Cost Theory claims that companies should take note of the costs of transacting as they have the same importance in driving the organisation as production costs. Transactions costs comprise the costs of searching and information, drafting and negotiating an agreement, and the costs of safeguarding the agreement. Other costs proposed by Williamson (1985), incurred after the agreement include costs of evaluating the input, measuring the output, and monitoring and enforcement. Similarly, Jones (1998) proposes that efficiency in transaction cost theory is conceptualised as Pareto efficiency where governance modes are compared according to their ability to facilitate transactions until the point at which it is impossible to make one party better off without making the other party worse off. On the other hand, Williamson (1919, 1981 and 1975) investigated how governance structures could be used to minimize transaction costs and proposed possible ways of handling relationships among economic actors. He suggested that transaction costs could be minimized through the signing of contracts and move towards vertical integration using a hierarchy.

Antecedents of supply chain coordination that were deduced from transaction cost theory are that coordination of activities among supply chain partners includes communication, trust, opportunistic behaviour, transaction-specific investments and environmental factors. Opportunistic behaviour also impacts trust. Actors who tend to advance their interests build mistrust among the players which will, in turn, affect the coordination of the entire supply chain. Trust plays a mediating role between communication and opportunistic behaviour in coordinating the supply chain. Environmental factors also affect the coordination of the supply chain as changes in the operating environment will negatively or positively impact coordination activities. A volatile environment makes it difficult for companies to coordinate and manage their supply chain. Transaction specific investments make coordination easier as actors/players invest resources in the relationship and concentrate on ensuring the success of the relationship. These

investments guarantee the participants in the supply chain quality of product and rewards, as this calls for mutual understanding, reward sharing and mutual benefits for all parties. The results from the transactions are proper coordination of the supply chain and ultimately organisational performance. From the theoretical analysis, seven hypotheses were proposed.

Hypothesis

H1: Trust among supply chain partners has a positive influence on supply chain coordination

H2: Communication among supply chain partners has a positive influence on supply chain coordination

H3: Transaction specific investments among supply chain partners have a positive influence on supply chain coordination

H4: Supply chain coordination among supply chain partners has a positive impact on organisational performance

H5: Trust among supply chain partners has a positive impact on organisational performance

H6: Communication among supply chain partners has a positive impact on organisational performance

H7: Transaction specific investments among supply chain partners has a positive impact on organisational performance

III. METHODOLOGY

The study was abductive with more emphasis on the deductive approach since there is abundant literature on supply chain coordination. Easterby-Smith et al. (2012) posit that the abductive approach enables the researcher to have an informed decision about the research design to be used while at the same time assisting the researcher to choose research strategies and methodological choices that will work for the study. The abductive approach combines both deductive and inductive reasoning, yet the focus is on the deductive approach (Johansson 2003, Suddaby 2006). The abductive approach provides knowledge of different traditions that enables the researcher to adapt to the research design to cater for constraints (Easterby-Smith *et al*. 2012). The study also used a concurrent parallel mixed methods research design, which involved the collection of both quantitative and qualitative data simultaneously, with the data analysis done separately then merged and interpreted but with more emphasis on the quantitative strand of the study (Creswell and Plano Clark 2011).

A questionnaire survey for the whole country was conducted to collect data from agro processing companies and suppliers. 105 questionnaires were distributed (75 agro processing companies and 30 suppliers), 79 were completed and returned (59 from agro processing companies and 20 from suppliers). To measure the causality of the dependent and independent variables in the questionnaire, the study used the 7-point Likert scales, ranging from 1 representing "Strongly Disagree" to 7 representing "Strongly Agree" for the construct measures. The One-sample T-Test in the SPSS Data Analysis Software, Version 21, was used to analyse data. Structural Equation Modelling in Stata was used to analyse quantitative data to provide a model for hypothesis testing.

Semi-structured interviews were used to collect data on antecedents and consequences of supply chain coordination in the Zimbabwean agro-processing sector. 20 interviews were scheduled with managers of agro processing companies during the data collection period and 13 were successful. 7 were not successful due to work commitments. For suppliers 20 interviews were scheduled and 13 were successful. Semi-structured interviews were used to provide detailed information needed to explore the nature of the supply chain adoption among agro processing companies and their suppliers. This is in line with Denscombe (1998) who argues that interviews are used in cases where there has been no previous research, as is the case with this study. Freebody (2003) bolsters this perspective when he notes that interviewing is a useful way of collecting qualitative data because the technique is introspective and allows respondents to provide their details, perspectives, beliefs, practices, interactions and concerns.

IV. RESULTS AND DISCUSSION

The results show descriptive measures for antecedents of supply chain coordination which are trust, communication and transaction-specific investments All the variables for this factor were above the Test Value (4.0) showing the significant effect of trust on supply chain coordination. Some of the results of the Test were: Supplier is trustworthy (M=5.49); Our supplier keeps promises (M=5.53) and Our coordinator is reliable (5.24).

Table 1: Antecedents of supply chain coordination

Antecedent	Statement	N	Mean	Std Dev	Std. Error Mean
Trust 1	The coordinator is reliable	59	5.24	1.023	0.133
Trust 2	Supplier is trustworthy	59	5.49	0.954	
Trust 3	Our relationship with main supplier is satisfactory	59	5.59	0.873	0.124
Trust 4	Our supplier performance is satisfactory	59	5.56	0.952	0.114
Trust 5	Our supplier always keeps promises	59	5.53	1.056	0.124
Trust 6	We have confidence in our suppliers	59	5.53	0.953	0.138

Trust 7	We mutually understand each other	59	4.90	1.337	0.179
Comm 1	We contact our suppliers for coordination purposes	59	3.63	1.751	0.228
Comm 2	We visit our suppliers premises	59	5.17	1.428	0.186
Comm 3	We have meetings with our suppliers	59	4.69	1.207	0.157
Comm 4	We call our suppliers	59	3.17	1.811	0.236
Comm 5	We communicate face to face with our suppliers	59	3.90	1.550	0.202
Comm 6	We use written communication with our suppliers	59	3.58	2.230	0.290
Comm 7	We communicate with our suppliers through skype	59	6.05	1.861	0.242
Comm 8	Changes on the buyers' side are communicated with the suppliers in advance	59	4.97	1.438	0.187
Comm 9	Suppliers inform the buyer about issues that affect the business	59	5.03	1.389	0.181
TSI 1	The company assists its suppliers to improve their product quality	59	5.66	1.321	0.172
TSI 2	The company has continuous improvement programs that include its key suppliers	59	5.39	1.352	0.176
TSI 3	We have engaged in joint investments with our suppliers	59	4.17	2.027	0.264

Results from the suppliers are in tandem with the results from agro-processors where the mean score was also above the Test Value (4.0) with Trust (M=5.738). The results from the quantitative strand of the study were corroborated by agro-processing companies' interviewees whose responses to questions relating to trust were then analysed by creating nodes in NVivo 11 as presented in Table 2.

Table 2: Coding Reference Percentage on Trust

NVivo Node	Coding References	Coding Reference %
Trustworthy	12	85.7
Not Trustworthy	2	14.3

Of the interviewees that completed the semi-structured interviews, 85.7% of the responses (12 coding references) indicated that their suppliers are trustworthy. Those who indicated that their suppliers are not trustworthy constitute 14.3% (2 coding references). To get an in-depth understanding of the level of trust in the sector, supplier interviewees were also asked if they trust their customers. Some of the responses that came out of the in-depth interviews with the respondents were:

Our supply chain partners are trustworthy
They are trustworthy and the National Railways of Zimbabwe (NRZ) is the key partner at times delays with products and raw materials
They are trustworthy to the extent of advance payments
They are trustworthy since they rely on the company for business
Not all are trustworthy

Communication was measured by 9 items which included contacting suppliers for coordination purposes, frequency of communication and methods of communication. On communication respondents also somewhat agreed with the mean agreement score (M=4.5). Methods of communication highlighted by respondents include calling suppliers, visiting supplier premises, writing to suppliers and calling and using skype. The respondents also agreed that changes on the supplier side are communicated in advance. These results are corroborated by results from suppliers whose mean score for the factor Communication (M=4.687). These results are corroborated by results from suppliers where interviewees indicated some of the communication channels used by the Zimbabwean agro processing organisations when communicating with their suppliers and customers. The results on communication were also corroborated by results from suppliers/farmers where interviewees were asked how they communicate with their suppliers. On the frequency of communication between suppliers and customers in the Zimbabwean agro processing organisations. The responses from interviewees are presented in Figure 1.

Figure 1: Word Frequency Query Results on Frequency of Communication

The word cloud depicting the frequency of communication shows that suppliers and customers of Zimbabwean agro-processing organisations communicate with each other weekly, followed by the interviewees who indicated that they communicate regularly. The other group of interviewees indicated that they communicate daily. The results show that suppliers and agro-processors in the Zimbabwean agro-

processing organisations use different communication channels when communicating with their customers but these communication channels do not show the impact on coordination activities of the supply chain.
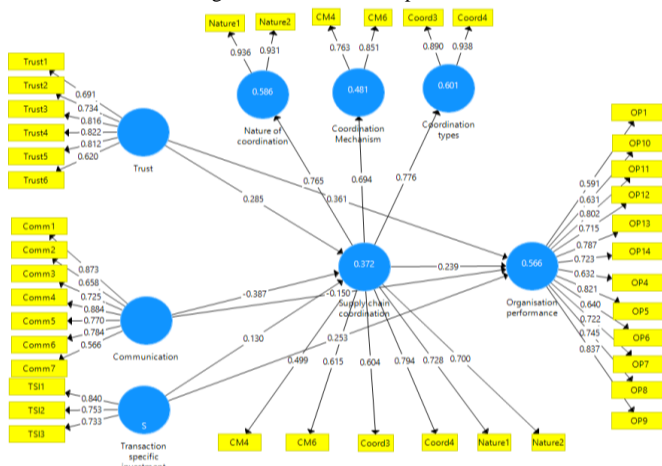
4.1 Structural Equation modelling

The previous section presented descriptive statistics from the survey data and results from the exploratory strand of the study presented in the form of word frequency queries and percentages.   In line with the convergent parallel methodological design used for the study, the quantitative strand had more weighting than the qualitative strand. Due to the dominance of the quantitative research approach, it was found necessary to test the hypothesis of the study. It is against this background that Partial Least Squares (PLS) and Structural Equation Modelling (SEM) were adopted for hypothesis testing to explain the correlational and causal relationships between the test variables.

An examination of outer loadings for all latent variables 7 indicators (Coord1, Coord2, CM1, CM2, CM3, OP2, OP3) was removed because their outer loadings were lower than the 0.4 threshold level (Hair et al., 2013). 8 indicators (CM4, CM5, CM6, Coord3, Nature3, Trust6, Comm2, Comm7, OP1, OP4, OP6, OP10), were found to have loading between 0.4 to 0.7. A loading relevance test was therefore performed for these indicators to see if they should be retained in the model. In a loading relevance test, problematic indicators should be deleted only if their removal from the PLS model leads to an increase of AVE and composite reliability of their constructs over the 0.5 thresholds. CM5 and Nature3 were removed to improve the Average Variance Extracted (AVE) and composite reliability for the latent variable Supply chain coordination to above 0.5; the other indicators were not removed from the PLS model to maintain content validity because their respective Average Variance Extracted (AVE) and composite reliability were above 0.50. The remaining indicators were retained because their outer loadings were 0.7 or higher.

Figure 2: Model Development

Table 3: Outer Loadings Model

Constructs (Latent Variables)	Outer loadings
Supply Chain Coordination	
Nature of Coordination	
Nature1	0.728
Nature2	0.700
Coordination Mechanism	
CM4	0.499
CM5	0.615
Coordination Types	
Coord3	0.604
Coord4	0.794
Trust	
Trust1	0.691
Trust2	0.734
Trust3	0.816
Trust4	0.822
Trust5	0.812
Trust6	0.620
Communication	
Comm1	0.873
Comm2	0.658
Comm3	0.725
Comm4	0.884
Comm5	0.770
Comm6	0.784
Comm7	0.566
Transaction Specific Investments	
TSI1	0.840
TSI2	0.753
TSI3	0.733
Organisation Performance	
OP1	0.591
OP4	0.632
OP5	0.821
OP6	0.640
OP7	0.722
OP8	0.745
OP9	0.837
OP10	0.631
OP11	0.802
OP12	0.715
OP13	0.787
OP14	0.723

Internal Consistency Reliability

Previous researches, according to Bagozzi and Yi, (1988) suggest that a threshold level of 0.60 or higher is required to demonstrate satisfactory composite reliability in exploratory research but not exceeding the 0.95 level (Hair et al., 2013). The composite reliability for the constructs Supply Chain Coordination, Trust, Communication, Transaction Specific Investments and Organisational Performance was 0.822, 0.886, 0.903, 0.820 and 0.929 respectively, indicating fairly high levels of internal consistency reliability (Nunnally & Bernstein, 1994).

Convergent Validity

Bagozzi and Yi (1988) suggest an AVE threshold level of 0.5 as evidence of convergent validity. The AVE for the latent construct Supply Chain Coordination, Trust, Communication, Transaction Specific Investments and Operations Performance were all above the required minimum level of 0.50 (Bagozzi and Yi, 1988) except for Supply Chain Coordination which has a value of 0.498 (very close to 0.500). Therefore, the measures of the five reflective constructs had fairly high levels of convergent validity.

Discriminant Validity

Fornell and Larcker, (1981) argue that for the establishment of discriminant validity, the square root of average variance extracted (AVE) of each latent variable should be larger than the latent variable correlations (LVC). Table 4 shows that discriminant validity was achieved because the square root of AVE for Supply Chain Coordination, Trust, Communication, Transaction Specific Investments and Operations Performance is much larger than the corresponding LVC.

Table 4: Convergent Validity and Discriminant Validity Model

	1	2	3	4	5
1. Communication	0.759				
2. Organisation Performance	-0.446	0.725			
3. Supply Chain Coordination	-0.516	0.589	0.664		
4. Transaction Specific Investments 5.	-0.350	0.551	0.388	0.777	
6. Trust	-0.254	0.588	0.465	0.409	0.753

Evaluation of the Structural Model in PLS-SEM: Collinearity Assessment

In addition to checking the measurement model, the structural model has to be properly evaluated before drawing any conclusion. Collinearity is a potential issue in the structural model and that variance inflation factor (VIF) value of 5 or above typically indicates such problem (Hair et al., 2013). The collinearity assessment results are summarized in Table 5. It can be noted that all VIF values were lower than five, suggesting that there is no indication of collinearity between the predictor variables.

Table 5: Collinearity Assessment Model

Constructs	VIF	Collinearity Problem? (VIF>5?)	Constructs	VIF	Collinearity Problem? (VIF>5?)
Communication	1.159	NO	Communication	1.405	NO
Trust	1.221	NO	Trust	1.363	NO
Transaction Specific Investments	1.301	NO	Transaction Specific Investments	1.348	NO
			Supply Chain Coordination	1.591	NO

Dependent variable: Supply Chain Coordination; Dependent variable: Organisation performance

Coefficient of Determination (R^2)

A major part of structural model evaluation is the assessment of the coefficient of determination (R^2). In this model, Organisation Performance is the main construct of interest. From the PLS Path model estimation, the overall R^2 was found to be a moderate one. Hair et al., (2013) note that threshold values of 0.25, 0.5 and 0.7 are often used to describe a weak, moderate, and strong coefficient of determination. In this study, the four constructs Supply Chain Coordination, Trust, Communication and Transaction Specific Investments jointly explain 56.6% of the variance of the endogenous construct Organisation Performance. The R^2 value is 0.566.

Path Coefficient

From Table 5, five of the seven of the structural model relationships were significant, confirming some of the hypotheses about the construct relationships. The PLS structural model results led to the conclusion that Trust has the strongest effect on Organisational performance (0.361), followed by Transaction Specific Investments (0.253) and Supply Chain Coordination (0.239). Communication had the least effect on Organisation Performance (-0.150).

The PLS model estimation reveals that the higher-order construct (HOC), Supply Chain Coordination, has strong relationships with its lower-order constructs (LOC), Nature of Coordination (0.765), Coordination Mechanism (0.694) and Coordination Types (0.776). This means that the LOC Nature of Coordination, Coordination Mechanism and Coordination Types are highly correlated for the HOC Supply Chain Coordination to explain more than 50% of each LOC's variance.

Table 6: Significance Testing Results of the Structural Model Path Coefficients Model

	Path:	Path Coefficients	t-values	p-value
H1	Trust →Supply Chain Coordination	0.285	2.091	0.037
H2	Communication →Supply Chain Coordination	-0.387	4.237	0.000
H3	Transaction Specific Investments→Supply Chain Coordination	0.130	0.994	0.323

H4	Supply Chain Coordination →Organisational Performance	0.239	2.005	0.045
H5	Trust →Organisational Performance	0.361	3.934	0.000
H6	Communication →Organisational Performance	-0.150	1.008	0.314
H7	Transaction Specific Investments →Organisational Performance	0.253	2.091	0.037

Predictive relevance (Q2)

An assessment of Stone-Geisser's predictive relevance (Q^2) is important because it checks if the data points of indicators in the reflective measurement model of endogenous construct can be predicted accurately. This can be achieved by making use of the blindfolding procedure in SmartPLS. *Supply Chain Coordination* and *Organisation Performance* are the two endogenous constructs in the model so they are selected for running the Blindfolding Algorithm.

From Table 7 the results show that the proposed model has good predictive relevance for the endogenous variables. Chin (1998) suggests that a model demonstrates good predictive relevance when its Q^2 value is larger than zero as shown in Table 7.

Table 7: Results of Coefficient of Determination (R^2) and Predictive Relevance (Q^2) Model

Endogenous Latent Variable	R^2 Value	Q^2 Value
Supply Chain Coordination	0.372	0.141
Organisational Performance	0.566	0.259

The f^2 Effect Size

The final step in structural model evaluation is to assess the effect of a specific exogenous construct on the endogenous construct if it is deleted from the model. This can be achieved by examining the f^2 effect sizes. Following Cohan's (1988) guideline which states that f^2 values of 0.02, 0.15, and 0.35 are interpreted as small, medium, and large effect sizes, respectively, it can be said that in general the exogenous variables have low to medium effect sizes on the endogenous variables as presented in Table 8.

Table 8: Results of f^2 Model

	Supply Chain Coordination		Organisational Performance	
	Path Coefficient	f^2 Effect Size	Path Coefficient	f^2 Effect Size
Communication	-0.387	0.204	-0.150	0.037
Trust	0.285	0.105	0.361	0.221
Transaction Specific Investments	0.130	0.020	0.253	0.110
Supply chain Coordination	n/a	n/a	0.239	0.083

Note: Target constructs appear in the first row, whereas the predecessor constructs are in the first

4.2 Summary of Hypothesis testing

Seven hypotheses were proposed and tested, the results show that five of the hypotheses are supported as presented in Table 9 below. Trust and Communication are found to have a significant impact on Supply Chain Coordination (H1 and H2). However, there is no significant effect of Transaction Specific Investments on Supply Chain Coordination so the hypothesis (H3) is rejected. There is also a significant effect of Supply Chain Coordination, Trust and Transaction Specific Investments on Organisation Performance, so the hypotheses (H4, H5 and H7) are supported. However, there is no significant effect of Communication on Organisation Performance so the hypothesis (H6) is rejected.

Table 9: Summary of Hypothesis testing

	Hypotheses	**Supported? (Yes/No)**
H1	Trust →Supply Chain Coordination	Yes
H2	Communication →Supply Chain Coordination	Yes
H3	Transaction Specific Investments→Supply Chain Coordination	No
H4	Supply Chain Coordination →Organisational Performance	Yes
H5	Trust →Organisational Performance	Yes
H6	Communication →Organisational Performance	No
H7	Transaction Specific Investments →Organisational Performance	Yes

Qualitative Findings

Trust among supply chain partners

The results from the qualitative strand of the study also show that the players in the Zimbabwean agro-processing organisations trust each other. The variable trustworthy recorded 12 coding references from agro-processing companies. This element was supported by suppliers who had 12 coding references for the same variable. Trust was also measured by reliability, where a total of 14 NVivo coding references were recorded for agro-processing companies and 10 NVivo coding references from suppliers on the same measure. Mayer *et al*. (1995) corroborate this view when he notes that trust facilitates cohesion and collaboration between organisations. Trust facilitates cooperation and is an enabler of coordination and interactions among supply chain partners. The findings show that trust plays an important role in the coordination of Zimbabwean agro-processing organizations' supply chains.

Communication among supply chain partners

The qualitative findings show that agro-processing companies communicate with suppliers through various communication platforms. The platforms used include telephone (6 NVivo coding references), face to face communication (6 coding references), and email and through association (4 coding references each). Communication through skype has the least number of respondents (1 coding reference), showing that

Zimbabwean agro-processing organisations have not embraced technology for communication purposes. The findings also show that Zimbabwean agro-processing organisations have very few international suppliers as highlighted in the responses:

We communicate through telephone, face to face, email and skype with foreign suppliers

We communicate through telephone, face to face, and at times written communication

We communicate through visits and calling the farmers' board depending on the situation.

We usually use the extension officers

The findings show that the companies communicate frequently with their suppliers on coordination of the supply chain. The findings show that communication is weekly (6 NVivo coding references) by agro-processing companies, when necessary and regularly (4 coding references each) and daily (3 coding references each). The findings from the supplier qualitative strand complement the quantitative findings. Findings from supplier interviews show that communication is done daily (12 coding references), face to face (8 coding references), email (4 coding references), skype (2 coding references) and written communication (1 coding reference).

Transaction specific investments

Findings from the qualitative strand of the study also differ from quantitative findings from the survey. The disagreement in findings could be from the fact that the prevailing economic conditions and cash and foreign currency shortages could be hindering transaction-related investments. Findings show that suppliers and agro-processing organisations work together in different aspects of the business for the benefit of the relationship. From agro-processing companies' interviewee responses, it was noted that the companies invest in their suppliers. Some of the responses from in-depth interviewees were:

We have assisted suppliers by offering clearance fees for their consignments through advance payments.

We have assisted our suppliers through knowledge sharing and inputs supply

We have assisted farmers with free extension services, inputs such as fertilisers, agrochemicals and diesel whose amount is deducted after selling their products to the company

We give farmers pesticides, protective clothing and provide technical knowledge and transport

These findings were also supported by findings from interviewees with suppliers. Some of the responses from the interviews with suppliers were:

We get cotton inputs from the contracting company and for maize, we purchase from hardware shops

Free deliveries of inputs and training from the suppliers

We have received fertilizers, chemicals, and herbicides, then they deduct after harvesting

We have received inputs in the form of seeds and fertilizers. We have also been trained

Customer transport directly to the mill

We have been trained by our customers on product handling.

The findings show that apart from offering suppliers access to inputs, agro-processing companies also assist suppliers through training, offering technical assistance, financial assistance and transport for the produce. Suppliers are also assisted by their agro customers through resource sharing as evidenced in some of the interview responses:

Individual farmers have adequate resources but we share resources for pumping water for irrigation purposes. We have a roaster for irrigation.

Our supplier assists us through training of employees on precision agriculture. When we buy new tractors, five employees are sent to the supplier in Brazil for training on equipment use, management and repairs.

The findings show that agro-suppliers share resources with their customers to the extent of having an irrigation roaster. The findings also show that suppliers of agro-processing organisations offer after-sales service through technical assistance to their customers. This shows that coordination of the entire supply chain runs from the source to the end customer. Generally, Zimbabwean agro-processing companies engage in transaction-specific investments to ensure timely delivery of raw materials, quality consistency and required quantities.

Supply chain coordination and organisational performance

The qualitative strand of the study also supports the quantitative findings with (10 NVivo coding references) from agro-processing companies' interviewees indicating that coordination of the Zimbabwean agro-supply chains has improved organisational performance. Coordination has also had a positive impact on the sector through competitiveness (2 NVivo coding references) and growth (2 NVivo coding references). Profitability is the least impact with (1 NVivo coding reference). Some of the responses that came from in-depth interviews were:

Improved performance and ability to meet demand and delivery requirements

Profitability, expansion, increases in production and factory capacity. Growth in market share

Improved competitiveness, profitability and market share

Continuous production since there are no raw material shortages

Other impacts from coordination among Zimbabwean agro-processing organisations include timeous delivery with 35.7%, product availability 18%, customer satisfaction 10.7%, new product development, quality improvements and training 7.1%. Some of the responses from agro processor interviewees were:

Improved performance as Company is operating at 70% production capacity. Milling starts April to November

Profitability, expansion, increases in production and factory capacity. Growth in market share

Improved competitiveness, profitability and market share

It has led to company expansion

Sustainability, product availability, scheduled deliveries, customer satisfaction, long term relationship. Reliable customer guarantees confidence.

Findings from supplier interviewees also corroborate agro-companies' findings as they show that coordination has had a positive impact on the performance of their organisation. From the supplier side, coordination has enabled company profitability with (5 NVivo coding references), innovation (4 NVivo coding references) and production efficiency (4 NVivo coding references). On the supplier side, coordination of the Zimbabwean agro-processing supply chain has given them a competitive advantage (2 NVivo coding references) and enabled them to have access to markets 2 NVivo coding references). From supplier interviewees, some of the responses were:

We have benefitted through exposure to innovative new products, profitability and competitive advantage.

We managed to achieve a 95% utilization of the allocated land

The performance of suppliers has improved due to the input scheme. Tonnage has also increased

Investments in new technology and agricultural equipment

We have benefited from credit facilities, a reliable ready market for our produce, linkages and cost savings

The findings show that due to coordination, suppliers of Zimbabwean agro-processing organisations have become efficient, effective and responsive to customer needs, thereby reducing customer complaints while satisfying the customer leading to profitability and ultimately competitive advantage. The findings in this study on supply chain coordination are in agreement with Arshinder et al. (2011) and Simatupang et al. (2002), where supply chain coordination was found to have an impact on the financial performance of an organisation.

V. CONCLUSIONS AND RECOMMENDATIONS

The study established that the Zimbabwean agro-processing organisations' supply chain coordination activities are influenced by factors such as trust, which is measured by satisfactory relationship, keeping promises, benevolence, supplier confidence, trustworthiness and reliability. These factors were considered important in building trust between supply chain members. Communication was also considered an important factor as it facilitates building trust and commitment through informing customers about business issues and communicating changes on the supplier side. The study established that trust and communication have a significant impact on supply chain coordination while transaction-specific investments have no significant impact. However, the study through hypothesis testing established that although transaction-specific investments had no impact on coordination, they had an impact on organisational performance together with supply chain coordination and trust. Other factors that were considered important for coordination activities include the commitment of the parties/ participants in the sector, information sharing on issues affecting businesses, price changes, demand fluctuations, inventory levels and operational activities and challenges.

Supply chain actors can use the findings of this study to improve their operations through coordination of their supply chains for competitive positioning and improvements in organisational performance. Managers in the sector can use the findings of the study to engage and train suppliers on management and coordination of the supply chain.

Policymakers can use the findings of this study to understand the role of supply chain coordination and identify appropriate interventions and policies that can improve coordination and organisational performance in the country. This study can provide insights to policymakers and the government, by assisting them to make adjustments in policies to increase trust among supply chain actors and improve relationships in supply chains by engaging all stakeholders in the sector. Through the Ministry of Agriculture, policymakers could conduct training by offering extensions services to suppliers to facilitate seamless flow of coordination among Zimbabwean agro processing organisations to improve supply chain performance

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