The Impact of Buyer-Supplier Integration on Supplier Logistics Performance in the Hospital Sector in Tanzania: The Moderation Effect of Buyer's Cross Functional Integration.

Abstract: Based on the resource based view theory (RBV), this study examines the association between buying firms' cross functional integration, buyer-supplier integration and supplier logistics performance in buyer-supplier relationships. RBV considers these two organizational dimensions of supply chain integration as strategic resources which play an important role in improving logistics performance.

This research examines the effects of both intra-firm integration and inter-firm integration on supplier logistics performance with survey data from key informants in the public medicine supply system in Mainland, Tanzania. The unit of analysis is the purchasing relationships between public health facilities and focal suppliers acting as public agents of the national Medical Stores Department (MSD).

The empirical analysis is based on data reported by 166 purchasing managers, and demonstrates that stronger buyer-supplier integration improves supplier logistics performance significantly. There is no main effect of the buying firm's cross functional integration on supplier logistics performance, but more extensive cross functional integration in the buying firms enforces the effect of buyer-supplier integration on supplier logistics performance significantly, and these findings indicate that extensive cross functional integration in the buying firms provides an administrative infrastructure that enhance the effectivity of extensive supplier-buyer integration.

1 Introduction

Tanzania, like other developing countries in Africa is vulnerable to unreliable medicine supply systems and has faced substantial medicine availability problems (JAHSR, 2006; MoHSW, 2008). The entire healthcare market is characterised by a high degree of competitiveness, leading to cost pressures that compel healthcare managers to continually seek opportunities to reduce procurement costs (Oumlil and Williams, 2010).

Although most practitioners associate medicine availability problems with the lack of financial resources, a recent drug tracking study carried out among 20 health facilities by The Euro Health Group (EHG) reported that financial resources are not the overriding problem, but rather the lack of availability of medical items due to supply system failures (EHG, 2007).

Several actions have been instituted to address the critical problem of medicine shortages in Tanzanian public health facilities, like (1) a change from a push system in order to integrate logistics systems (MoHSW, 2009), (2) an increase in health budget allocations, (3) decentralization of government activities to the local governments (Macha et al., 2011), (4) adoption of a national essential medicine list, (6) standardized treatment guidelines, and (7) implementation of a national drug policy designed to ensure medicine availability (MoHSW, 2008).

Despite such initiatives, the availability of medicines in public health facilities is still a critical problem (SIKIKA, 2011; EHG, 2007; JAHSR, 2006; MoHSW, 2008). Moreover, great differences between public health institutions in the same regions were also observed with respect to fulfilment rates and stock outs. The reasons behind such variations remain unclear, and the observed variations cannot be ignored because they may contribute to demand amplifications and impair the performance of the whole health system. This study will address this logistics performance problem by relating it to basic intra-firm and inter-firm organization issues.

The existing supply chain management and logistics literature acknowledge integration as a key attribute to performance improvements (Bowersox et al., 1999; Frohlich and Westbrook, 2001). According to the resource based view theory (RBV), integration is an organizational resource which improves performance (Dyer and Singh, 1998), and the interplay between internal and external integration is a key factor for improving the value creation in buyer-supplier relationships (Hammervoll, 2012; Lindgreen and Wynstra, 2005).

Most studies focusing on the impacts of cross functional integration and buyer-supplier integration on relationship performance have focused mainly on the direct effects on logistics performance (Ellinger et al., 2000; Stank et al., 1999), and there exist rather few research

contributions focusing on contingent factors influencing these effects (Fabbes-Costes and Jahre, 2008). Experiences from business practice indicate that most of the companies are more familiar and focused on intra-firm than inter-firm integration (Fawcett and Magnan, 2002) and the role of procurement managers engaged in supply chain integration is rather limited, and in particular for customized products (Giannakis, 2012), and there is rather limited progress made in implementing external integration in order to improve the logistics in purchasing relationships (Whipple and Rusell, 2007; Richey et al., 2010). The implication is that a firm should be more aware of the increasing requirements of supply chain integration, and create appropriate strategies for recruiting individuals who are able to enhance the firm's overall competence in this field (Heilman et al., 2011).

This study will respond to the debate on how to improve the effects of intra-firm and inter-firm integration on logistics performance (Danese et. al., 2013), and will in particular examine whether the interplay between cross functional integration in buying firms and buyer-supplier integration will improve logistics performance.

Buyer-supplier integration is considered as a unique resource that synchronises the core logistics competencies, and the capabilities of all actors to jointly achieve improved logistics service capabilities. However, the link between buyer-supplier integration and logistics performance is not straight forward. Several research contributions assert that investing more in buyer-supplier integration should enhance logistics performance (Gimenez and Ventura, 2005; Stank et al., 1999; Stank et al., 1999), while others, e.g. Das et al. (2006) are sceptical, and suggest that this effect is rather modest. The observed inconsistencies in current research indicate that there exist contingent factors that influence the association between buyer-supplier integration and logistics performance.

Several research contributions propose environmental uncertainty to represent a potential external factor that will influence the effect of buyer-supplier integration on logistics performance (Gimenez et al., 2012; Van Donk and van der Vaart, 2004; van der Vaart and Van Donk, 2006; Wong et al., 2011), and other scholars propose cross functional integration (internal integration) to provide a foundation for enhancing the effect of buyer-supplier integration on logistics performance (Carr and Kaynak, 2007; Germain and Iyer, 2006). The main implication of these suggestions is that cross functional integration complements external integration, and hence strengthen the effect of buyer-supplier integration on logistics performance. However, the research on the effect of the combined effect of internal integration and buyer-supplier integration on logistics performance has so far been incomplete in the sense that most of the studies have focused on focal firms as the unit of analysis

(Whipple and Rusell, 2007; Richey et al., 2010; van der Vaart and van Donk, 2006), and hence overlooked possible effects of cross functional and buyer-supplier integration on logistics performance in dyadic contexts.

The resource-based view theory (RBV) suggests that it is not the impact of isolated practices that matters in order to improve business performance, but rather the performance synergies from several specific organizational arrangements or practices (Das et al., 2006). This research suggests that performance gains from buyer-supplier integration are contingent on sufficient cross functional integration between the purchasing unit and other functional units within the buying firm. Accordingly, buying organizations with the ability to promote efficient combinations of internal organizational resources and external supplier integration will also experience higher supplier logistics performance than those that do not (Droge et al., 2004).

2 Literature review and development of hypotheses

According to RBV, both cross functional integration and buyer-supplier integration represent key firm resources (Ellram and Carr, 1994: Cousins and Spekman, 2003; Comb and Ketchen, 1999) and cross functional integration is considered as a rare and firm specific resource that enhances coordination capabilities and improves business performance (Galbraith, 1977; Hart, 1995).

Even if the purchasing management literature has underscored buyer-supplier integration as a strategic resource for performance improvements (Ellram and Carr, 1994: Cousins and Spekman, 2003), basic contributions from transaction cost economy (Buvik and John, 2000; Williamson, 1999) and supply chain management (Hammervoll, 2012) assert that buyer-supplier integration is the main managerial mode for improved value creation in buyer-supplier relationships because it facilitates information exchange and provides the coaching and sharing of strategic knowledge to a greater extent than classical market transactions.

2.1 Cross Functional Integration in the Buying Firms and Supplier Logistics Performance

Cross functional integration is the extent to which logistics activities (e.g. purchasing) interact with other intra-firm functional areas and internal customers (Stock et al., 1998). According to the RBV theory, cross functional integration is an organisational ability aimed at coordinating activities and cooperation between the critical functions effectively within firms (Grant, 1996).

The main focus concerns the coordination across functional areas (Stock et al., 1998) leading to discouragement of individualistic behaviour and encouragement of collective behaviour that reduces sub optimization and conflicts between intra-firm organizational units (Cohen and Levinthal, 1990; Gimenez and Ventura, 2005), and enhanced ability to meet customer requirements (Flynn et al., 2010).

Recent research contributions associate cross functional integration between departments with improved logistics performance (Chen et al., 2007; Ellegaard and Koch, 2012; Germain and Iyer, 2006) like (1) better delivery performance (Droge et al., 2004; Swink et al., 2007; Wong et al., 2011), (2) higher responsiveness (Danese et al., 2013; Droge et al., 2004), (3) improved distribution service (Ellinger et al., 2000), and (4) reduced lead times (Gimenez and Ventura, 2005).

The benefits of better cross functional integration arise due to its ability to enhance connectedness, cooperation and mutual support between functional areas (Lawrence and Lorsch, 1967), and such intra-firm integration will improve knowledge sharing (Narasimhan and Kim, 2002) and ensure more relevant and accurate information flows to the supply base (Das et al., 2006). Better cross functional integration also supports internal knowledge sharing that allows the purchasing personnel to have close and up-to-date information about the preferences of internal customers, the demand pattern for essential medicines and available inventories, so as to be able to provide more effective planning (Chen et al., 2007) and make better strategic procurement (Reck and Long, 1988).

Furthermore, improved cross functional integration will simplify operational practices (Stank et al., 2001a) such as standardized procedures and methods, and reduce the uncertainty and complexity associated to managerial operations. On the contrary, weak cross functional planning might weaken the ability to coordinate purchasing relationships due to the inability of the purchasing managers to develop proper ordering practices based on reliable demand requirements and fill rates from internal customers (Bowersox and Closs, 2000).

Moreover, supplier's inventory policy and inventory planning are based on accurate demand forecasts from the buying firms (Bowersox and Closs, 2000) in order to enable them to meet time based performance requirements, and will be strongly contingent on predictable purchasing routines in the buying firm (Fisher et al., 1997; Venkatesh et al., 1995).

Taken together, improved cross functional integration on the buyer side is strongly linked to the logistics performance of the supplier firms, and we propose the following refutable hypothesis:

H1: There is a positive association between the extent of cross functional integration in the buying firms and supplier logistics performance.

2.2 The Impact of Buyer-Supplier Integration on Supplier Logistics Performance

Buyer-supplier integration concerns the interaction aspects of value creation (Hammervoll and Toften, 2010), like governance arrangements and economic performance (Dyer and Singh, 1998), and current research asserts that superior supplier logistics performance in buyer-seller relationships can only occur when both parties work closely together (Daugherty et al., 2009), and supports the view that strong buyer-supplier integration will improve supplier logistics performance (Germain and Iyer, 2006; Gimenez and Ventura, 2005; Paulraj and Chen, 2007; Stank et al., 2001b; Chen *et al*., 2007).

Buyer-supplier integration plays several key roles in buyer-supplier relationship. First, it supports adaptations to changes through mutual adjustment (Heide and John, 1992; Wong et al., 2011), it mitigates uncertainty problems (Childerhouse and Towill, 2003; Noordewier et al., 1990), and it reassures the partners to learn and organize their business so as to improve value adding (Lindgreen et al., 2012).

Furthermore, buyer-supplier integration supports the development of inter-organisational capabilities like information visibility and flexibility (Wang and Wei, 2007), and these capabilities can be gained in close exchange relationships (Sahin and Robinson, 2002). Flexibility and information visibility across firm boundaries is associated to substantial sharing of information on real-time demand and inventory levels and is critical for planning, forecasting, and scheduling at the chain level (Inemek and Matthyssens, 2012; Kulp et al., 2004).

Stronger buyer-supplier integration also supports the safeguarding of inter-firm exchange by enforcing and ensuring that the exchange partners' obligations are fulfilled (Buvik, 2002; Dyer and Singh, 1998; Heide, 1994). Such integration also encourages suppliers to employ specific investments in logistics systems (Poppo and Zenger, 2002) in order to improve relationship performance. Based on these reasoning, we propose the following refutable hypothesis:

H2: There is a positive association between buyer-supplier integration and supplier logistics performance.

2.3 The Combined Effect Cross Functional Integration and Buyer-Supplier Integration on Supplier Logistics Performance

The interplay between cross functional integration and external integration is not straight forward. Several research contributions suggest that there is an association between internal and external integration (Carr and Kaynak, 2007; Germain and Iyer, 2006; Gimenez, 2006; Paulraj et al., 2006; Zhao et al., 2011). Other scholars, e.g. Gimenez and Ventura (2005) find that external integration is more powerful than internal integration for the purpose of improving logistics performance, and find a positive effect of external integration on logistics performance even if the extent of cross function integration is rather modest.

Furthermore, some research findings suggest that external integration enforces logistics performance only when the level of in-house, cross functional integration is substantial, and assert that internal integration provides the foundation upon which external integration develops and promotes relationship performance (Droge et al., 2004; Flynn et al., 2010; Germain and Iyer, 2006; Stank et al., 2001b).

Our research follows this research stream, but departs from current research by focusing on the interplay between upstream integration and internal integration, and with buyer-seller relationships as the unit of analysis, while the former research contributions have basically focused on the interplay between downstream integration (customer integration) and internal integration with single firms as the unit of analysis.

We expect cross functional integration to improve the effect of buyer-supplier integration on supplier logistics performance because the effectiveness of information exchange within the buying firm is a significant determinant of the accuracy and timeliness of operational information that is shared with the suppliers (Carr and Kaynak, 2007; Zhao et al., 2011). In the absence of extensive cross functional integration in the buying firm, the buyers will be limited in engaging the supplier firms in effective problem solving and logistics planning (Zhao et al., 2011). Das et al., (2006) support this argument, and find that the ability to share information between functions in the buying firm enforces the insight into the supplier's potential for improved logistics planning.

According to RBV, the ability to build up functional external linkages depends on strong functional and internal linkages. In this regard, intra-firm and inter-firm integration are embedded into each other (Dierickx and Cool, 1989), and such integration will promote shared visions (Hamel and Prahalad, 1989). Notably, our empirical setting, the health care sector, has a complex organization structure and is generally accompanied by a high degree of variability in the clinicians' demand for treatment, and the physicians' preferential treatment

methods. Hence, cross-functional integration is a necessity for the purchasing function to have accurate demand estimates, and reliable information in order to figure out and implement suitable supplier integration arrangements. Based on these arguments, we propose the following refutable hypothesis:

H3: When the extent of cross functional integration in the buying firm increases, the association between buyer-supplier integration and supplier logistics performance becomes more positively shaped.

3 Empirical Setting, Measure Development and Validation of Constructs

3.1 Empirical Setting and Data Collection

This study was carried out in the public medicine supply sector in Tanzania. The unit of analysis is the relationship between the public health facility and a focal supplier. The population included all public health facilities in Mainland of Tanzania, and a stratified random sampling method was used to sample 215 public health facilities including hospitals, health centers and dispensaries.

A questionnaire survey conducted our data collection method, and the development of items is based on relevant literature and measures from relevant studies of buyer-seller relationships. All items were measured by a seven point Likert scale and the original questionnaire was first developed in English language, later it was translated into Swahili, and finally translated back to English to check for possible language discrepancies.

Prior to the main survey, the questionnaire was reviewed by three academicians and three experts in the hospital field and then pretested in 35 public health facilities. Based on the feedback from this pilot study, the text of the questionnaire was modified to suit the research setting better. Data was collected by using purchasing managers responsible for the purchasing of essential medicines in public health facilities as key informants.

All key informants were contacted prior to the survey to ensure a good response rate, and asked to administer the completion of the answers of the questionnaires on their own. The majority of the respondents (48%) had a position as clinical officers in charge, 23% of them had professional background as pharmacists, and 20% were medical officers in charge. The average experience time as purchasing managers among the respondents was 5.90 years, and indicates satisfactory familiarity with purchasing management and procurement issues.

The completed questionnaires were collected by local representatives of the data collection group, and a total of 183 questionnaires were successfully completed in the end of the data collection period and counts for 86% of the sample.

3.2 Measure Development

The measure of *Supplier logistics performance (SUPLPERF)* consists of six items capturing how well the buying firms perceived the performance of the focal medical supplier with respect to on time delivery, order filling capacity, lead time, and accuracy in order delivery. The development of these items is based on adapted measured from several research contributions (Flynn et al., 2010; Germain and Iyer, 2006; Mentzer et al., 2001; Rodrigues et al., 2004; Stank et al., 2001a, 2001b).

Cross functional integration (BUYINT) describes the extent of intra-firm integration between the purchasing department and other user units and internal customers in the buying firms, and the items were adapted from research contribution by Ellinger (2000), Gimenez (2006), Narasimhan and Das (2001), and Pagell, 2004).

Buyer-supplier integration (SUPLINT) concerns the extent of inter-firm information exchange, joint actions and cooperation efforts taking place in the relationship between the health institution and the focal medicine supplier. The construct consists of 6 items and is based on adaptations from current research by Buvik (2002), Danese et al. (2013), Gimenes (2006), Rodrigues et al. (2004), Sander and Premius (2005) and Wong et al. (2011).

Purchasing volume (PURCHASE). We expect that parties to a high stakes exchange find it more important to organize their purchasing transactions well, and pay stronger attention to supplier logistics performance, and most discussions of inter-firm relations find the size of business-to-business trade to reflect a significant stake (e.g., Spekman, 1988). We used the natural logarithm of the annual purchasing volume provided by the focal medicine supplier to control for this effect.

Geographical location (GEO) is a dichotomy indicating whether the health institution (buyer) has a rural or urban localization. Existing literature suggests that geographical distance will influence logistics effectivity, and in particular in developing countries with relatively poor infrastructure (Nishiguchi, 1994), and this variable was included in the study to account for this possible effect.

3.3 Validation of Constructs

First, discriminant validity was assessed by explorative factor analysis of the 16 items composing the reflective scales of supplier logistics performance (SUPLPERF), cross functional integration (BUYINT) and byer-supplier integration (SUPLINT). The output matrix assigned the 16 items into three factors that explained 64% of the total variance. All factor loadings were 0.4 and above for each construct and support satisfactory internal consistency of the data (Hair et al., 2006).

Table 1 Measurement of Constructs

Scales:	Sample of items. *Response format*: 7-point Likert-type scale with end points inaccurate description and accurate description.
SUPLPERF Supplier Logistics Performance 6 items α=0.89	SUPLPERF1:We regularly experience on timely delivery of essential drugs from the MSD SUPLPERF2:We always experience consistency on the MSD order fill capacity SUPLPERF3:We regularly experience satisfactory lead time from the MSD SUPLPERF4:We always experience satisfactory lead time on the back order delivery SUPLPERF5:We always experience high accuracy on order delivery from the MSD SUPLPERF6:We always experience complete order delivery from the MSD
BUYINT Cross Functional Buyer Integration 4 items α=0.83	BUINT1:Our purchasing unit and other user units frequently share real time data on inventory levels of essential drugs in our locations BUYINT2:Our purchasing unit and other user units often work together as a team in solving supply-related problems BUYINT3: Our purchasing unit and other user units always work as a team on essential drug demand forecasting BUYINT4: Our purchasing unit and other user units regularly have periodic meetings to discuss internal operational problems associated with essential drug ordering
SUPLINT Buyer-Supplier Integration 6 items α=0.85	SUPLINT1: Our purchasing unit and the MSD always work together as a team to solve essential drug supply-related problems. SUPLINT2: Our purchasing unit and the MSD always work together in following up of our essential drug orders sent SUPLINT3: Our purchasing unit always collaborates closely with the MSD on quality control of delivered essential drugs SUPLINT4: Our purchasing unit always collaborates closely with the MSD on quality control of delivered essential drugs SUPLINT5: Our purchasing unit and the MSD have closely integrated the supply of essential drugs and other drugs in vertical programs SUPLINT6: Our purchasing unit and the MSD always hold periodic meetings to plan for our drug supply.
GEO Geographical location of health institution	Dichotomy variable 0= urban location 1= rural location
PURCHASE Annual purchasing volume	Natural logarithm of annual purchasing volume (Tanzanian Shilling) by the health institution from the focal supplier.

The items of each of the three constructs were then subjected to an examination of item to total correlations to determine whether they belong to the same construct, and all coefficients conformed solid reliability.

Bartlett's test of specificity showed χ^2 = 1293; d.f =120 (p<0.000), and the KMO statistics showed a value 0.86 and verify that the items in a particular construct belong together psychometrically (Tobias and Calson, 1969).

Confirmatory factor analysis (CFA) was then carried out by using AMOS with model fit indices showing χ^2 =155.76, d.f=101, and p<0.01. The other model fit indicators met the recommended levels (IFI = 0.96, TLI = 0.95, CFI = 0.96, and RMSEA = 0.05) and indicate satisfactory model fit and convergent validity.

All factor loadings were significant and greater than 0.5 with t-values > 2, which further demonstrate convergent validity (Droge et al., 2004), and Cronbach alpha (α) exceeded the value of 0.80 for all of the three reflective scaled constructs and demonstrates satisfactory construct reliability (confer Table 1).

4 Statistical Analysis and Empirical Findings

4.1 Regression Model and Model Fit

In order to test our research hypotheses, the following OLS-regression model was estimated:

$$SUPLPERF=b_0 + b_1GEO + b_2PURCHASE + b_3BUYINT + b_4SUPLINT + b_5SUPLINT \times BUYINT + e$$

SUPLPERF= Logistics Supplier Performance

GEO=Location of the Supplier Firm (rural/urban)

PURCHASE=Annual Purchasing Volume from the Focal Supplier

BUYINT=Cross Functional Integration in the Buying Firm

SUPLINT=Buyer-Supplier Integration

The overall goodness of fit measures of the model are satisfactory with F(5,160) = 14.58 (p<0.01) and R^2_{Adj} = 0.31 and indicate that the model provides an adequate description of our data. We mean-centered the scales of the two constructs entering the interaction term, cross sectional buyer integration BUYINT and buyer-supplier integration SUPLINT in order to handle possible collinearity problems (Jaccard et al., 1990), and the VIF-measures in Table 2 show no critical values of any variables.

A test of the significance of the two-way interaction effect (BUYINT x SUPLINT) was conducted by using the approach suggested by Jaccard and Turrisi (2003). This approach assesses the significance of interaction effects by measuring the change in R^2 when we add an interaction chain into the regression model. The explanatory power of our model increased by 0.02 when we introduced this interaction term in the regression equation, and corresponds to an F-value of 4.03 and exceeds the critical F-value of 3.82 for F(1,169) at a significance level

of p<0.05. This output figures demonstrate that the interaction term contributes significantly to the explanatory power of our model.

4.2 Test of Hypotheses

The effects of each of the variables entering interaction terms express their effect on the dependent variable when the value of the variable with which they interact is zero (Jaccard et al., 1990). H1 is related to the main effect of cross functional buyer integration on supplier logistics performance, and the regression data reveals that this association is not significant (b_3 = 0.03, t=0.25) and falsifies H1. This implies that substantial cross functional integration in the buying firm is unable to improve logistics supplier performance as long as the extent of supplier-buyer integration is low or modest.

H2 corresponds to the main effect of supplier-buyer integration on supplier logistics performance, and the regression data shows that b_4 = 0.48 and significant (t=6.43, p<0.01), and provides support to H2. This finding demonstrates that supplier-buyer integration on its own has more direct influence on supplier operations and supplier logistics performance than sole internal, administrative integration in the buying firm.

Table 2 Regression Analysis. Dependent Variable: Inter-firm Coordination

Independent variables	Unstandardized Coefficients b	t-values	Collinearity Measure: VIF
Constant, b_0	1.04	0.77	
Geographical Location, GEO, b_1	-0.33	-1.45	1.20
Annual Purchasing Volume, PURCHASE, b_2	0.31	1.73*	1.39
Cross functional buyer integration, BUYINTEG, b_3	0.03	0.25	1.03
Buyer-Supplier Integration, SUPINTEG, b_4	0.48	6.43***	1.23
BUYINTEG x SUPINTEG, b_5	0.15	2.13**	1.03
Model fit: F(5, 160) =14.58 (p<0.01), R^2= 0.31, R^2_{Adj} = 0.30			

*p<0.10, **p<0.05 and p***<0.01

H3 expresses the combined effect of cross functional buyer integration (BUINT) and buyer-supplier integration (SUPLINT) on supplier logistics integration (SUPLPERF), and the interaction effect (BUYINT x SUPPLINT) is positive and significant as predicted, and provides support to H3 (b_4 = 0.15, t=2.13, p<0.05).

This analysis was further elaborated by estimating the effect of buyer-supplier integration on supplier logistics performance for different levels of cross functional buyer integration based on (Schoonhoven, 1981):

(1) $\delta SUPLPERF/\delta SUPLINT = b_4 + b_5\, BUYINT$

When we insert the values of the coefficients from the regression output data in Table 2, we get:

(2) $\delta SUPLPERF/\delta SUPLINT = 0.48 + 0.15\, BUYINT$

Table 3 Slope Analysis

The slope of: $\delta SUPLPERF/\delta SUPLINT = 0.48 + 0.15\, BUYINT$	The level of cross functional buyer integration (BUYINT)				
	Very low Mean - 2	Low Mean – 1	Mean	High Mean + 1	Very high Mean + 2
Estimated Coefficients	0.18	0.33	0.48	0.63	0.78
t-values (level of significance)	1.21(ns)	3.48 ($p<0.01$)	6.20($p<0.01$)	5.53($p<0.01$)	4.50($p<0.01$)

In the slope analysis in Table 3 above, we calculated the coefficients and t-values for the association between buyer-supplier integration and supplier logistics performance ($\delta SUPLPERF/\delta SUPLINT$) when the values of cross functional buyer integration deviated +/- 1-2 scale units from its mean value. This association is enforced and maintains significant as the level of cross functional buyer integration (BUYINT) increases, and appears insignificant ($b = 0.18$, $t=1.21$, $p > 0.05$) when the level of BUYINT becomes 2 scale units below the mean value (very low) of cross functional buyer integration. Taken together, the analysis provides strong support to H3, and demonstrates that cross functional buyer integration is complimentary to supplier integration and enforces the effect of supplier integration on logistics performance.

Table1 4 Correlation Matrix and Descriptive Statistics

Variables	1	2	3	4	5	6	Mean	s.d
1.GEO	1.00	-0.38	-0.18	-0.09	0.14	0.08	0.59	0.49
2.SIZE		1.00	0.35	0.41	-0.01	-0.08	7.26	0.67
3.SUPLPERF			1.00	0.51	0.03	0.06	3.11	1.54
4.BUYINTEG				1.00	0.07	-0.14	0.00	1.50
5.SUPLINTEG					1.00	0.01	0.00	1.00
6.BUYINTEG x SUPLINTEG						1.00	0.11	1.44

Correlations $r > 0.15$ and $r < 0.15$ are significant at $p<0.05$ for $n=166$.

Effects of Control Variables: The geographical location of the health institutions (GEO) seems to have a slight effect on supplier logistics performance, and buying firms in rural districts perceive the level of logistics supplier performance to be lower than health institutions in urban districts (b_1 = -0.33, t= -1.45, p<0.10, one way test).

Substantial purchasing volumes (PURCHASE) imply higher stakes associated to purchasing agreements and might also imply stronger buyer power and influence on supplier performance (Buvik and Reve, 2002), and our empirical findings demonstrate that there is a positive association between annual purchasing volume and supplier logistics performance (b_2 = 0.33, t=1.73, p<0.05, one way).

5 Summary, Conclusions and Implications

5.1 Contributions and Theoretical Implications

The general objective of this study was to examine factors which influence supplier logistics performance based on a buyer perspective. The study provides a valuable theoretical contribution to the procurement management literature by combining significant factors from purchasing management literature (purchasing process and cross functional planning) with basic elements from the RBV literature and inter-organizational theory (resource complementarity, supplier integration/hybrid governance).

Logistics performance in a buyer-supplier relationship is a strategic management issue that has received considerable attention in the purchasing and supply management field. In this study, we applied RBV reasoning and purchasing management literature to develop and test the effect of cross-functional integration and supplier integration on supplier logistics performance and the interaction effect of these two factors.

Our findings demonstrate that there is a strong and positive effect of buyer-supplier integration on supplier logistics performance, and contribute to more solid, empirical verification of this effect (Claro et al., 2006). This empirical finding is also consistent with previous empirical studies by (1) Kale et al. (2009) focusing on antecedents to distribution channel performance, (2) Devaraj et al. (2007) examining the effect of supplier integration on operational performance, (3) Mentzer et al. (2001) investigating how supplier integration influenced supply chain performances, and (4) Stank et al. (2001b) focusing on antecedents to performance in supplier-customer relationships.

Our study found no main effect of cross-functional integration on supplier logistics performance and indicates that the effect of cross-functional integration is limited to the

firm's boundaries and is difficult to relate directly to supplier's behaviour and performance independent of the level of supplier integration.

Taken together, the empirical outcome of this study demonstrates that the extent of cross functional integration in the buying firm enforces the effect of buyer-supplier integration on supplier logistics performance significantly. The observed strength of this interaction effect suggests that cross-functional integration act as an administrative infrastructure that enables stronger effects of buyer-supplier integration on logistics performance in supply chain links, and this finding is consistent with other scholars asserting that firms need stronger internal integration to support external integration (Flynn et al., 2010; Droge et al., 2004; Narasimhan and Kim 2001).

5.2 Managerial Implications

Our study provides some valuable insights for purchasing managers (practitioners), medical suppliers (MSD) and policy makers on important factors which need more attention in order to revamp and enhance the performance in the essential medicine supply system.

First of all, the government should focus more on supporting the public health facilities in developing proper governance mechanisms by allocating more resources to support capacity building and training in supply management practices. One possibility is to review the MSD's operational structure, and come up with better control structures, including penalties to curb MSD opportunism and reduce ex-post transaction costs at the health facility level.

Purchasing managers in health institutions need to understand the important role of the two dimensions of supply chain integration in improving their supplier's logistics performance, and notify that cross-functional and supplier integration have both different and complimentary roles in improving supplier performance.

We suggest that governmental principals should provide more resources to support the development of an integration platform between the public health facilities and the MSD agencies in Tanzania by establishing a management information systems based on computerized information flows, and make more efforts to improve electronic data interchange (EDI) and vendor-managed inventory systems (VMI) in order to support the access to timely information between the health facilities and the suppliers (Charu, 2008; Alvarado and Kotzab, 2001; Welker et al., 2008).

The influence of geographical location on logistics performance also implies that policy makers should implement decisions which foster more robust logistics infrastructure

investments in rural districts by improving communication systems and integrated logistics system (ILS) by establishing intermediary distribution centres with exclusive focus on rural health facilities.

5.3 Limitations and Further Research

This study has some methodological and theoretical limitations. First, this study has used the buyer's vantage point to describe buyer-supplier relationships and future studies should consider collecting data from both sides of buyer-supplier relationships and test for possible perception differences.

Secondly, a cross sectional design may have limitations in terms of grasping the development of certain competencies such as cross sectional buyer integration which may require time to be materialized in improved supplier performance. Furthermore, we do not know how the sequencing of internal, cross functional integration and external buyer-supplier integration takes place or should be organized? Hence, future studies are encouraged to consider using a longitudinal design to explore this in more depth in order to grasp the dynamics and performance effects of these processes.

Furthermore, the empirical findings of this study are limited to one single industry, the health care sector with a unique public and pharmaceutical supply chain. Public organizations are highly regulated and controlled by the government, and this might limit the external validity of our study. Accordingly, further research in other empirical settings is desirable to test the external validity of our findings.

The selected antecedents to supplier performance are by no mean complete, and it would be interesting in further research to explore possible effects of other organization factors like complexity, organization structure and power-dependence structures (Buvik and Reve, 2002), and relationship factors capturing the establishment of trust and relational norms.

The examination of the antecedents and the nature of relational norms and trust is an interesting research issue (Burki and Buvik, 2008; Williamson, 1999) and concerns problems associated to possible opportunistic behaviour among employee in public medicine agencies that might represent a threat against a smooth and effective organization of the medicine supplies (Watne and Heide, 2000; Mwakibinga and Buvik, 2013).

REFERENCES:

Alvarado, U., and Kotzab, H. (2001) 'Supply Chain Management. The integration of logistics in marketing'. *Industrial Marketing Management*, Vol. 30, No. 2, pp. 183-198.

Bowersox, D.J., Closs, D.J., Keller, S.B. (2000)'How supply chain competency leads to business success', *Supply Chain Management Review*, Vol. 4, No. 4, pp. 70-78.

Bowersox, D.J., Closs, D.J. and Stank, T.P. (1999), *21st Century logistics. Making supply chain integration a reality,* Michigan State University, Council of Logistics Management.

Burki, U. and Buvik, A. (2008) 'Do relationship history and norms matter in overcoming inter-organizational difficulties in the procurement function? *International Journal of Procurement Management,* Vol. 3, No. 3, pp. 279-291.

Buvik, A., and John, G. (2000) 'When does vertical coordination improve industrial purchasing relationships? *Journal of Marketing*, Vol. 64, No. 4, pp. 52-64.

Buvik, A., and Reve, T. (2002) 'Inter-firm governance and structural power in industrial relationships: the moderating effects of bargaining power on the contractual safeguarding of specific assets. *Scandinavian Journal of Management*, Vol. 18, No. 3, pp. 261-284.

Buvik, A. (2002) 'Hybrid governance and governance performance in industrial purchasing relationships', *Scandinavian Journal of Management*, Vol. 18, No. 4, pp. 567-587.

Carr, A.S., and Kaynak, H. (2007)'Communication methods, information sharing, supplier development and performance: An empirical study of their relationships', *International Journal of Operations and Production Management,* Vol. 27, No. 4, pp. 346-370.

Charu, C. (2008)'The case of healthcare supply chain management: insight from problem-solving approaches', *International Journal of Procurement Management*, Vol. 1, No. 3, pp. 261-279.

Chen, M., Yang, T., and Li, H. (2007) 'Evaluating the supply chain performance of IT-based inter-enterprise collaboration', *Information and Management,* Vol. 44, No. 6, pp. 524-534.

Childerhouse, P., and Towill, D.R. (2003) 'Simplified material flow holds the key to supply chain integration'. *Omega*, Vol. 31, No. 1, pp. 17-27.

Claro, D., Claro, P., and Hagelaar, G. (2006) 'Coordinating collaborative joint efforts with suppliers: the effects of trust, transaction specific investment and information networks in the Dutch Flower Industry', *Supply Chain Management: An International Journal*, Vol. 11, No 3, pp. 216-224.

Cohen, W.M. and Levinthal, D.A. (1990) 'Absorptive capacity: a new perspective on learning and innovation', *Administrative Science Quarterly*, Vol. 35, No. 1, pp. 128-152.

Combs, J.G., and Ketchen, D. Jr. (1999) 'Explaining interfirm cooperation and performance: Toward a reconciliation of prediction from the resource based view and organizational economics', *Strategic Management Journal*, Vol. 20, No. 9, pp. 867-888.

Cousins, D., and Spekman, R. (2003)'Strategic supply and the management of inter- and intra-organisational relationships', *Journal Purchasing and Supply Management*, Vol. 9, No. 1, pp. 19-29.

Danese, P., Romano, P., and Formentini, M. (2013) 'The impact of supply chain integration on responsiveness: The moderating effect of using an international supplier network', *Transportation Research Part E: Logistics and Transportation Review,* Vol. 49, No. 1, pp. 125-140.

Das, A., Narasimhan, R., and Talluri, S. (2006)'Supplier integration-finding an optimal configuration', *Journal of Operations Management,* Vol. 24, No. 5, pp. 563-582-

Daugherty, P.J., Chen, H., Mattioda, D. D and Grawe, S. J. (2009)'Marketing/logistics relationship. Influence on capabilities and performance', *Journal of Business Logistics*, Vol. 30, No. 1, pp. 1-18.

Devaraj, S., Krajewski, L., and Wei, J.C. (2007)'Impact of e-business technologies on operational performance: the role of production information in the supply chain', *Journal of Operations Management,* Vol. 25, No. 6, pp. 1199-1216.

Dierickx, I., and Cool, K. (1989) 'Asset stock accumulation and sustainability of competitive advantage', *Management Science*, Vol. 35, No. 12, pp. 1504-1513-

Droge, C., Jayaram, J., Vickery, S.K. (2004)'The effects of internal versus external integration practices on time-based performance and overall firm performance', *Journal of Operations Management,* Vol. 22, No. 6, pp. 557-573.

Dyer, J. H., and Singh, H. (1998)'The relational view: cooperative strategy and sources of interorganisational competitive advantage', *Academy of Management Review,* Vol. 23, No. 4, pp. 660-679.

EHG, Euro Health Group (2007) *Tanzania drug tracking study.* Dar Es Salaam, Tanzania.

Ellegaard, C., and Koch, C. (2012)'The effects of low internal integration between purchasing and operations on suppliers' resource mobilization', *Journal of Purchasing and Supply Management,* Vol. 18, No. 3, pp. 148-158.

Ellinger, A., Daugherty, P., and Keller, S., (2000)'The relationship between marketing/logistics interdepartmental integration and performance in U.S manufacturing firms. An empirical study', *Journal of Business Logistics,* Vol 21, No. 1, pp. 1-22.

Ellram, L.M., and Carr, A. (1994)'Strategic purchasing: a history and review of the literature', *International Journal of Purchasing and Materials Management,* Vol. 30, No. 1, pp. 9-19.

Fabbes-Coste, N, and Jahre, M. (2008)'Supply chain integration and performance. a review of the evidence', *The International Journal of Logistics Management*, Vol. 19, No. 2, pp. 130-154.

Fawcett, S.E., and Magnan, G.M. (2002)'The Rhetoric and reality of supply chain integration', *International Journal of Physical Distribution and Logistics Management,* Vol. 32, No. 5, pp. 339-361.

Fisher, M.J., Hammond, W.O., and Raman, A. (1997)'Configuring a supply chain to reduce the cost of demand uncertainty', *Production and Operations Management*, Vol. 6, No. 3, pp. 211-225.

Flynn, B., Huo, B. and Zhao, X. (2010)'The impact of supply chain integration on performance: a contingency and configuration approach', *Journal of Operations Management,* Vol. 28, No. 1, pp. 58-71.

Frohlich, M.T., and Westbrook. R. (2001)'Arcs of integration: an international study of supply chain strategies', *Journal of Operations Management*, Vol. 19, No. 2, pp. 185-200.

Galbraith, J. (1977) *Organizational Design*, Addison-Wesley, Reading, MA.

Germain,R. and Iyer, K.N.S. (2006)'The interaction of internal and downstream integration and its association with performance', *Journal of Business Logistics*, Vol. 27, No. 2, pp. 29-51.

Gimenez, C., van der Vaart, T. and van Donk, D. P. (2012)'Supply chain integration and performance: the moderating effect of supply complexity', *International Journal of Operations and Production Management,* Vol. 32, No. 5, pp. 583-610.

Gimenez, C. (2006)'Logistical integration processes in the food industry', *International Journal of Physical Distribution and Logistics Management,* Vol. 36, No. 3, pp. 231-249.

Gimenez, C., and Ventura, E. (2005)'Logistics production, logistics marketing and external integration: Their impact on performance', *International Journal of Operations and Production Management,* Vol. 25, No. 1, pp. 20-38.

Giannakis, M. (2012)'The role of procurement in the management of supplier relationships', *International Journal of Procurement Management,* Vol. 5, No. 3, pp. 368-408.

Grant, R. M. (1996)'Prospering in dynamically-competitive environments: organizational capability as knowledge integration', *Organization Science*, Vol. 7, No. 4, pp. 375-387.

Hair, J. F., Black, W.C., Babin, B. J., Anderson, R.E. and Tatham, R.L. (2006) *Multivariate Data Analysis,* Pearson-Prentice Hall, New Jersey.

Hamel, G., and Prahalad, C. (1989)'Strategic intent', *Harvard Business Review*, Vol. 67, No. 3, pp. 63-76.

Hammervoll, T. (2012)'Managing interaction for learning and value creation in exchange relationships', *Journal of Business Research,* Vol. 65, No. 2, pp. 128-136.

Hammervoll, T. and Toften, K. (2010)'Value creation initiatives in buyer-supplier relationships', *European Business Review*, Vol. 22, No. 5, pp. 539-555.

Hart, S.L. (1995)'A natural resource based view of the firm', *Academy of Management Review,* Vol. 20, No. 4, pp. 986-1014.

Heide, J. B. (1994)'Interorganizational governance in marketing channels', *Journal of Marketing*, Vol. 58, No. 1, pp. 71-85.

Heide, J. B. and John, G. (1992)'Do norms matter in marketing relationships? *Journal of Marketing,* Vol. 56, No. 2, pp. 32-44.

Heilman, P., Lintukanges, K. and Pektola, S. (2011)'Competence areas and knowledge gap in supply management', *International Journal of Procurement Management*, Vol. 6, No. 6, pp. 642-660.

Inemek, A. and Matthyssens, P. (2012)'The impact of buyer-supplier relationships on supplier innovativeness: An empirical study in cross-border supply networks', *Industrial Marketing Management,* Vol. 42, No. 4, pp. 580-594.

Jaccard, J. J., Wan, C. and Turrisi, R. (1990)'The detection and interpretation of interaction effects between continuous variables in multiple regression', *Multivariate Behavioral Research,* Vol. 25, No. 4, pp. 467-478.

Jaccard, J. J. and Turissi, R. (2003) *Interaction Effects in Multiple Regression (Quantitative Applications in the Social Sciences),* Sage University Paper, SAGE Publication, Thousand Oaks.

JAHSR (2006) *Joint Annual Health Sector Review*, Dar Es Salaam, Tanzania.

Kale, R., Choi, Y., Paulraj, A. and Williamson, S. (2009)'Exploring Superior Distribution Practices in the Paper Industry', *Transportation Journal,* Vol. 48, No. 4, pp. 40-60.

Kulp, S.C., Lee, H.L. and Ofek, E. (2004)'Manufacturer benefits from Information Integration with Retail Customers', *Management Science,* Vol. 50, No. 4, pp. 431-444-

Lawrence, P.R., and Lorsch, J. W. (1986) *Organization and Environment: Managing Differentiation and Integration.* Harvard Business School Press, Boston, MA.

Lindgreen, A. and Wynstra, F. (2005)'Value in business markets: what do we know? Where are we going?' *Industrial Marketing Management*, Vol. 34, No. 7, pp.732-748.

Lindgreen, A., Hingley, M.K., Grant, D.B. and Morgan, R.E. (2012)'Value in business and industrial marketing: Past, present and future', *Industrial Marketing Management*, Vol. 41, No. 1, pp. 207-214.

Macha, J., Mushi, H. P. and Borghi, J. (2011) *Examining the links between accountability, trust and performance in health service delivery in Tanzania,* Consortium for research on equitable health systems, IFAKARA health Institute, Tanzania.

Mentzer, J.T., Flint, D.J. and Hult, T.M. (2001)'Logistics service quality as a segment-customized process', *Journal of Marketing*, Vol. 65, No. 4, pp. 82-104.

MoHSW (2008) *In-depth assessment of the medicines supplies system in Tanzania.* Ministry of Health and Social Welfare, Dar Es salaam, Tanzania.

MoHSW (2009) *Integrated logistics system manual.* Ministry of Health and Social Welfare, Dar Es Salaam, Tanzania.

Mwakibinga, F. A. and Buvik, A. (2013)'An empirical analysis of coercive means of enforcing compliance in public procurement', *Journal of Public Procurement,* Vol. 13, No. 3, pp. 245-257.

Narasimhan, R., and Das, A. (2001)'The impact of purchasing integration and practices on manufacturing performance', *Journal of Operations Management,* Vol. 19, No. 5, pp. 593-609.

Narasimhan, R. and Kim, S.W. (2002)'Effect of supply chain integration on the relationship between diversification and performance: evidence from Japanese and Korean firms', *Journal of Operations Management,* Vol. 20, No. 3, pp. 303-323.

Nishiguchi, T. (1994) *Strategic industrial sourcing. The Japanese advantage.* New York, Oxford University Press.

Noordewier, T.G., John, G.G. and Nevin. J.R. (1990)'Performance outcomes of purchasing arrangement in industrial buyer–vendor relationships', *Journal of Marketing,* Vol. 54, No. 4, pp. 80-93.

Oumlil, A. B and Williams, A. J. (2010)'Strategic alliances and organizational buying: an empirical study of the healthcare industry', *International Journal of Procurement Management,* Vol. 4, No. 6, pp. 610-626.

Pagell, M. (2004)'Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics', *Journal of Operations Management,* Vol. 22, No. (5), pp. 459-487.

Paulraj, A., and Chen, I. J. (2007)'Strategic Buyer-Supplier Relationships. Information Technology and External Logistics Integration', *Journal of Supply Chain Management*, Vol. 43, No. 2, pp. 2-14.

Poppo, L., and Zenger, T. (2002)'Do formal contracts and relational governance function as substitutes or complements?' *Strategic Management Journal*, Vol. 23, No. 8, pp. 707-725.

Reck, R., and Long, B. (1988)'Purchasing: a competitive weapon', *Journal of Purchasing and Materials Management,* Vol. 3, No. 24, pp. 2-8.

Richey, Jr. R. G., Roath, A.S., Whipple, J.M. and Fawcett, S.E. (2010)'Exploring a governance theory of supply chain management: barriers and facilitators to integration', *Journal of Business Logistics,* Vol. 31, No. 1, pp. 237-256.

Rodrigues, A., Stank, T. P. and Lynch, D. (2004)'Linking strategy, structure, process and performance in integrated logistics', *Journal of Business Logistics*, Vol. 25, No. 2, pp. 65-94.

Sahin, R., and Robinson, E. P. (2002)'Flow coordination and information sharing in supply chains: Review of implications and directions for future research', *Decision Sciences,* Vol. 33, No. 4, pp. 505-536.

Schoonhoven, C. B. (1981)'Problems with Contingency Theory: Testing Assumptions Hidden within the Language of Contingency Theory', *Administrative Science Quarterly,* Vol. 26, No. 3, pp. 349 - 377.

SIKIKA (2011) *Medicines and medical supplies availability report. Using absorbent gauze availability.* Dar Es Salaam, Tanzania.

Spekman, R. E. (1988)'Strategic Supplier Selection. Understanding Long-Term Buyer Relationships', *Business Horizons,* Vol. 31, No. 4, pp. 75-81.

Stank, T.P., Daugherty, P.J., and Autry, C. (1999)'Collaborative planning: supporting automatic replenishment programs', *Supply Chain Management*, Vol. 4, No. 2, pp. 75-85.

Stank, T.P., Keller, S.B. and Closs, D. J. (2001a)'Performance benefits of supply chain logistical integration', *Transportation Journal*, Vol. 41, No. 2/3, pp. 32-46.

Stank, T.P., Keller, S.B. and Daugherty, P.J. (2001b)'Supply chain collaboration and logistical service performance', *Journal of Business Logistics*, Vol. 22, No. 1, pp. 29-48.

Stock, G.N., Greis, N.P. and Kasarda, J.D. (1998)'Logistics strategy and structure. A conceptual framework', *International Journal of Operations and Production Management,* Vol. 18, No. 1, pp. 37-52.

Swink, M., Narasimhan, R. and Wang, C. (2007)'Managing beyond the factor walls: Effects of four types of strategic integration on manufacturing plan performance', *Journal of Operations Management,* Vol. 25, No. 1, pp. 148-164.

Tobias, S. and Carlson, J. E (1969)'Brief report: Bartlett's test of sphericity and chance findings in factor analysis', *Multivariate Behavioral Research,* Vol. 4, No. 3, pp. 375-377.

van der Vaart, J.T. and van Donk, D. P. (2006)'Buyer-focused operations as a supply chain strategy: identifying the influence of business characteristics', *International Journal of Operations and Production Management*, Vol. 111, No. 1, pp. 42-55.

van Donk, D.P. and van der Vaart, J. T. (2004)'Business conditions, shared resources and integrative practices in the supply chain', *Journal of Purchasing and Supply Management,* Vol. 10, No. 3, pp. 107-116.

Venkatesh, R. K., Ajay K. and Zaltman, G. (1995)'Influence Strategies in Buying Centers, *Journal of Marketing,* Vol. 59, No. 4, pp. 71-82.

Wang, R.T.G. and Wei, H. (2007)'Interorganizational governance value creation: coordination for information visibility and flexibility in supply chains', *Decision Sciences,* Vol. 38, No. 4, pp. 647-674.

Wathne, K. H., and Heide, J. B. (2000)'Opportunism in interfirm relationships: Forms, outcomes, and solutions', *Journal of Marketing*, Vol. 64, No. 4, pp. 36-51.

Welker, G.A., van der Vaart, T. and van Donk, D. (2008)'The influence of business conditions on supply chain information sharing mechanisms. A study among supply chain links of SMEs', *International Journal of Production Economics*, Vol. 113, No. 2, pp. 706-720.

Whipple, J. M. and Russell, D. (2007)'Building supply chain collaboration: a typology of collaborative approaches', *The International Journal of Logistics Management,* Vol. 18, No. 2, pp. 174-196.

Williamson, O.E. (1999)'Public and private bureaucracies; A transaction cost economics perspective', *The Journal of Law Economics and Organization*, Vol. 15, No. 1, pp. 306-342.

Wong, C.Y., Boonitt, S. and Wong, C.W.Y. (2011)'The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance', *Journal of Operations Management*, Vol. 29, No. 6, pp. 604-615.

Zhao, X., Huo, B., Selen, W. and Yeung, J.H. (2011)'The impact of internal integration and relationship commitment on external integration**',** *Journal of Operations Management,* Vol. 29, No. 1/2, pp. 17-32.