

# Information technology as a facilitator of suppliers' collaborative communication, network governance and relationship longevity in supply chains

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There is an increasing awareness about the paramount importance of information technology within business in the context of large businesses. However, research about the investigation of the role of information technology resources in fostering collaborative communication, network governance and relationship longevity in the small and medium enterprise sector has remained scant. The primary objective of this study was to investigate the influence of information technology on collaborative communication, network governance and relationship longevity in Zimbabwe's SME sector. Five research hypotheses were posited and sample data from 162 small and medium enterprise suppliers were collected and used to empirically test the hypotheses. The results of this study showed that information technology resources positively influenced small and medium enterprise suppliers' collaborative communication, network governance and consequential relationship longevity with their buyers in a significant way. Overall, the current study findings provided tentative support to the proposition that information technology resources, collaborative communication and network governance should be recognised as significant antecedents for improved relationship longevity between suppliers and their buyers in the SME setting. Therefore, managers in the small and medium enterprise sector and small and medium enterprise owners need to pay attention to both collaborative communication and network governance in order to optimise information technology resource impact on their relationship longevity with their business counterparts. Limitations and future research directions were also indicated.

## Introduction

Managing supply chains with efficacy creates value and consequently enhances supply chain members' business performance (Zhao, Xie & Zhang 2002). As indicated by Vijayasarathy (2004) and Prajogo and Olhager (2012), effective and efficient supply chain management (SCM) forms the basis upon which long-term, sustainable, competitive edge and superior supply chain performance contracts can be achieved. Supply chain contracts have increasingly become long term in nature and partners willingly share information regarding their processes, quality performance and even cost structure in order to achieve this objective (Helper & Sako 1995; White, Daniel & Mohdzain 2005; Lee, Kwon & Severance 2007). Through close long-term relationships, the suppliers have become part of a well-managed chain resulting to lasting effect on the superior competitiveness and performance of the entire supply chain (Choi & Hartley 1996; Kotabe Martin & Domoto 2003; Vijayasarathy 2004).

A key question that can be asked is: What relationship-specific factors are likely to affect the development of long-term orientation in order for supply chain partners to realise the superior performance? It is worth noting that supplier communication and supplier network structure are two key constructs in the evolving paradigm of SCM – a paradigm whose general theme is the shifting of emphasis from isolated individual firm performance to superior long-term collaborative value creation in a whole supply chain. Supplier communication can be characterised as frequent, genuine and involving information sharing or personal contacts between supply chain partners in order to jointly find solutions or facilitate business (Holmen & Pedersen 2010; Paulraj, Lado & Chen 2008; Carr & Pearson 1999). In the context of SCM, network structure refers to a grouping of businesses and customers who are characterised by strong linkages between supply chain members with low levels of vertical integration (Prajogo & Olhager 2012). Researchers and managers have increasingly recognised that in order to capture potential synergy and create superior value in supply chains, the supply partners must develop effective communication and network structures (Aviv 2001; Su & Zhang 2006). Consequently, research interest in supply chain collaborative communication and network governance is currently quite substantial and growing (Chen & Paulraj 2004; Kim & Mahoney 2006; Vijayasarathy 2004; Prajogo & Olhager 2012).

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Recently, some researchers such as Paulraj, Lado and Chen (2008) have been particularly interested in identifying the key drivers of supplier communication and network structure; information technology (IT) has been singled out as a paramount driver in the relatively large body of models and empirical findings in the IT and management-related literature. It is recognised in the literature that more than ever before, today's information technology is permeating the supply chain at every point, transforming the way in which exchange-related activities are performed and the nature of the linkages between them (Rapp, Rapp & Schillewaert 2008; Kim & Jae 2007). A more recent perspective on linkages within the supply chain considers the role of inter-business communication systems, which are sophisticated information systems connecting separate supply chain partners (Lai, Wong & Cheng 2010; Rapp, Rapp & Schillewaert 2008; Trainor *et al.* 2011). The strength of inter-business IT systems has been particularly crucial with respect to enabling the process transformation needed to create effective networks (Brady, Saren & Tzokas 2002; Brodie *et al.* 2007; Christiaanse & Kumar 2000). Information technology also enhances supply chain efficiency by providing real-time information regarding product availability, inventory level, shipment status and production requirements (Kim & Jae 2007; Kim & Mahoney 2006). It has a vast potential to facilitate collaborative planning among supply chain partners by sharing information on demand forecasts and production schedules that dictate supply chain activities (Roseira, Brito & Henneberg 2010; Trainor *et al.* 2011).

Despite the appreciation of the value of IT, supply communication, network structure and long term relationships traced in the literature, there is a relative dearth of studies that have specifically investigated the influence of IT use on relationship longevity and the mediating role of collaborative communication and network governance. Furthermore, most of the studies that have attempted to investigate the relationships between some of these variables have been conducted in the developed countries of Europe and the USA (Holmen & Pedersen 2010; Paulraj *et al.* 2008), or the newly developed countries of Asia (Choi & Wu 2009). Therefore, researches that has investigated the relationships between IT utilisation, supplier collaborative communication, network governance and relationships longevity in supply chains in the context of the developing countries of Africa remains scant – hence the need for the current empirical study.

Based on these identified research gaps, this article has three objectives:

- To examine the causal influence of information technology on a supplier's relationship longevity in Zimbabwe's supply chains.
- To present an empirical investigation into the mediating role of supplier collaborative communication and network governance in IT – relationship longevity linkage.
- To apply the Network theory in this research context.

This study has a strong theoretical grounding from the current research. On the whole, the findings of this study are expected to contribute new knowledge to the existing

body of SCM literature in addition to providing practical implications to supply chain practitioners within the context of a developing African country such as Zimbabwe.

The remainder of this article will review the literature on Network theory, then propose a conceptual research model and develop the research hypotheses. The study will also provide the research methodology, data analysis and results. The results are then discussed, implications provided and limitations and future research directions highlighted.

## Literature review

This section of the article will provide a review of literature on Network analysis theory, information technology resources, collaborative communication, network governance and relationship longevity.

### Network analysis theory

The network concept, which can be traced by its roots from anthropology and sociology (Streeter & Gillespie 1992), has recently become a standard technique for studying the structure of social networks (Ma, Yao & Xi 2009). In the business arena, network analysis is methodologically becoming an increasingly popular tool that is used to understand complex patterns of interaction (Dyer & Nobeoka 2000; Holmen & Pedersen 2010). By definition, network analysis examines actors that are connected directly or indirectly by one or more different relationships, whilst a network refers to any bounded set of connected social units (Paulraj *et al.* 2008). In a network analysis four issues are important to note:

- Networks have boundaries and some criteria exist that determine membership in the network.
- Networks are also presumed to be embedded in larger social systems, therefore it is sometimes difficult to distinguish between a network and its broader social context.
- Relational properties focus on the content of the relationship between network members and on the form of these relationships. According to Choi and Kim (2008), transaction content and the nature of relationships – the two aspects of relational properties – seek to understand why a network exists and try to ascertain the functions performed by the relations among the members. Whilst transaction content denotes what flows or what is exchanged in networks (e.g., resources, information, influence and social support), the nature of relationships refers to the qualities inherent in the relationship between members of the network.
- Structural properties describe the way in which members fit together to form social networks as individual members, subgroups and total networks. Measures of individual members describe the differences among their connections to other members of the network, whilst measures of subgroups as the unit of analysis represent the structural characteristics of clusters within the total network. According to Chen and Paulraj (2004), the advances in computer technology have made it possible to design network studies and conduct complex network analyses, which were impossible just a decade ago.

By relating Network analysis theory to the current study, this research accordingly submits that IT is an important resource that characterises both the nature of relationships and structure of supply chain networks. As such, it can be used as a tool to understand the nature of supply chain network structures and the depth and content of communication in supply chains. Eventually, the depth of communication and the strength of network structure influences the longevity of business relationships in supply chains and hence business performance.

### Supplier information technology use

Information technology is referred to as the knowledge process and its application of methods, processing, transferring and making information improvement (Oz 2005). IT includes gathering, organising, storing, publishing and using the information in the form of sound, picture graphics, text and number by using a computer and telecommunication tools (Crowston & Myers 2004). According to Ali and Kumar (2011), IT provides several advantages for industry: increasing the rate of operation speed; providing the stability and compatibility in order to create data; promoting efficiency for the organisation; improving productivity; and controlling internal processes. As a business resource, IT can reduce transactional costs by electronic data transaction and shared databases and removes intermediaries in organisational processes (Fisher 2000; Zhou, Yim & Tse 2005). Accordingly, the ability of a company to exploit the benefits emanating from IT resource utilisation will equip it with a competitive advantage over its competitors (Melville, Kraemer & Gurbaxani 2004). Therefore, using information technology represents a business's capability in recognising and adapting to emerging technologies (Ali & Kumar 2011). In today's business world, it has become imperative for supply chain members to invest more in IT and foster a commitment to the application of new technology within their supply chains (Christiaanse & Kumar 2000; Oz 2005). In this study, IT use is defined as the presence and utilisation of electronic transactions and communication in various forms between the supply chain partners (Zhou *et al.* 2005).

### Supplier collaborative communication

The importance of communication and information sharing has been heavily emphasised for effective inter-organisational relationships in the developed countries such as the United States of America (Monczka *et al.*, 1998; Mohr & Nevin 1990). According to Prahinski and Benton (2004), collaborative communication can be regarded as the glue that holds together a channel of distribution or supply chains and it is a necessity for successful supplier relationship (Monczka, Tren & Handfield 2002; Galt & Dale 1991; Krause 1999). Communication theory indicates that communication can be viewed as a transmission process through a channel (mode) and that collaborative communication has four important facets characterised in terms of frequency of communication, the direction (whether bi-directional or unidirectional), content (whether direct or indirect) and modality (whether formal or informal) (Paulraj *et al.* 2008; Holland, Lockett &

Blackman 1994). In supply chain management, collaborative communication can be expected to be frequent, genuine and involving personal contacts between buying and selling personnel. Hitherto, SCM literature has found that many supplier product problems have been due to poor communication (Chen & Paulraj 2004; Holland 1995). In the current study, supplier communication is collaborative and refers to a communication effort that emphasises indirect influence strategy, formality and feedback in unison (Prahinski & Benton 2004).

### Supplier network governance

In SCM, networks constitute an immediate form of governance characterised by task, authority and co-ordination mechanisms across distinct businesses that enhance supply chain performance (Dyer & Nobeoka 2000; Harland & Knight 2001). Roseira *et al.* (2010) asserted that the structure of a business's network and the location of each business and its contacts within the structure define the business's chances of obtaining benefits from the network. Such reasoning has been supported in the extant literature by Holmen and Pedersen (2010) and Lorentz and Ghauri (2010), who submitted that if a supply network structure provides many opportunities for businesses to benefit, then they are more likely to accept that they can all gain and to be motivated to co-operate rather than compete with each other. Thus, network structures establish some of the conditions that potentially affect the motivation of businesses to co-operate with each other (Cannon, Achrol & Gundlach, 2000; Roseira *et al.* 2010). When networks are well developed, a kind of governance structure emerges (Ma *et al.* 2009). However, according to Chen and Paulraj (2004), the lower the levels of vertical integration, the stronger the linkages between the supply chain partners. Thus, effective supply network structures are personified by suppliers' interdependence (Paulraj *et al.* 2008). In line with existing research, supply network structure development is characterised by non-power based relationships and inter-business co-ordination as well as the informal social systems that are linked through a network of relations (Dyer & Nobeoka 2000; Harland & Knight 2001; Lambert & Cooper 2000; Croom 2001).

### Supplier relationship longevity

Relationship longevity is often defined as both the actual length of the relationship as well as the expectation of continuing or a desire to continue the relationship (Kim 2001; Barkema & Vermeulen 1997; Heide & John 1990; Moorman, Zaltman & Deshpande 1992). Supplier contracts have increasingly become long-term; more and more suppliers must provide customers with information regarding their processes, quality performance and even cost structure (Krause, Pagell & Curkovic 2001; Helper 1991; Helper & Sako 1995). Perhaps the reason for that, as indicated in the management literature, is that long-lasting relationships are profitable and beneficial. It is posited in the literature that the longer the business relationship is, the more co-operative, trusting and committed the companies will be through the adaptations they make (Choi & Hartley 1996). Krause and

Ellram (1997) found that maintenance of relationships over a longer period of time induces supply chain partners to be more willing to share risks and rewards, whilst Carr and Pearson (1999) suggested that companies would gain benefits by placing a larger volume of business with fewer suppliers using long-term contracts. Further buttressing the notion of Carr and Pearson (1999), Kotabe *et al.* (2003) discovered that strategically managed long-term relationships with key suppliers have a positive impact on business's supplier performance. Their argument was that through a long-term relationship, the supplier will become part of a well-managed chain and will have a lasting effect on the competitiveness of the entire supply chain (Krause *et al.* 2001). Following the suggestions of existing research, the theoretical construct is operationalised to involve the initiatives taken by the buying business to encourage long-term relationships with their suppliers (Kim & Mahoney 2006).

## Conceptual model and hypothesis development

Drawing from the network theory, the literature of SCM and logistics management aforementioned, a conceptual model has been developed as shown in Figure 1. The model consists of five constructs: one predictor – supplier information technology use; three mediators – supplier collaborative communication, supplier network structure development and supplier long-term relationship; and one outcome variable – supplier performance. Conceivably, the suppliers' information technology use influences their collaborative communication, network structure development and consequent relationship longevity in supply chains. Detailed explanations of the associations between these constructs are provided in the hypotheses developed hereafter.

### Supplier information technology use and collaborative communication

Increasingly, resource has become a vital element in contemporary supply chain systems, transforming the way that exchange-related activities are performed (Kim & Mahoney 2006; Palmer & Griffith 1998). It is noted in the literature that IT can generate a sustainable competitive advantage by facilitating collaborative communication and fostering relational capabilities (Grover & Malhotra 1997;

Walton and Marucheck 1997; Subramani 2004). Accordingly, sustainability of advantage is possible when IT resources facilitate collaborative communication, leading to the development of complementary capabilities (Powell & Dent-Micallef 1997; Dyer & Singh 1998; Kale, Singh & Perlmutter 2000). In the context of this study, it is argued that IT as a crucial business resource connects and creates an enabling environment that fosters suppliers' communication with their business counterparts. Therefore, the ability of suppliers in Zimbabwe to aptly utilise IT resources to connect with their partners will likely generate a conducive environment in which business communication can flourish. In light of this view and also drawing from network theory, IT resource is expected to impact positively on a supplier's communication with its partners in Zimbabwe. Such a relationship has also been supported in prior empirical studies (Dyer & Singh 1998; Kale *et al.* 2000; Ali & Kumar 2011). Accordingly, this study posits five hypotheses. The first is that:

Hypothesis 1: There is a positive relationship between the suppliers' IT resource utilisation and their collaborative communication with business partners in Zimbabwe.

### Supplier information technology use and network governance

IT resource can be viewed as a necessary business infrastructure that facilitates networking between business partners (Kim & Mahoney 2006). By connecting to a business partner who is also connected to other supply chain partners using IT resources, a network structure is established (Paulraj *et al.* 2008). Network structure refers to inter-business governance and co-ordination that is characterised by informal social systems in contrast to the use of hierarchical authority (Jones, Hesterly & Borgatti 1997). These social systems are relational in nature and are characterised by: solidarity, mutuality, flexibility, information exchange and role integrity (Heide & John 1992; Kaufmann & Stern 1988; Macneil 1980). In this regard, IT resource plays an important role in activating and translating these relational norms into value-enhancing relational assets (Mohr, Fisher & Nevin 1996). Thus, through IT resources utilisation, network structure enables the exchange of information among supply chain partners and facilitates the development and maintenance of value-enhancing relational exchanges among supply chain partners (Dyer & Chu 2003; Poppo & Zenger 2002; Powell 1990). Similarly, in the context of this study, a supplier's IT resource utilisation is likely to facilitate linkages between business partners in a supply chain. Eventually, a network governance structure that promotes a richer communication among supply chain partners emerges (Jones *et al.* 1997; Powell 1990; Zaheer & Bell 2005). Previous studies have also supported a positive relationship between IT resource utilisation and network structure development (Paulraj *et al.* 2008). Therefore, deducing from the Network theory and empirical evidence, this study posits that:

Hypothesis 2: There is a positive relationship between the suppliers' IT resource utilisation and their network governance with business partners in Zimbabwe.

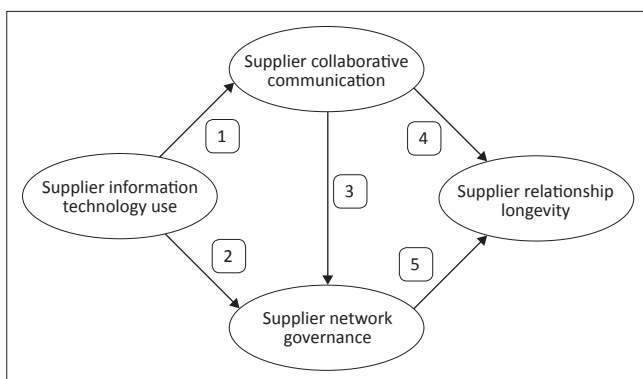


FIGURE 1: Conceptual model.



## Supplier collaborative communication and network governance

Inter-business long-term orientation has been increasingly recognised as an important factor driving business competitiveness. The reasoning is that, through a long-term relationship, the supplier will become part of a well-managed chain and will have a lasting effect on the competitiveness of the entire supply chain (Choi & Hartley 1996; Kotabe *et al.* 2003).

Hypothesis 3: There is a positive relationship between the suppliers' collaborative communication and their network governance with business partners in Zimbabwe.

## Supplier collaborative communication and relationship longevity

Higher levels of collaborative communication in organisations leads to better co-ordination (Cushman & King 1989) and effective completion of tasks (Guetzkow 1965), which positively affects the performance of alliance relationships (Mohr & Nevin 1990; Monczka *et al.* 1998). Promotions of collaborative communication enables supply chain partners to build stronger relational bonds (De Toni & Nassimbeni 1999; Kotabe *et al.* 2003; Mohr *et al.* 1996; Powell, Koput & Smith-Doerr 1996). Consequently, supply chain partners are able to focus on knowledge development and exchange and increase investment in relational competencies (Madhok & Tallman 1998; Cousins & Menguc 2008). Insofar as these relational competencies are 'socially created,' resulting from on-going collaborative communication among exchange partners (Mohr *et al.* 1996) and not easily tradable in strategic factor markets (Dierickx & Cool 1989), they may confer durable strategic advantages for the supply chain partners (Kale *et al.* 2000; Dyer & Singh 1998). Thus, collaborative communication between suppliers and their partners in the supply chain provides the strategic context necessary for fostering long-term relationships. To that extent, collaborative communication enables the exchange parties to cultivate relational norms that promote co-operation for mutual gains (Heide & John 1992; Macneil 1980). Accordingly, this study submits that, suppliers' collaborative communication can be expected to foster long-term relationship between suppliers and their partners in the supply chain. Moreover, a positive relationship between collaborative communication and long-term relationship has also been supported previously in the extant management literature (Chen & Paulraj 2004; Kotabe *et al.* 2003). Drawing from the foregoing discussion, this study therefore proposes the following hypothesis:

Hypothesis 4: There is a positive relationship between the suppliers' collaborative communication and their relationship longevity with business partners in Zimbabwe.

## Supplier network governance and relationship longevity

Supplier network structure can be an effective governance mechanism that creates co-operative bonding between suppliers and their partners in the supply chain (Dyer &

Nobeoka 2000). Consequently, as a result of such co-operative bonding, understandings and conventions involving fair play and good faith develop between suppliers and their business partners (Harland & Knight, 2001). The development of good faith between supply partners generates trust and relationship commitment, which eventually expedites long-term relationships (Kim & Mahoney 2006). Moreover, the literature indicates that the development of supplier network structures facilitates the integration of logistics activities in supply chains (Chen & Paulraj 2004) – a process that strengthens and promotes long-term relationships between suppliers and their business partners (Choi & Kim 2008). In the context of this study, it is expected that the development of suppliers' network structures will facilitate co-operative bonding, trust and relationship commitment (Chinomona & Pretorius 2011). As a result of this, long-term relationships between the suppliers and their partners is expected to develop. Accordingly, a positive linkage between the suppliers' network structure development and long-term relationship can be anticipated. Previous research has also supported a positive relationship between suppliers' network structure development and long-term relationships (Paulraj *et al.* 2008). Based on the above-mentioned discussions, the current study postulates the following hypothesis:

Hypothesis 5: There is a positive relationship between the suppliers' network governance and their relationship longevity with business partners in Zimbabwe.

## Research methodology

### Sample and data collection

The data for this research were collected from Harare, the largest city in Zimbabwe. The research-sampling frame was the Small to Medium Enterprise Association of Zimbabwe. The database of the small and medium enterprises was obtained from the Ministry of small to medium enterprise development in Zimbabwe. Students from the University of Zimbabwe were recruited to distribute and collect the questionnaires after appointments with target small businesses were made by telephone. Of the total of 180 questionnaires distributed, 162 usable questionnaires were retrieved for the final data analysis, representing a response rate of 90.0%.

### Measurement instrument and questionnaire design

Research scales were operationalised on the basis of previous work. Proper modifications were made in order to fit the current research context and purpose. 'Information technology use' measurement used a six-item scale adapted from Chen and Paulraj (2004). 'Collaborative communication' measurement used a seven-item scale, whilst 'network governance' used a four-item scale measurement, which was adopted from Paulraj *et al.* (2008). Finally, 'relationship longevity' was measured using a five-item scale, which was adapted from Ganesan (1994). All the measurement items were measured on a five-point Likert-type scale that was anchored by 1 = strongly disagree to 5 = strongly agree in order to express the degree of agreement.

## Respondent profile

Table 1 presents the profile of the participants. The profile indicates that almost close to three quarters of the participating small businesses employed less than 50 workers (73.0%), whilst more than a quarter had a workforce above 51 employees (27.0%). More than half of the participants had less than five years working experience (57.0%), more than a quarter of the participants had five to ten years working

**TABLE 1:** Sample demographic characteristics.

Demographic characteristics		Frequency	%
Gender	Male	99	61.1
	Female	63	38.9
<b>Total</b>		<b>162</b>	<b>100</b>
Age	≤ 30	72	44.4
	31–60	59	36.4
	≥ 60	31	19.2
<b>Total</b>		<b>162</b>	<b>100</b>
Marital status	Married	106	65.4
	Single	56	34.6
<b>Total</b>		<b>162</b>	<b>100</b>
Number of employees	≤ 20	63	38.9
	21–50	55	34.0
	≥ 51	44	27.1
<b>Total</b>		<b>162</b>	<b>100</b>
Participants working experience	≤ 5 years	92	56.8
	5–10 years	54	33.3
	≥ 10 years	16	9.9
<b>Total</b>		<b>162</b>	<b>100</b>
Monthly salary in US dollar	≤ US\$ 200	25	15.4
	US\$ 200–US\$ 400	91	56.2
	≥ US\$ 400	46	28.4
<b>Total</b>		<b>162</b>	<b>100</b>
Industry	Manufacturing	88	54.3
	Service	74	45.7
<b>Total</b>		<b>162</b>	<b>100</b>

experience (33.0%) and less than a quarter had more than ten years working experience (10.0%). Also, more than three quarters of the participating employees earned a monthly salary that was more than US\$200 (84.6%) and the remainder earned a salary that was less than US\$200 (15.4%). The article also indicated that the majority of the participants belonged to the manufacturing sector, which occupied 54.3%, whilst the service sector occupied the remainder.

## Data analysis

In this study, a structural equation modeling (SEM) approach, using Smart PLS statistical software (Ringle, Wende & Will 2005), was used to test the hypotheses in the conceptual research model. Smart PLS is suitable for a small sample size and does not require normal distribution of the manifest variables (Chin, 1998; Chin & Newsted 1999). Since the current study sample size was relatively small (162), Smart PLS was found to be more appropriate and befitting of the purpose. As recommended by Anderson and Gerbing (1988), a two-stage procedure to hypothesis testing using SEM was utilised in this study. Measurement model assessment was performed first by examining the convergent and discriminant validity of items and constructs respectively, before the testing of the hypothesised causal relationship between the research variables in the structural model.

## Measurement model

To ensure convergent validity, the researcher checked if items were loaded on their respective (a priori) constructs with loadings greater than 0.600, whilst discriminant validity was checked by ensuring that there were no significant inter-research variable cross-loadings (Chin 1998). As can be seen in Table 2, all items except for ITR4 and CC6,

**TABLE 2:** Accuracy analysis statistics.

Research construct	LV index value	R <sup>2</sup> value	Cronbach's $\alpha$ value	C.R. value	AVE value	Communality	Factor loading
ITR	ITR 1	3.993	0.000	0.806	0.861	0.510	0.767
	ITR 2						0.698
	ITR 3						0.575
	ITR 4						0.775
	ITR 5						0.739
	ITR 6						0.711
CC	CC 1	3.749	0.532	0.807	0.863	0.514	0.797
	CC 2						0.755
	CC 3						0.754
	CC 4						0.748
	CC 5						0.552
	CC 6						0.669
NG	NG 1	3.771	0.768	0.860	0.896	0.590	0.763
	NG 2						0.645
	NG 3						0.823
	NG 4						0.754
	NG 5						0.826
	NG 6						0.784
RL	RL 1	3.871	0.737	0.872	0.903	0.609	0.792
	RL 2						0.787
	RL 3						0.730
	RL 4						0.797
	RL 5						0.788
	RL 6						0.784

ITR, Information technology resource; CC, Collaborative communication; NG, Network governance; RL, Relationship longevity; C.R., Composite reliability; AVE, Average variance reliability; LV, Latent variable.

Note: Scores: 1 = Strongly disagree; 3 = Neutral; 5 = Strongly agree.

which approached 0.600 (0.552 and 0.575 respectively) have loadings greater than 0.600, with no cross-loadings greater than 0.850, whilst *t*-statistics derived from bootstrapping (300 re-samples) suggest that all loadings are significant at a probability value (pb) of 0.001. As such, this confirms that all the measurement items mostly converged well on their respective constructs and therefore are acceptable measures.

According to Chin (1998), research variables should have an average variance extracted (AVE) of more than 0.500 and a composite reliability of more than 0.700 (convergent validity). The inter-construct correlations should be less than the square root of the AVE (discriminant validity). As can be seen in Table 2, all constructs exceed these criteria, with AVE and composite reliability (CR) generally equal to or greater than 0.600 and 0.800 respectively, and the square root of the AVE being at least 0.710 greater than the inter-construct

correlations (Table 3). These results confirm the existence of discriminant validity of the measurements used in this study.

## Structural model

Figure 2 and Table 4 present the current study's results of the PLS analysis. The standardised path coefficients were expected to be at least 0.200 and preferably greater than 0.300 (Chin 1998). Bootstrapping (300 re-samples) was utilised to assess the reliability of each coefficient. The results provide support for all the five hypotheses. All other path coefficients were above 0.2 and significant (pb 0.001). As indicated in Figure 2 and Table 4, the path coefficients are 0.729, 0.324, 0.611, 0.226 and 0.659 for Hypothesis 1, Hypothesis 2, Hypothesis 3, Hypothesis 4 and Hypothesis 5 respectively.

Table 4 provides the *t*-statistics for the hypothesised relationships. The minimum *t*-statistic is 13.020 and therefore exceeds the recommended threshold of 2. This further confirms the statistical significance of the posited relationships and therefore all the hypotheses are supported.

Overall,  $R^2$  for logistics integration (LI) and small and medium enterprise performance (SMEP) in Figure 2, indicate that the research model explains more than 51.0% of the variance in the endogenous variables. Following the formulae provided

**TABLE 3:** Correlations between constructs.

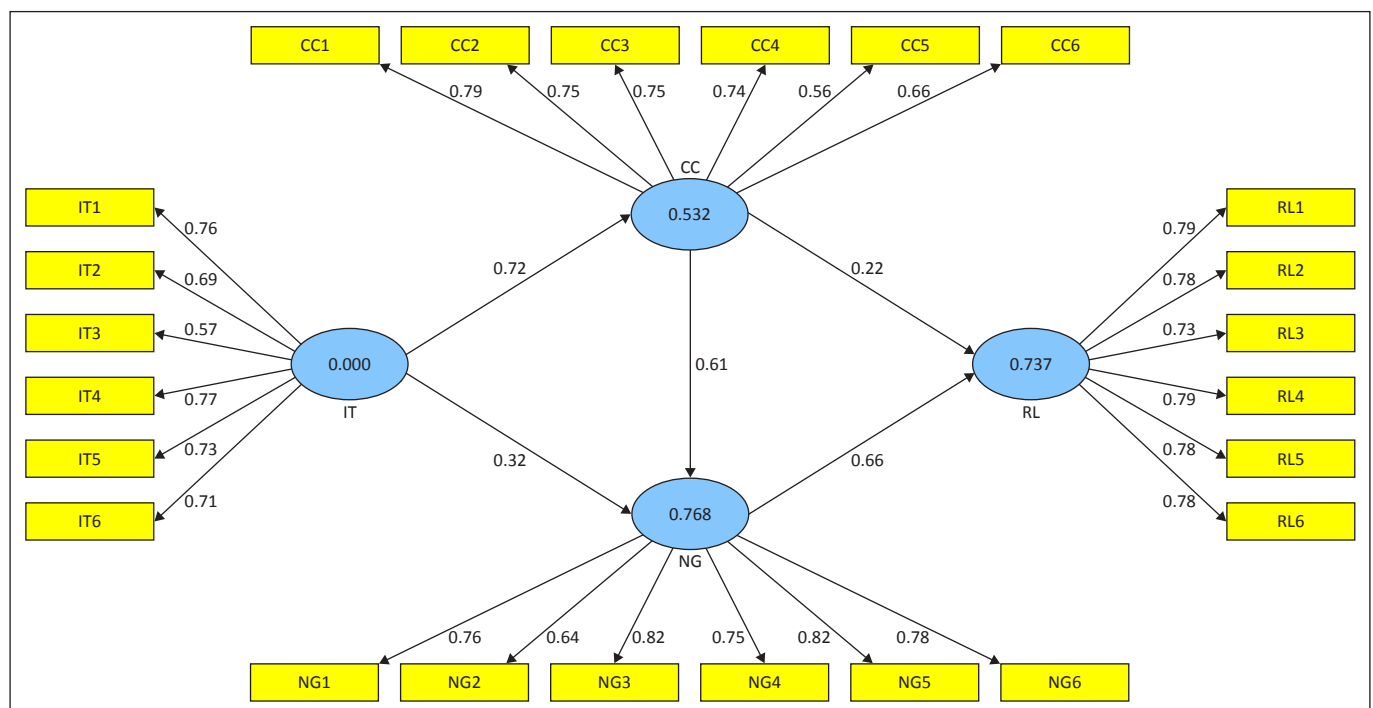
Research constructs	ITR	CC	NG	RL
Information technology resource (ITR)	1.000	-	-	-
Collaborative communication (CC)	0.629	1.000	-	-
Network governance (NG)	0.670	0.708	1.000	-
Relationship longevity (RL)	0.585	0.704	0.709	1.000

ITR, Information technology resource; CC, Collaborative communication; NG, Network governance; RL, Relationship longevity.

**TABLE 4:** Results of structural equation model analysis.

Proposed hypothesis relationship	Hypothesis (H)	Path coefficients	<i>t</i> -statistics	Rejected or supported
Information technology resource (ITR) → Collaborative communication (CC)	H1	0.729	29.081	Supported
Information technology resource (ITR) → Network governance (NG)	H2	0.324	29.336	Supported
Collaborative communication (CC) → Network governance (NG)	H3	0.611	14.388	Supported
Collaborative communication (CC) → Relationship longevity (RL)	H4	0.226	14.586	Supported
Network governance (NG) → Relationship longevity (RL)	H5	0.659	13.020	Supported

ITR, Information technology resource; CC, Collaborative communication; NG, Network governance; RL, Relationship longevity.



IT, Information technology; CC, Collaborative communication; NG, Network governance; RL, Relationship longevity

**FIGURE 2:** Measurement and structural model results.

by Tenenhaus, Vinzi, Chatelin and Lauro (2005), the global goodness-of-fit (GoF) statistic for the research model was calculated and is 0.38, which exceeds the threshold of GoF > 0.36 suggested by Wetzels, Odekerken-Schröder and Van Oppen (2009). Thus, this study concludes that the research model has a good overall fit.

## Discussion and conclusion

The purpose of this study was to investigate the fostering role of small and medium enterprise (SME) information technology use on collaborative communication, network governance and relationship longevity. In particular, five hypotheses were postulated. To test the proposed hypotheses, data were collected from SME employees in Zimbabwe. The empirical results supported all the posited research hypotheses in a significant way.

It is important to note about the study findings that the SME information technology has stronger effects on collaborative communication (0.729) than on network governance (0.324). However, network governance strongly influences relationship longevity (0.659) more than SME collaborative communication (0.226). Notably too, the relationship between collaborative communication and network governance is robust (0.611). By implication, this finding indicates that collaborative communication can have a strong influence on relationship longevity via network governance. Perhaps this could be due to the fact that collaborative communication is likely to be more effective between business partners when they are networked and that governance structures are pronounced (Lai *et al.* 2010).

## Implications of the study

The ever-increasing importance of the SME sector in Zimbabwe cannot be over-emphasised. In particular, contribution to employment generation and economic growth among others has often been cited in the empirical literature (Chinomona *et al.* 2010; Chinomona & Pretorius 2011). This article is an attempt to undertake research in an often-neglected context, but important sector of the Zimbabwean economy. Therefore, the findings of this empirical study are expected to provide fruitful implications to both practitioners and academics.

On the academic side, this article makes a significant contribution to literature by systematically exploring the impact of information technology resources on collaborative communication, network governance and business relationship longevity within the SME context. Overall, the current study findings provide tentative support to the proposition that information technology resources, collaborative communication and network governance should be recognised as significant antecedents for improved relationship longevity between suppliers and their buyers in the SME setting.

On the practitioners' side, the important influential role of information technology resources on relationship longevity

in Zimbabwe's SME sector is highlighted. This article therefore submits that SME owners and their managers can benefit from the implications of these findings. For instance, given robust relationship between network governance and relationship longevity (0.659), collaborative communication and network governance (0.611), and IT resource and collaborative communication (0.729), managers in the SME sector and SME owners ought to pay attention to both collaborative communication and network governance. Such endeavours tend to optimise the IT resources impact on their relationship longevity with their business counterparts.

The general observation and conclusion drawn from these findings is that IT use has a positive and significant influence on collaborative communication, network governance and relationship longevity in the SME context – which by and large supports some of the previous research findings in the large business environment (Holmen & Pedersen 2010; Paulraj *et al.* 2008; Chen & Paulraj 2004; Cousins, Lawson & Squire 2008; Vijayarathay 2004; Prajogo & Olhager 2012).

## Limitations and future research

Despite the usefulness of this article, the research has its limitations. First and most significantly, the present research is conducted from the perspective of SME suppliers only. Perhaps if data is collected from both the SME suppliers and their buyers, and a comparative study is done, insightful findings about the impact of IT resources on collaborative communication, network governance and relationship longevity might be revealed. Second, the current study was limited to SMEs in Zimbabwe. Subsequent research should contemplate replicating this study in other developing countries for result comparisons. Finally, further research could also investigate the effects of IT resources on business performance, as the outcome is variable in the context of the SME sector. Such researches might potentially expand the understanding of the impact of IT resources on collaborative communication, network governance, relationship longevity and eventually business performance. These suggested future avenues of study stand to immensely contribute new knowledge to the existing body of SME-management literature, a context that is often neglected by researchers in developing countries (Chinomona & Pretorius 2011; Chinomona 2012).

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### Competing interests

The author declares that he has no financial or personal relationship(s) that may have inappropriately influenced him in writing this article.

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