BUYER-SUPPLIER INTEGRATION AND LOGISTICS PERFORMANCE IN HEALTH CARE FACILITIES IN TANZANIA: THE MODERATING EFFECT OF CENTRALIZED DECISION CONTROL

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ABSTRACT

Purpose

This research concerns logistics performance in public purchasing relationships, and explores the effect of buyer-supplier integration on supplier logistics performance. The research focuses in particular on purchasing centralization in health care facilities, and examine whether centralization of purchasing decision control exercised by the health authorities will influence the effect of buyer-supplier integration on supplier logistics performances at the firm level in health care facilities.

Design/methodology/approach

This research is based on basic organization theory, inter-organizational theory, and supply chain management literature, and examines the combined effect of purchasing centralization and supplier integration on supplier logistics performance based on survey data from 164 key informants from public health institutions in Tanzania.

Findings

The analysis reveals that stronger buyer-supplier integration improves supplier logistics performance significantly, and that stronger centralization of purchasing decision control by the health authorities reduces the effect of more extensive buyer-supplier integration on supplier logistics performance at the firm level.

Research limitations/implications

Public health institutions in Tanzania are highly regulated and controlled by public authorities, and this might limit the external validity of this study. Possible effects of opportunistic behaviour among public agents might also influence the outcome of the analyses, and further research in other empirical settings and cultural settings is desirable to test the external validity of the empirical findings.

Practical implications

The local government should focus more on supporting the individual public health facilities in developing and adapting proper governance mechanisms for their supplier integration, and be aware of the advantages associated to the alignment of independent and local supplier coordination at the institutional level.

Social implications

Strong bureaucratic decision control and possible opportunistic behaviour among public agents and employee in public medicine institutions might represent a threat against a smooth and effective organization of the medicine supplies in the public sector.

Original/value

The study provides a valuable theoretical contribution to the supply chain management research. In particular, the combination of significant contributions from basic organization theory, principal-agent theory and supply chain management literature provides a broad and interesting focus on significant antecedents to supplier logistics performance.

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Keywords: Organization theory, supplier logistics performance, purchasing centralization, supplier integration, health sector logistics.

1. INTRODUCTION

Buying firms' external integration with suppliers is a central issue of operations strategy (Koufteros *et al*., 2014, Flynn *et al*., 2010). In the literature, it has been noted that, most of the companies are more comfortable with internal than external integration (Fawcett and Magnan, 2002), and a limited progress in implementing external integration has been noted, despite various efforts to encourage external integration with suppliers and customers (Richey *et al*., 2010).

The resource based view (RBV) theory holds buyer-supplier integration as a unique dyadic resource which synchronises the core logistics competencies and capabilities of all actors to jointly achieve improved logistics performance. However it has been noted that the proposed link between buyer-supplier integration and supplier logistic performance is not straight forward. While the majority of researchers asserts that investing more in buyer-supplier integration should enhance logistic performance (Gimenez and Ventura, 2005; Stank *et al.,* 1999a), others like Das *et al*., (2006) are sceptical and suggest that this effect is rather modest. The observed inconsistencies in the literature suggest that there are other factors influencing this association, and this research examines the role of purchasing centralisation as an organizational design factor that might influence the effect of buyer-supplier integration on supplier logistics performance.

The reviewed literature on organisation theory asserts that organisation structure is an important antecedent to organizational behaviour, and this argument has been supported by evidences which demonstrate that organization's ability to integrate successfully with external actors acquires strong mobilizing of organizational resources (Teixeira *et al*., 2012), and Aiken and Hage (1971) assert that substantial centralization of decision control is negatively related to smooth organizational communication which is considered a key factor for the development of buyer-supplier integration.

Despite the importance of organization structure and supplier integration, empirical evidence is missing on how these factors are related, and little work has been done in exploring the influence of organization structure on external relationships with suppliers and customers (Koufteros *et al*., 2014). The objective of this research is to introduce a research model which relates purchasing centralization and buyer-supplier integration and examines the effects of these factors on supplier logistics performance based on the organizational design literature (Koufterous *et al.,* 2014).

This paper integrates contributions from basic organization theory and supply chain management literature, and examines the combined effects of purchasing centralization and buyer-supplier integration on supplier logistics performance in buyer-supplier exchange relationships. The supplier logistics performance model (figure 1) also controls for environmental uncertainty (UNCERT), supplier's output monitoring (SUPPLMON), geographical location (GEO), and the distance between the sites of buyers and suppliers (PROX). The research model (figure 1) depicts our research hypotheses and will be elaborated further in the next section.

2. THEORETICAL FRAMEWORK, RESEARCH MODEL AND HYPOTHESES

2.1. Theoretical Contributions

This paper employed three theoretical perspectives, (1) inter-organizational theory is used to explain the motivation for buyer-supplier integration, (2) organizational design theory is applied to shed light on how purchasing centralization influence the effects of external integration initiatives in buyer-supplier relationships, and (3) the principal-agent theory will enlighten the problems of several principals influencing the decision making in public purchasing firms.

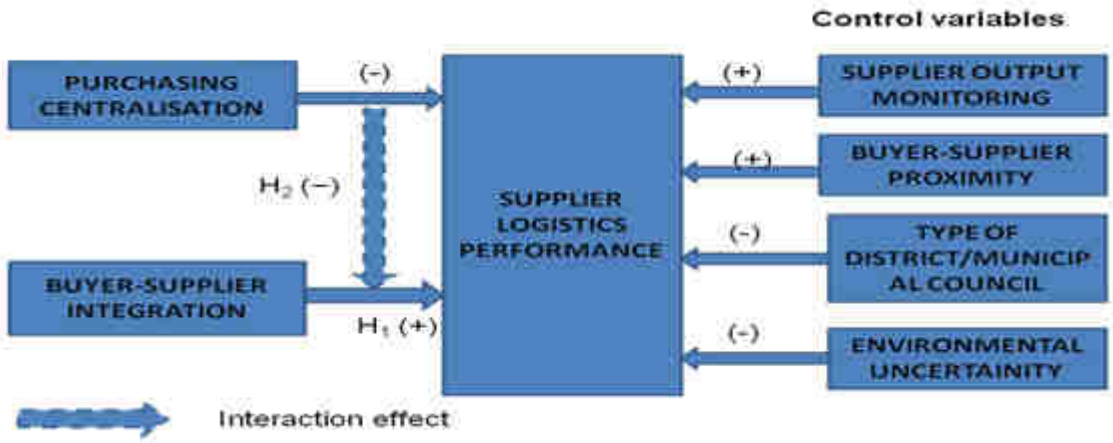


Figure 1: Research model

2.2. Centralization, Decision Control and the Problem of Several Principals in Supplier Relationships

The principal-agency theory focuses on agency problems in bureaucratic organizations, and there are in particular two key elements of the P-A theory which are relevant for public institutions, and these factors concern (1) goal conflicts and (2) information asymmetry (Waterman and Meier, 1998). In the presence of goal conflicts between multiple principals and agents, the agents tend to shirk responsibility or engage in non-sanctioned actions, while information asymmetry, on the other hand, allows agents to be less responsive to the principals and engaged in free riding behaviour.

The current study setting illustrates a situation with several principals, the buying health care facilities that put emphasis on smooth supplier integration, and the public agencies that exercise bureaucratic control over the health care institutions. Such multiple governance structures enforce the organization complexity because it is rather difficult for public bureaucracies, e.g. local government authorities (LGAs) and public health facilities to have compatible goals due to divergences in their decision focuses and responsibilities. In such a situation, the supplier becomes more uncertain about the priorities of goals and sub goals and such agency problems will also influence the

behaviour of the suppliers of health care facilities. When a supplier (agent) is caught in a web of conflicting goals exposed by bureaucracies (e.g. local government authorities) and the health facilities (the buyers), the supplier may not know the entity to respond to (Waterman and Meier, 1998), and the supplier will have an incentive to align with the principal who most closely reflects his/her basic interests.

Centralization of decision control is also associated to severe information asymmetry problems (moral hazard) because the buyer cannot closely observe the actions of the supplier. It is expected to limit the actual buyer's (principal) ability to establish close contacts with the supplier (agent) due to the presence of a central administrative block between the two actors, and hence enforce the problems associated to the implementation of effective supplier coordination and the prospects of improved supplier logistics performance (Waterman and Meier, 1998).

Based on contributions from basic organizational design theory, it is expected that centralization of buying firms' purchasing management will influence supplier logistics performance negatively. This problem concerns low collaborations between personnel (Bower, 1970) and restricted information gathering and dissemination which hinder smooth adaptability in the administration of logistics activities. It is expected that firms utilizing a centralized structure will hinder the suppliers' visibility due to the limitations of a centralized structure with respect to inter-firm interactions and smooth information flows. On the other hand, a decentralized structure has been positively associated with technical and productive efficiency due to fewer decision levels (Saltman *et al*., 2003).

Taken together, the discussion above suggest that purchasing centralization makes suppliers more unconscious of their responsibilities (Hambleton *et al.*, 1996), and reduces the suppliers' flexibility and abilities for quick responses (De varies, 2000).

2.3. Buyer-Supplier Integration and Supplier Logistics Performance

Buyer-supplier integration supports external routines and processes which collect accurate demand and supply information essential for the co-ordination of activities between buyers and suppliers (Stank *et al*., 1999a), and such coordination enables the supplier and the buyer to anticipate and coordinate inter-firm supplies more precisely (Flynn *et al*., 2010). In addition, buyer-supplier integration provides the supplier with more accurate local information about the customers for the purpose of improving the quality of the problem-solving (Flynn and Flynn, 1999).

A direct information flow between suppliers and buyers is expected to assist the suppliers in being more responsive in the performing of logistical services, such as inventory management, order processing and transportation planning. These arguments have been supported by Daugherty *et al*., (2009) who suggest that superior logistics performance can only occur when both participants work closely together, and buyer-supplier integration is the main managerial mode for value creation in a buyer-supplier relationship because it facilitates a smooth information flow by the coaching and sharing of strategic knowledge (Hammervoll, 2012).

Based on this reasoning, we propose the following refutable research hypothesis:

H1: There is a positive association between the extent of buyer-supplier integration and supplier logistics performance.

2.4. The Combined Effect of Purchasing Centralization and Buyer-Supplier Integration on Supplier Logistics Performance

The coordination of the interdependent activities and functions between buyers and suppliers requires a substantial amount of information (Galbraith, 1977). Overall, buyer-supplier integration practices facilitate co-ordination through information exchange and joint or collective actions between the buyer and the supplier. However the inherent features of purchasing centralization will reduce the effect of buyer-supplier integration on supplier logistics performance because centralization limits the quality and outcomes of inter-firm collaboration (Bower, 1970).

Furthermore, a centralized structure might reduce an open an effective information gathering and information dissemination (Jaworski and Kohli, 1993), and we will argue that purchasing centralization will limit a smooth and open interaction and collaboration between the buyer and the supplier, and will hence distort and erode the information flow.

In a public health system, the lack of decision-making authority at the health facility level will discourage proactive problem solving because the decision authority is not located and attached to the sources of local decision problems associated to local information exchange improvements or customized transportation solutions in a specific, local buyer-seller relationship.

Accordingly, we expect that some potential benefits of improved coordination and control at the micro level is likely to be suppressed or outweighed by more standardized and centralized, institutional policies (Koufteros *et al*., 2014). The current literature supports those arguments and provides some evidences showing that centralization at the micro level has negative effects on external integration (Koufteros *et al*., 2014). This study extends this reasoning, and considers centralization of decision control at the micro level to erode the potential effect of buyer-supplier integration on supplier logistics performance, and we propose the following refutable hypothesis:

H2: The association between buyer-supplier integration and supplier logistics performance decreases as the extent of the buying firm's purchasing centralization increases.

3. RESEARCH METHODOLOGY, MEASURES AND VALIDITY ASSESSMENTS

3.1. Empirical Setting and Data Collection

A survey was conducted in the public medicine supply system in Tanzania. The target population was all categories of public health facilities (hospitals, health centers and dispensaries). A stratified random sampling technique was used to select 215 public health facilities. The unit of analysis was the dyadic exchange relationship between a public health facility and its focal supplier (Medical Supplies Department, MSD).

A questionnaire was developed and used to collected data, and all measures were adapted from previous studies in inter-organizational research. The construct items were measured by a seven point Likert scale.

The original questionnaire was written in English, translated into Kiswahili, and then retranslated into English to ensure data quality.
A pilot study was then carried out in 35 public health facilities, and the obtained feedback was used to modify and develop the questionnaire wordings further.
Data was collected by using key informants from the purchasing departments of the sampled health facilities in Tanzania.
The average work experience of the key informants was 6 years, and indicates that they had sufficient experience with respect to the purchasing practices and supplier evaluations. A total of 164 questionnaires were completed and provide a response rate of 77%.

3.2. Measure Development

In the following section, we describe the basic contents of the constructs appearing in our research model. Table 1 below provides a detailed overview of the items composing our scales. All measures were adapted from previous similar studies in inter-organizational research.

Table 1: Scales and Reliability Measures

Scales:	Sample of items. *Response format*: 7-point Likert-type scale with end points inaccurate description and accurate description.
SUPPLPERF Supplier Logistic Performance 6 items α=0.90	SUPPLPERF1:We regularly experience on timely delivery of essential drugs from the MSD SUPPLPERF2:We always experience consistency on the MSD order fill capacity SUPPLPERF3:We regularly experience satisfactory lead time from the MSD SUPPLPERF4:We always experience satisfactory lead time on the back order delivery SUPPLPERF5:We always experience high accuracy on order delivery from the MSD SUPPLPERF6:We always experience complete order delivery from the MSD
SUPPLINT Buyer-supplier integration 6 items α= 0.84	SUPPLINT1: Our purchasing unit and the MSD always work together as a team to solve essential drug supply-related problems. SUPPLINT2: Our purchasing unit and the MSD always work together in following up of our essential drug orders sent SUPPLINT3: Our purchasing unit always collaborates closely with the MSD on quality control of delivered essential drugs SUPPLINT4: Our purchasing unit always collaborates closely with the MSD on quality control of delivered essential drugs SUPPLINT5: Our purchasing unit and the MSD have closely integrated the supply of essential drugs and other drugs in vertical programs SUPPLINT6: Our purchasing unit and the MSD always hold periodic meetings to plan for our drug supply.
CENTRAL Purchasing centralisation 4 items α= 0.79	CENTRAL 1: All decisions on supplementary funding for drug purchasing have to be made by the regional or district government authority (DMO/ RMO). CENTRAL 2: All decisions on purchasing from other suppliers have to be made by the regional or district government authority (DMO/ RMO) CENTRAL 3: All decisions we make on ordering must be approved by the regional or district government authority (DMO/ RMO) CENTRAL 4: All decisions on financial matters to support drug purchase must have an approval from the regional or district government authority (DMO/ RMO)
SUPPLMON Supplier's output monitoring 5 items α=0.86	SUPPLMON 1: We frequently monitor the MSD delivery timeliness SUPPLMON 2: We always monitor the MSD delivery accuracy (conformity to order) SUPPLMON 3: We frequently monitor the MSD's lead time (time between ordering and delivery) SUPPLMON 4: We always monitor the MSD's time on backorder delivery. SUPPLMON 5: We regularly monitor the MSD's stock out rate.
UNCERT Environmental uncertainity 4 items α= 0.76	UNCER1: Our essential drug demand fluctuates regularly from time to time UNCER2: Our essential drug supply fluctuates regularly from time to time UNCER3: Our essential drug prices fluctuate regularly from time to time UNCER4: Our health facility always has high variation in patients mix for a particular essential drug

Supplier Logistics Performance (SUPPLPERF). Six items compose this scale. The construct captures how well the buying firm perceives the performance of their zonal medical supplier with respect to on time delivery; order filling capacity, lead time and accuracy in order delivery.
*Purchasing Centralization (CENTRAL).*This measure describes the extent of autonomy in purchasing decision making residing with the purchasing managers and is composed by four items.
*Buyer-supplier Integration (SUPPLINT).*This construct measures the extent of inter-firm coordination and collaboration between a public health facility and its focal supplier of essential medicines, and is measured by 6 items.
Supplier's Output Monitoring (SUPPLMON). This construct describes the verification of the delivery based on product quality, delivery timelines, and order accuracy and is composed by 5 items.
Environmental Uncertainty (UNCERT). These items measure the level of unpredictability in the exchange environment of the health facility, and the scale is composed by four items.
Geographical Location (GEO). This is a dummy variable that indicates the location of the public health facility in a rural (value1.00) or urban (0) council.
*Buyer-supplier Proximity (PROX).*This is a ratio scaled variable measuring the geographical distance, assessed by the number of days spent on transportation between the public health facility and its zonal medical supplier.

3.3. Validity Assessments and Descriptive Statistics

First, an exploratory factor analysis was carried out based on Eigen values, and the analysis assigned all the items of the five constructs into five factors explaining a total of 63% of the total variance.

Table 2: Correlation Matrix, average variance extracted (AVE) and Descriptive Statistics

Contracts	1	2	3	4	5	6	7
1.CENTRAL[a]	1.00	0.02	0.03	0.001	0.02	0.01	0.001
2.SUPPLINT[a]	-0.15	1.00	0.26	0.001	0.27	0.02	0.01
3.SUPPLPERF	-0.17*	0.51*	1.00	0.002	0.25	0.04	0.001
4.UNCERT	0.03	0.03	-0.04	1.00	0.001	0.001	0.01
5.SUPPLMON	-0.13	0.52*	0.50*	0.01	1.00	0.03	0.01
6.GEO	0.11	-0.13	-0.20*	0.01	-0.16*	1.00	0.06
7.PROX	-0.03	-0.08	0.01	0.09	-0.10	0.24*	1.00
Mean	0.00	0.00	3.14	4.69	3.99	0.64	1.55
S.d	1.44	1.49	1.54	1.34	1.59	0.48	0.67
AVE	**0.50**	**0.46**	**0.59**	**0.44**	**0.56**		

Note: Values above the diagonal are the shared variances between constructs, while those below the diagonal are the inter-construct correlation estimates.
* Correlation is significant at the 0.05 level (2-tailed).
[a] mean centered variables

All factor-items loadings were above 0.4 for each of the constructs, and indicate satisfactory internal consistency (Hair *et al*., 2006), and all constructs had Cronbach alpha values above 0.7 (confer Table 1) and provide further support for satisfactory data reliability (Nunnally, 1981; Pallant, 2010).
A confirmatory factor analysis (CFA) was carried out by Amos and resulted into a satisfactory model fit indices were; χ^2 =352.2 df 262, p<0.01, IFI =0.951; TLI =0.95; CFI =0.95. All indices fell within the cutoff point of 0.9 (Byrne, 2010), and the RMSEA value (0.046) was within the 0.05-limit as proposed by Byrne (2010). All factor loadings were significant and greater than 0.5 with t-values > 2.00, and demonstrate satisfactory convergent validity for the model (Droge *et al*., 2004).
Discriminant validity was assessed by using the procedures of Fornel and Larcker (1981). The estimated average variance extracted (AVE) was greater than the percentage of variance shared by each construct (confer Table 2) except for buyer-supplier integration (SUPPLINT) and environmental uncertainty (UNCERT) which had AVE-scores below 0.5, 0.46 and 0.44 respectively. However, the discriminant validity assessments revealed that SUPPLINT and UNCERT satisfied the other criteria above and support satisfactory discriminant for the research model. The moderate AVE-values may be explained by the fact that this is the first time the variables are tested in a health care setting.

4. DATA ANALYSIS AND EMPIRICAL FINDINGS

4.1. Regression Analysis and Model Fit

In this paper a moderated multiple regression(MMR) analysis was used to estimate the model because it is superior to Structural equation modelling (SEM) when measures' reliabilities are high and the sample size is small (Jaccard and Wan, 1996). In addition, this paper used continuous variables, and hence MMR explains more variance than a sub-group analysis in SEM (Aiken and West, 1991; Cohen and Cohen, 1983; Jaccard *et al*., 1990).

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

$$SUPPLPERF=b_0 + b_1CENTRAL + b_2SUPPLINT + b_3SUPPLMON + b_4 UNCERT + b_5GEO + b_6 PROX + b_7SUPPLINT \times CENTRAL \times SUPPLINT + e$$

The model (confer Table 3) demonstrates satisfactory goodness of fit with F (7,156) = 13.56, p<0.01), R^2_{Adj} = 0.35, and shows that the model provides an adequate description of our data. All constructs (SUPPLINT and CENTRAL) entering the interaction term were mean-centered in order to handle possible collinearity problems (Jaccard and Turrisi, 2003), and the moderate VIF-measures in Table 3 show no signs of critical multi-collinearity problems for any constructs.
By using the approach suggested by Jaccard and Turrisi (2003), a test of the significance of the two-way interaction effect (CENTRAL x SUPPLINT) was carried out. This test assesses the significance of an interaction effect by measuring the change in R^2 when the interaction term is added to the regression model. The results demonstrated that when the interaction term (CENTRALxSUPPLINT) was introduced into the regression model, the model's explanatory power increased by 0.02 (2%). This

corresponds to an F-value of 4.55 and exceeds the critical F-value of 3.84 for F (1,156) at a significance level of $p<0.05$, and demonstrates that the interaction term contributes significantly to the explanatory power of our model.

Table 3: Regression Analysis: Dependent Variable: Supplier Logistics Performance

	Unstandardized Coefficients (b)	t values	Collinearity Statistics	
			Tolerance	VIF
(Constant)	b_0 =2.238	4.301***		
CENTRAL[a]	b_1 =-0.03	-.46	.911	1.098
SUPPLINT[a]	b_2 =0.33	4.28***	.715	1.399
SUPPLMON	b_3 =0.30	4.18***	.714	1.401
UNCERT	b_4 =-0.10	-1.39*	.945	1.058
GEO	b_5 =-0.42	-1.99**	.913	1.095
PROX	b_6 =0.27	1.79*	.920	1.087
CENTRALxSUPPLINT	b_7 =-0.10	-2.13**	.901	1.109
Model fit: F(7, 156) =13.566 ($p<0.01$); R^2= 0.38, R^2_{Adj} = 0.35				

*p<0.10, **p<0.05 and p***<0.01 a = mean centered variables

4.2. Empirical Findings

According to Jaccard and Turissi, (2003), the main 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. H1 corresponds to the main effect of buyer-supplier integration on supplier logistic performance when the level of centralization (CENTRAL) is zero. This corresponds to the mean level of centralization as the variables entering the interaction term were mean-centered. The regression output supports H1 (b_2 = 0.33; t = 4.28, $p<0.01$), and the findings demonstrate that supplier-buyer integration on its own has a direct influence on supplier logistics performance.

H_2 expresses the combined effect of centralization of purchasing decision control in buying firms (CENTRAL) and buyer-supplier integration (SUPPLINT) on supplier logistic performance (SUPPLPERF). The regression results support H_2 in the sense that the interaction effect (CENTRAL x SUPPLINT) is negative and significant (b_7 = -0.10, t =-2.132, $p<0.05$).

An elaboration of this interaction effect was carried out by estimating the effects of buyer-supplier integration on supplier logistic performance at different levels of purchasing centralization as recommended by Aiken and West (1991) and Schoonhoven (1981)[1].

(1) $\delta SUPPLPERF/\delta SUPPLINT = b_2 + b_7 CENTRAL$

[1] Estimated effects of buyer-supplier integration on supplier logistics performance at different levels of purchasing centralization (+/-2 scale units, s.u). Recall that CENTRAL and SUPPLINT are mean-centered.

By inserting the data from the regression outputs, we get:

(2)δSUPPLPERF/δSUPPLINT = 0.33 -0.10*CENTRAL

The analysis below demonstrates that the effect of buyer-supplier integration on supplier logistics performance was significantly weakened as the extent of centralization of the decision control in the buying firm increased:

Value of centralization (CENTRAL):	Low (-2 s.u)	Mean	High (+2 s.u)
δ SUPLPERF/ δSUPPLINT:	0.53	0.33	0.13
Significance: t-values	4.31	4.30	1.06

The figures in the table above demonstrate that at low and medium levels of centralization (CENTRAL), the effect of supplier integration (SUPPLINT) on supplier logistics performance (SUPPLPERF) is significant and high (the slope is 0.53, $p<0.01$ and 0.33, $p<0.01$ for these levels). This effect vanishes when centralization increases to a "high" level where the slope is 0.13 ($p>0.10$), and demonstrates how substantial centralization of decision control erodes the effect of supplier integration on supplier logistics performance.

4.3. The Effects of Control Variables

The geographical location of the health facility (GEO) has a significant and negative effect on supplier logistics performance ($b_5 = -0.42$, $t = -1.99$, $p<0.05$), and this implies that public health facilities in rural district councils experience lower supplier logistics performance than those in urban councils.

Supplier output monitoring (SUPPLMON) has a strong positive effect on supplier logistics performance ($b_3 = 0.30$, $t = 4.18$, $p<0.01$). This finding is in line with basic principal-agent reasoning, and demonstrates that the more the health facilities enforce their monitoring verification of their suppliers, the higher is the supplier logistics performance.

Environmental uncertainty (UNCERT) is negatively associated to logistics performance ($b_4 = -0.10$, $t = -1.39$, $p>0.10$), but the association is not significant. Finally, the empirical findings also demonstrate that the distance between the public health facilities and their zonal supplier (PROX) has a slight negative effect on supplier logistics performance ($b_6 = -0.27$, $t = -1.79$, $p<0.10$). This finding indicates that those health facilities residing far away from their focal supplier experience lower supplier logistics performance than closer ones. This might concern practical problems associated to the implementation of activities aiming at improving logistics activities when the geographical distance between buyers and suppliers becomes large.

5. DISCUSION, IMPLICATIONS AND FUTURE RESEARCH

The main objective of this paper was to examine the combined effect of purchasing centralization and buyer-supplier integration on supplier logistics performance. The empirical findings show that substantial centralization of purchasing decisions in public

institutions weakens the effects of buyer-supplier integration on supplier logistics performance. This supports previous scholars (Koufterous *et al*., 2014) who assert that there is a negative association between purchasing centralization and customer integration, indicating that extensive supplier integration should not be paired with substantial centralization of buying firms' decision control. Similarly, others scholars like Aiken and Hage (1971) and Galbraith (1974) argue that substantial centralization of decision control erodes organization communications and information flows and the buying firms' abilities to implement smooth and effective supplier integration.

These arguments are strongly relevant in studies of buyer-supplier relationships because substantial centralization of decision control at the firm level seems to impair buyer-supplier interactions and collaborations which are key factors in improving the logistical operations at the supplier side.

Most of the daily inter-organizational contact points in business operations reside at lower organizational levels and line managers who are local experts on purchasing requirements, and hence they are in a better position to mediate relevant information and demands to suppliers in order to improve logistics activities. If they are denied such an autonomy option, the information gaps between the two actors will be enforced with successive reduction of the potentials for improved supplier's performance.

The findings of this study provide some evidence for a strong and positive effect of buyer supplier integration on supplier logistics performance and support previous research contributions by Devaraj *et al*., (2007) who examined the effect of supplier integration on operational performance, and demonstrated that supplier integration is a key factor for improving supplier logistics performance. However, our study also contradicts with other scholars like Swink *et al*., (2007) in the sense that our study did not observe any main effect of purchasing centralization on supplier logistics performance.

Theoretically, this research provides important knowledge to the administration elements of the supply chain management literature, and extends Vora's (1992) arguments concerning the fruitfulness of integrating constructs and reasoning from basic organizational theory and other fields of inter-organizational theory into supply chain management research. The organization design theory has a relatively long and strong tenure in management research even if its research applications in recent years has somewhat waned (Koufterous *et al.,* 2014). This paper supports (Koufterous *et al.,* (2014) who claims that there is still substantial values and perspectives in organizational design theory that contribute to the existing debate on the effects of supply chain integration on logistics performance (Fabbes-Costes and Jahre, 2008),

For managers and policy makers, our findings demonstrate the importance of looking into the interplay of several organizational factors based on an organizational design approach in the search for improved logistics performance in supplier relationships. The reason for this is that the marginal effects of logistics decisions and activities might be contingent on both intra-firm organizational capacities and motivation, this article has advocated the need to decentralize tactical and operational decision making to operations managers at the firm level in order to improve supplier logistics operations and logistics performance.

This study is based on a cross-sectional survey design with data collected only from the buyer's side. However, relational variables such as buyer-supplier integration may require time to realize their potential effects, and therefore future studies should consider a longitudinal approach based on data from both sides of business relationships in order to explore this further.

Furthermore, public health institutions in Tanzania are highly regulated and controlled by public authorities, and this might limit the external validity of this study. Possible effects of opportunistic behaviour among public agents might also influence the outcome of the analysis, and further research in other organizational settings and cultural settings is desirable to test the validity of the empirical findings further.
This study used only one dimension of organisation structure "centralisation", and it is desirable in future research to incorporate other organizational dimensions like formalisation and standardisation when exploring antecedents to supplier logistics performance.

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