Alliance Structural Design and its Influence on Competitive Advantage in Strategic Collaborations between Universities and Teaching Hospitals in Kenya

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Cite: Sesi, P., & Ndegwa, J. (2022). Alliance Structural Design and its Influence on Competitive Advantage in Strategic Collaborations between Universities and Teaching Hospitals in Kenya. *The University Journal, 5*(1), 13-34.

Abstract

Kenya is one of the Developing countries that are yet to attain universal healthcare goals. It targets and envisions collaborations in healthcare as being critical to the realization of the universal health goals. The general objective of the study was therefore toestablish the influence of the alliance structural design on strategic collaboration competitive advantage among universities and teaching hospitals in Kenya. This study adopted a positivist philosophy and a descriptive cross sectional research design. The study population comprised 10 universities and 10 teaching hospitals as approved, by the Kenya Medical Practitioners and Dentists Council, respectively. The census technique was deployed to make use of all the elements in the population with primary data collected by use of a structured questionnaire, while secondary data was collected using a document review guide. Frequencies, measures of central tendency and dispersal were used in descriptive statistical analysis while correlations, cross tabulations and ordinal logistic regression were used for inferential statistical analysis. Ordinal logistic regression helped determine the significance of relationships between the predictor and outcome variables. The study established that the alliance structurewas significant for collaboration competitive advantage. Competitive advantage was operationalized using financial outcomes and learning and growth. Alliance structural design was a significant predictor of the financial outcome of universities ($\beta = 1.513, p < 0.05$), teaching hospitals ($\beta = 1.518, p < 0.05$) and in combination ($\beta = 1.520, p < 0.05$). Alliance structural design was also a significant predictor of learning and growth in universities ($\beta = 1.594, p < 0.05$), teaching hospitals ($\beta = 1.231, p < 0.05$) and combined ($\beta = 1.371, p < 0.05$).

Keywords: Alliance Structure, Competitive Advantage, Strategic Collaboration, Universities, Teaching Hospitals

Introduction

Strategic collaborations enable firms exploit and create new markets, increase and consolidate market positions while at the same time, adjust to and configure unstable environments through radical transformation of value chains and business models (Spieth et al., 2021). These kind of collaborations are critical in managing risk as alliancing firms spread risks across the alliance network effectively facilitating innovative and competitive aggression according to Das and Rahman (2010). Collaborations may manifest in all functional divisions within firms on one end of a continuum, or limited to specific value creating activities in a value chain on the other end. Despite the importance of strategic collaborations in realizing competitive advantage, especially as a viable alternative to mergers and acquisitions, according to Hitt, Ireland and

Hoskisson (2017) point out that strategic collaborations are fraught with risk of failure arising out of the intricacy and difficulty in appropriately managing and developing alliances, effectively creating a strategic alliance paradox, where success and failure in collaborations manifest with similar magnitude (Day-Duro et al., 2020; George et al., 2016; Koschmann et al., 2012; Mamédio et al., 2019).

Organizational structure makes the inner workings of an organization explicit and gains prominence as an antecedent to collaborative success out of its twain relationship with strategy (Albers et al., 2016; Mintzberg et al., 1999). Despite the universal acceptance of the centrality of strategic alliances to competitive advantage, collaborations still experience very high failure rates and weak attainment of envisioned goals (Gulati et al., 2012; Li et al., 2017; Prashant & Harbir, 2009). The failure rate in strategic alliances is mainly attributed to the multiplexity and risks associated with collaborative ventures that are exacerbated by weak coordination structures and systems. Structural coordination is critical for the opportunity sensing function within a strategic alliance, regardless of the level of alignment of strategic intent. Amalgamated resources would still need to be structurally coordinated and configured for competitive advantage and alliance success by extension (Mamédio et al., 2019). The structural coordination function in the alliance gives prominence to the structural interface and intraface and the levels of specialization, formalization and centralization of the structural design (Albers et al., 2016; Gulati et al., 2012).

Strategic collaborations between universities and healthcare institutions have gained traction as a source of competitive advantage, specifically in the resolution of systemic challenges in healthcare that generally cut across sectors (El-Jardali et al., 2018). Healthcare as a context is a complex realm characterized by critical and divergent strategic goals with a multiplicity of actors and stakeholders all entwined in a delicate power matrix often through strategic alliances (Croker et al., 2016). Collaborations also provide universities opportunities for attaining a competitive edge in a turbulent higher education environment that is highly competitive and experiencing a constant lowering of entry barriers. Competitive advantage arises mainly out of the expansion of the alliancing firm’s resource base as a necessary condition made sufficient by the optimal fit of the resources, as deployed in an efficient well configured value chain. Competitive advantage also results from the development of competencies and dynamic capabilities arising out of the strategic interaction and the exploitation of synergies within the alliance (Croker et al., 2016; Day-Duro et al., 2020; Denis et al., 2001; Panico, 2017).

Health sector players in Kenya, including teaching hospitals, are adopting strategic collaborations through the application of networked relationship organizational designs effectively transitioning from the traditional hierarchical mono organization structures. Strategic alliances by nature are characterized by complex organizational designs arising out of shared authority, dual structures and shared leadership. Specific to teaching hospitals and universities, the power matrix gets complicated by the professionals involved and other government and quasi government agencies. Healthcare goals can best be realized through co-created management capability and models of care and only collaboration can create competitive advantage impossible to attain and replicate by use of conventional structures and systems. Alliances in healthcare, especially with universities, are emerging and increasing in significance with Kenya encompassing such collaborative efforts in The Health Act (2017) and subsequent strategic plans (Denis et al., 2001; Government of Kenya, 2017; Martin, McNicol, & Chew, 2013; Mervyn, Amoo, & Malby, 2019; Ministry of Health, 2014; 2017).

The Problem

Strategic alliances are critical for the attainment of competitive advantage in healthcare (Croker et al., 2016; Day-Duro et al., 2020).The shortcomings of strategic collaborations between universities and teaching hospitals in Kenya are of concern according to Health Committee Report (2019). Collaborations between universities and teaching hospitals are critical to the attaining of competitive advantage in healthcare and higher education, achieving the sustainable development goals and fulfilling regional and national agenda (Ministry of Health, 2014; Ramutsindela & Mickler, 2020; WHO, 2014). Cross sector collaborations, though most significant in solving societal issues, are also the most difficult to execute according to Koschmann et al. (2012) and Al-Tabbaa et al. (2019). Despite the criticality of cross sector strategic collaborations in healthcare, a lot still needs to be done in examining alliance strategy at the institutional level and the central role of the university in the collaboration (El-Jardali et al., 2018; He et al., 2020). Studies on collaborative engagements have centered mainly on the formation and justification for alliances, leaving room for improvement on the antecedents of effective collaboration (Albers et al., 2016; Mascarenhas et al., 2018; Prashant & Harbir, 2009).

Objective

To establish the influence of the collaborative structural design on strategic collaboration competitive advantage among universities and teaching hospitals in Kenya.

Hypothesis

H_o: Alliance structural design does not significantly influence collaborative competitive advantage.

Literature Review

The alliance structural design has a positive influence on alliance performance (Albers et al., 2016). In a study on the antecedents of alliance performance, reviewing the effect of culture alignment between alliancing partners and organizational structural design and how they facilitate alliance performance as mediated by relational mechanisms, established a positive relationship (Lavie et al., 2012). A study of four hundred and twenty alliances in technology using field interviews, returned a response rate of 44% and analyzed the results using factor analysis and logistic regression. The study further established that congruence in alliancing partner organizational routines was critical for performance. The nurture of trust, commitment and embeddedness which are critical for alliance performance, were also reliant on the congruence of organizational routines. The study is critical to strategic alliance literature as it provides a wholesome review on the importance of the alliance structural design.

In a study by Bos, Faems and Noseleit (2017) on the distribution of alliances within a multinational organization's internal structure and its effect on the alliance's focal firm performance, the study established that the higher the number of alliances embedded within a focal firm's internal structure, the higher its effect on the focal firm's performance. This relationship is however negatively moderated by the number of alliances concentrated within a geographic unit. The study sampled thirtytwo large and researchintensive pharmaceutical multinationals and analyzed collected data using ordinary least squares regression. The major contribution of this study was to move away from viewing large companies as structurally monolithic and impossible to disaggregate and by anchoring the study on the knowledge-based view theory that seeks to understand the learning effect out of collaborations. Knowledge and its assimilation is continually dynamic in nature, requiring constant reconfigurations, therefore, the study would have also been anchored on the dynamic capabilities theory as a supplement to the knowledge based-view theory according to He et al. (2020).

Zheng and Zhao (2013) examined the effect of alliance network structure on innovation capability, which is a contributory factor for competitive advantage. Alliance data from ten high technology industries in China was collected and analyzed using negative binomial regression. The study findings suggested that organizations embedded in alliance networks with an expansive span of control have a greater innovation output for competitive advantage and that the alliance network as a facilitation for knowledge transfer, erodes over time. The erosion of knowledge synthesis over time is in contrast with Albers et al. (2016) and Wang et al. (2020) and as they indicate a positive effect on exploratory and exploitative learning. Li, Lin and Lyu (2022) findings were also in contrast and the difference in findings could be attributed to the omission of trust as a moderating variable since it has a consequence on learning in an alliance according to Inkpen and Tsang (2005).

Methodology

Data analysis was undertaken by use of varied statistical techniques suited to ordered categorical variables. Nonparametric tests, especially the Mann-Whitney U and the chi-squaretests were used. These statistical approaches notwithstanding, the main technique that was used to test the hypotheses for this study was ordinal logistic regression analysis.

Results

Test of Difference in Alliance Structural Design between Primary and Secondary data

The authors perform the Mann-Whitney U test to determine whether there was any difference between the ratings by respondents regarding alliance structure and the secondary data collected on the variable. The outcomes are enumerated in Table 1.

Table 1: Test of Difference in Alliance Structural Design between Primary and Secondary Data

Variable	Data	N	Mean Rank	Sum of Ranks
Alliance Structure	Primary	115	63.27	7276.00
	Secondary	10	59.90	599.00
	Total	125		
Test Statistics				**Alliance Structural Design**
Mann-Whitney U				544.000
Z				-.296
Asymp. Sig. (2-tailed)				.767

The findings provided in Table 1 indicate that the mean rank of alliance structural design from the secondary data (59.90) was higher than the mean rank from the primary data (63.27). The results of the Mann-Whitney U test, however, indicated that this difference was not statistically significant ($U = 544$, $p = 0.767$). Therefore, these findings indicate that the ratings of alliance structural design of the institutions in strategic collaborations were not different from the ratings derived after the document review.

Test of Association between Alliance Structural Design and Strategic Collaboration Competitive Advantage

This study applied chi-square tests to assess the association between alliance structural design and strategic collaboration competitive advantage. The mode was applied as the measure of central tendency to derive a single statistic from the different measures of alliance structural design. The findings of the cross tabulation, chi-square tests and symmetric measures for the association between alliance structural design and financial outcome are provided in Table 2.

Table 2: Association between Alliance Structural Design and Financial Outcome

			Financial Outcome					Total
			No extent	Little extent	Moderate extent	Good extent	Very good extent	
Alliance Structural Design	No extent	Count	0	3	2	0	0	5
		Expected Count	.0	.5	1.4	1.8	1.3	5.0
	Little extent	Count	1	5	9	0	2	17
		Expected Count	.1	1.6	4.6	6.1	4.5	17.0
	Moderate extent	Count	0	3	14	17	5	39
		Expected Count	.3	3.8	10.6	14.0	10.3	39.0
	Good extent	Count	0	0	5	20	11	36
		Expected Count	.3	3.5	9.8	12.9	9.5	36.0
	Very good extent	Count	0	0	1	4	12	17
		Expected Count	.1	1.6	4.6	6.1	4.5	17.0
Total		Count	1	11	31	41	30	114
		Expected Count	1.0	11.0	31.0	41.0	30.0	114.0

Chi-Square Tests	**Value**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	73.114	16	<.001
Likelihood Ratio	73.179	16	<.001
Linear-by-Linear Association	45.648	1	<.001

Symmetric Measures		**Value**	**Approximate Significance**
Nominal by Nominal	Phi	.801	<.001
	Cramer's V	.600	<.001

The findings of the cross tabulation in Table 2 indicate that the observed values in relation to expected values are gradually increasing towards the very great extent ranking. The chi square statistics ($\chi^2 = 73.114$, $p < 0.05$) indicate that there is a significant association between alliance structural design and financial outcome. The Cramer's V statistics ($CV = 0.6$, $p < 0.05$) show a significant moderate and positive association between alliance structural design and financial outcome for strategic collaborations.

The study also applied chi-square tests to assess the association between alliance structural design and learning and growth from strategic collaborations. The findings of the cross tabulation, chi-square tests and symmetric measures for the association between alliance structural design and learning and growth are provided in Table 3.

Table 3: Association between Alliance Structural Design and Learning and Growth

			Learning and growth					Total
			No extent	Little extent	Moderate extent	Good extent	Very good extent	
Alliance Structural Design	No extent	Count	1	2	2	0	0	5
		Expected Count	.1	.4	1.0	1.9	1.7	5.0
	Little extent	Count	0	3	7	5	2	17
		Expected Count	.3	1.2	3.3	6.6	5.7	17.0
	Moderate extent	Count	1	2	10	18	8	39
		Expected Count	.7	2.7	7.5	15.1	13.0	39.0
	Good extent	Count	0	1	3	19	13	36
		Expected Count	.6	2.5	6.9	13.9	12.0	36.0
	Very good extent	Count	0	0	0	2	15	17
		Expected Count	.3	1.2	3.3	6.6	5.7	17.0
Total		Count	2	8	22	44	38	114
		Expected Count	2.0	8.0	22.0	44.0	38.0	114.0

Chi-Square Tests	**Value**	**Df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	64.670	16	<.001
Likelihood Ratio	59.393	16	<.001
Linear-by-Linear Association	39.609	1	<.001
Symmetric Measures	**Value**		**Approximate Significance**
Nominal by Nominal Phi	.753		<.001
Cramer's V	.577		<.001

The findings of the cross tabulation in Table 3 indicate that the observed values in relation to expected values are gradually increasing towards the very great extent ranking for both alliance structural design and learning and growth variables. The chi square statistics ($\chi^2 = 64.67$, $p < 0.05$) indicate that there is a significant association between alliance structural design and learning and growth. The Cramer's V statistics ($CV = 0.577$, $p < 0.05$) show a significant moderate and positive association between alliance structural design and learning and growth from strategic collaborations.

Preliminary Tests of Ordinal Logistic Regression Assumptions

The influence of alliance structural design on strategic collaboration competitive advantage among universities and teaching hospitals in Kenya was investigated using an ordinal logistic regression model. This model was appropriate for the study because the dependent variable (financial outcome and learning and growth) was measured on an ordinal scale of 1–5 (where 1 is to no extent, 2 is to a little extent, 3 is to a moderate extent, 4 is to a good extent and 5 is to a very great extent). Before fitting the ordinal logistic regression, the authors conducted preliminary tests to determine whether the four assumptions of the ordinal logistic regression were met. The four assumptions are an ordinal dependent variable, one or more ordinal, continuous, or categorical independent variables, no multicollinearity and the assumption of proportional odds.

The first assumption was met since the dependent variable was on an ordinal scale. The second assumption was also met since only one independent variable (alliance structural design) was measured using an ordinal scale. Since there were many statements measuring alliance structural design, the mode was computed to measure the alliance structural design used in the model. The multicollinearity assumption did not apply in this case since there was only one independent variable. The proportional odds supposition, commonly referred to as the parallel lines assumption, requires that at every cumulative split, the predictor variable adopts a uniform effect on the ordered outcome variable. The fitted location model was compared to a model with variable location parameters using a -2-log likelihood ratio test. The null hypothesis of this investigation posits that the slope coefficients of the predictor variables are uniform across all the groupings of the outcome variable. The results are shown in Table 4.

Table 4: Test of Proportional Odds for the Model of Alliance Structural Design against Strategic Collaboration Competitive Advantage

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	43.791			
General	43.066	.724	3	.867

The null hypothesis of proportionate odds was accepted ($\chi^2 = 0.724$, p = 0.867), according to the results presented in Table 4. These findings suggest that alliance structural design variable had similar influence or slope coefficients across all the levels of the dependent variable. Since all the assumptions of ordinal logistic regression model were met, the following section provides the results of the model of strategic collaboration competitive advantage (financial outcome and learning and growth) against the alliance structural design.

Generalized Ordinal Logistic Regression Model for Strategic Collaboration Competitive Advantage Against Alliance Structural Design

Using the ordered logistic technique, the researcher fitted three proportional odds models for universities, teaching hospitals and a combination of the two institutions. The first model fitted the alliance structural design on strategic collaboration of universities. However, in the case of universities, two models were fitted since strategic collaboration competitive advantage was measured using financial outcome and learning and growth. This section provides the results of the R-squared values, the model fitness test and parameter estimates for the alliance structural design and financial outcome model for universities. The R-squared findings are shown first in Table 5.

Table 5: R-Squared for the Model of Alliance Structural Design on Financial Outcome of Universities

Cox and Snell	.380
Nagelkerke	.411
McFadden	.185

Link function: Logit.

The findings in Table 5 indicate that the Nagelkerke R–squared was 0.411, implying that alliance structural design for strategic collaboration in universities explained 41.1% of the financial outcome that universities derived from strategic collaborations. This implies that 58.9% of the financial outcome derived from strategic collaborations was explained by other factors not included in the model.

The -2-log likelihood ratio chi-square test was also used to assess the model's fitness. The model fitting information includes the -2-log likelihood ratio for the intercept only model and the model that consists of the independent variable (alliance structural design) and the chi square test to test the fitness of the ordinal logistic model relative to the intercept only model. Table 6 presents a summary of the results.

Table 6: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	57.365			
Final	30.618	26.747	1	<.001

Link function: Logit.

The findings provided in Table 6 show that there is a significant improvement in the final model relative to the intercept only model (χ^2 = 26.747, p < 0.05). The researcher also conducted the goodness of fit test using the Pearson and deviance chi-square tests. This is a test to assess whether the model fits the data well. The null hypothesis of the two tests is that the model is a good fit for the data. The outcomes are enumerated in Table 7.

Table 7: Goodness-of-Fit Test

	Chi-Square	Df	Sig.
Pearson	9.447	11	.581
Deviance	11.614	11	.393

Link function: Logit.

The findings provided in Table 7 indicate that both the Pearson Chi square test (χ^2 = 9.447, p = 0.581) and the deviance chi square test (χ^2 = 11.614, p = 0.393) were not significant, indicating that the null hypothesis was not rejected. This implies that the fitted ordinal logic regression model was a good fit for the data.

The fitted ordinal logistic regression model on financial outcome against alliance structural design is provided in Table 8. The regression coefficients and the significance of alliance structural design in predicting the financial outcomes of strategic collaborations in universities is provided.

Table 8: Parameter Estimates for Alliance Structural Design on Financial Outcome of Universities

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Financial Outcome = 2]	1.950	1.007	3.748	1	.053	-.024	3.923
	[Financial Outcome = 3]	4.754	1.144	17.26	1	.000	2.511	6.996
	[Financial Outcome = 4]	6.815	1.316	26.80	1	.000	4.235	9.395
Location	Alliance Structural Design	1.513	.332	20.79	1	.000	.863	2.163

Link function: Logit.

The resulting ordinal regression models were;

Logit P (Y≤ 3)) = 4.754 – 1.513X_2

Logit P (Y≤ 4)) = 6.815 – 1.513X_2

Where Y is financial outcome and X_2 is alliance structural design.

The findings provided in Table 8 show the thresholds for the different levels of the dependent variable (Financial outcome). The findings also provide the location estimates of the alliance's structural design. The results indicate that alliance structural design was a significant predictor of the financial outcome of universities ($\beta = 1.513$, $p < 0.05$). These findings suggest that when alliance structural design is improved by a unit, there is a predicted change of 1.513 in the log odds of a university being in a higher financial outcome category. This implies that improvements in alliance structural design for collaborations are likely to improve the financial outcome of a university.

The study also fitted a model of alliance structural design on learning and growth of universities. This section provides the results of the R-squared values, the model fitness test and parameter estimates for the alliance structural design and learning and growth model for universities. The R-squared findings are shown first in Table 9.

Table 9: R-Squared for the Model of Alliance Structural Design on Learning and Growth of Universities

Cox and Snell	.393
Nagelkerke	.431
McFadden	.211

Link function: Logit.

The findings in Table 9 indicate that the Nagelkerke R–squared was 0.431, implying that alliance structural design for collaboration in universities explained 43.1% of the universities' learning and growth derived from strategic collaborations. This implies that 56.9% of learning and growth derived from strategic collaborations was explained by other factors not included in the model.

The -2-log likelihood ratio chi-square test was also used to assess the model's fitness. The model fitting information includes the -2-log likelihood ratio for the intercept only model and the model that consists of the independent variable (alliance structural design) and the chi square test to test the fitness of the ordinal logistic model relative to the intercept only model. Table 10 presents a summary of the results.

Table 10: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	53.952			
Final	27.184	26.768	1	<.001

Link function: Logit.

The findings provided in Table 10 show that there is a significant improvement in the final model relative to the intercept only model (χ^2 = 26.868, p < 0.05). The researcher also conducted the goodness of fit test using the Pearson and Deviance chi-square tests. These are tests to assess whether the model fits the data well. The null hypothesis of the two tests is that the model is a good fit for the data. The outcomes are enumerated in Table 11.

Table 11: Goodness-of-Fit Test

	Chi-Square	Df	Sig.
Pearson	7.093	11	.792
Deviance	8.269	11	.689

Link function: Logit.

The findings provided in Table 11 indicate that both the Pearson Chi square test (χ^2 = 7.093, p = 0.792) and the Deviance chi square test (χ^2 = 8.269, p = 0.689) were not significant, indicating that the null hypothesis was not rejected. This implies that the fitted ordinal logic regression model was a good fit for the data.

The fitted ordinal logistic regression model on the learning and growth againstalliance structural design is provided in Table 12. The regression coefficients, the significance of alliance structural design in predicting learning and growth of strategic collaborations in universities is provided.

Table 12: Parameter Estimates for Alliance Structural Design on Learning and Growth of Universities

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Learning and growth = 2]	1.024	1.112	.848	1	.357	-1.155	3.203
	[Learning and growth = 3]	3.919	1.118	12.297	1	.000	1.729	6.110
	[Learning and growth = 4]	6.423	1.326	23.474	1	.000	3.825	9.022
Location	Alliance Structural Design	1.594	.352	20.570	1	.000	.905	2.283

Link function: Logit.

The resulting ordinal regression models are;

Logit P (Y≤ 3)) = 3.919 – 1.594X_2

Logit P (Y≤ 4)) = 6.423 – 1.594X_2

Where Y is learning and growth and X_2 is alliance structural design.

The findings provided in Table 12 show the thresholds for the different levels of the dependent variable (learning and growth). The findings also provide the location estimates of alliance structural design. The results indicate that alliance structural design was a significant predictor of learning and growth of universities (β = 1.594, p < 0.05). These findings suggest that when alliance structural design is improved by a unit, there is a predicted change of 1.594 in the log odds of a university being in a higher learning and growth category. This implies that improvements in alliance structural design for collaborations are likely to improve the learning and growth of a university.

The study also assessed how alliance structural design influenced strategic collaboration competitive advantage of teaching hospitals. First, the study fitted a model of alliance structural design to financial outcome of teaching hospitals. This section provides the results of the r-squared values, the model fitness test and parameter estimates for the alliance structural design and financial outcome model for teaching hospitals. The R-squared findings are shown first in Table 13.

Table 13: R-Squared for the Model of Alliance Structural Design on Financial Outcome of Teaching Hospitals

Cox and Snell	.418
Nagelkerke	.448
McFadden	.199

Link function: Logit.

The findings in Table 13 indicate that the Nagelkerke R–squared was 0.448, implying that alliance structural design for collaboration in teaching hospitals explained 44.8% of the financial outcome that teaching hospitals derived from strategic collaborations. This implies that 55.2% of financial outcomes derived from strategic collaborations was explained by other factors not included in the model.

The -2-log likelihood ratio chi-square test was also used to assess the model's fitness. The model fitting information includes the -2-log likelihood ratio for the intercept only model and the model that consists of the independent variable (alliance structural design) and the chi square test to test the fitness of the ordinal logistic model relative to the intercept only model. Table 14 presents a summary of the results.

Table 14: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	73.816			
Final	42.392	31.423	1	<.001

Link function: Logit.

The findings provided in Table 14 show that there is a significant improvement in the final model relative to the intercept only model (χ^2 = 31.423, $p < 0.05$). The researcher also conducted the goodness of fit test using the Pearson and Deviance chi-square tests. These are tests to assess whether the model fits the data well. The null hypothesis of the two tests is that the model is a good fit for the data. The outcomes are enumerated in Table 15.

Table 15: Goodness-of-Fit Test

	Chi-Square	Df	Sig.
Pearson	21.733	15	.115
Deviance	20.478	15	.154

Link function: Logit.

The findings provided in Table 15 indicate that both the Pearson Chi square test (χ^2 = 21.733, p = 0.115) and the Deviance chi square test (χ^2 = 20.478, p = 0.154) were not significant, indicating that the null hypothesis was not rejected. This implies that the fitted ordinal logic regression model was a good fit for the data.

The fitted ordinal logistic regression model on financial outcome of teaching hospitals against alliance structural design is provided in Table 16. The regression coefficients and the significance of alliance structural design in predicting the financial outcome of strategic collaborations in teaching hospitals is provided.

Table 16: Parameter Estimates for Alliance Structural Design on Financial Outcome of Teaching Hospitals

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Financial Outcome = 1]	-.375	1.267	.088	1	.767	-2.859	2.109
	[Financial Outcome = 2]	2.182	.877	6.193	1	.013	.463	3.900
	[Financial Outcome = 3]	4.202	.981	18.354	1	.000	2.280	6.125
	[Financial Outcome = 4]	6.536	1.196	29.885	1	.000	4.192	8.879
Location	Alliance Structural Design	1.518	.301	25.506	1	.000	.929	2.107

Link function: Logit.

The resulting ordinal regression models are;

Logit P $(Y \leq 2)) = 2.182 - 1.518X_2$

Logit P $(Y \leq 3)) = 4.202 - 1.518X_2$

Logit P $(Y \leq 4)) = 6.536 - 1.518X_2$

Where Y is financial outcome and X_2 is alliance structural design.

The findings provided in Table16 show the thresholds for the different levels of the dependent variable (financial outcome). The findings also provide the location estimates of alliance structural design. The results indicate that alliance structural design was a significant positive predictor of the financial outcome of teaching hospitals ($\beta = 1.518$, $p < 0.05$). These findings suggest that when alliance structural design increases by one unit, there is a predicted change of 1.518 in the log odds of a teaching hospital moving into a higher financial outcome category. This implies that an improvement in the alliance structural design for collaborations is likely to enhance the financial outcomes of teaching hospitals.

An ordinal logistic model of alliance structural design on learning and growth of teaching hospitals was also fitted. This section provides the results of the R-squared values, the model fitness test and parameter estimates for the alliance structural design and learning and growth model for teaching hospitals. The R-squared findings are shown first in Table 17.

Table 17: R-Squared for the Model of Alliance Structural Design on Learning and Growth of Teaching Hospitals

Cox and Snell	.346
Nagelkerke	.369
McFadden	.153

Link function: Logit.

The findings in Table 17 indicate that the Nagelkerke R–squared was 0.369, implying that alliance structural design for collaboration in teaching hospitals explained 36.9% of the teaching hospitals' learning and growth derived from strategic collaborations. This implies that 63.1% of learning and growth derived from strategic collaborations was explained by other factors not included in the model.

The -2-log likelihood ratio chi-square test was also used to assess the model's fitness. The model fitting information includes the -2-log likelihood ratio for the intercept only model and the model that consists of the independent variable (alliance structural design) and the chi square test to test the fitness of the ordinal logistic model relative to the intercept only model. Table 18 presents a summary of the results.

Table 18: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	60.147			
Final	35.507	24.640	1	<.001

Link function: Logit.

The findings provided in Table 18 show that there is a significant improvement in the final model relative to the intercept only model ($\chi^2 = 24.64$, $p < 0.05$). The researcher also conducted the goodness of fit test using the Pearson and Deviance chi-square tests. These are tests to assess whether the model fits the data well. The null hypothesis of the two tests is that the model is a good fit for the data. The outcomes are enumerated in Table 19.

Table 19: Goodness-of-Fit Test

	Chi-Square	Df	Sig.
Pearson	4.603	15	.995
Deviance	6.025	15	.979

Link function: Logit.

The findings provided in Table 19 indicate that both the Pearson Chi square test ($\chi^2 = 4.603$, $p = 0.995$) and the Deviance chi square test ($\chi^2 = 6.025$, $p = 0.979$) were not significant, indicating that the null hypothesis was not rejected. This implies that the fitted ordinal logic regression model was a good fit for the data.

The fitted ordinal logistic regression model on the learning and growth of teaching hospitals against alliance structural design is provided in Table 20. The regression coefficients and the significance of alliance structural design in predicting learning and growth from strategic collaborations in teaching hospitals is provided.

Table 20: Parameter Estimates for Alliance Structural Design on Learning and Growth of Teaching Hospitals

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Learning and growth = 1]	-.034	.983	.001	1	.972	-1.962	1.893
	[Learning and growth = 2]	1.706	.835	4.176	1	.041	.070	3.341
	[Learning and growth = 3]	3.075	.884	12.112	1	.001	1.343	4.807
	[Learning and growth = 4]	5.156	1.048	24.203	1	.000	3.102	7.210
Location	Alliance Structural Design	1.231	.273	20.373	1	.000	.696	1.765

Link function: Logit.

The resulting ordinal regression models are;

$\text{Logit } P(Y \leq 2)) = 1.706 - 1.231X_2$

$\text{Logit } P(Y \leq 3)) = 3.075 - 1.231X_2$

$\text{Logit } P(Y \leq 4)) = 5.156 - 1.231X_2$

Where Y is learning and growth and X_2 is alliance structural design.

The findings provided in Table 20 show the thresholds for the different levels of the dependent variable (learning and growth). The findings also provide the location estimates of alliance structural design from the fitted model. The results indicate that alliance structural design was a significant positive predictor of learning and growth of teaching hospitals ($\beta = 1.231$, $p < 0.05$). These findings suggest that when alliance structural design improves by one unit, there is a predicted change of 1.231 in the log odds of a teaching hospital moving into a higher learning and growth category. This implies that improvements in alliance structural design for collaborations are likely to enhance the learning and growth of teaching hospitals.

The study further assessed how alliance structural design influenced strategic collaboration competitive advantage of both universities and teaching hospitals. First, the study fitted a model of alliance structural design to financial outcomes of universities and teaching hospitals. This section provides the results of the R-squared values, the model fitness test and parameter estimates for the alliance structural design and financial outcome model for universities and teaching hospitals. The R-squared findings are shown first in Table 21.

Table 21: R-Squared for the Model of Alliance Structural Design on Financial Outcome of Universities and Teaching Hospitals

Cox and Snell	.405
Nagelkerke	.434
McFadden	.193

Link function: Logit.

The findings in Table 21 indicate that the NagelkerkeR–squared was 0.434, implying that alliance structural design for strategic collaboration in universities and teaching hospitals explained 43.4% of the financial outcome that universities and teaching hospitals derived from strategic collaborations. This implies that 56.6% of financial outcomes derived from strategic collaborations was explained by other factors not included in the model.

The -2-log likelihood ratio chi-square test was also used to assess the model's fitness. The model fitting information includes the -2-log likelihood ratio for the intercept only model and the model that consists of the independent variable (alliance structural design) and the chi square test to test the fitness of the ordinal logistic model relative to the intercept only model. Table 22 presents a summary of the results.

Table 22: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	104.977			
Final	45.863	59.114	1	<.001

Link function: Logit.

The findings provided in Table 22 show that there is a significant improvement in the final model relative to the intercept only model (χ^2=59.114, $p < 0.05$). The researcher also conducted the goodness of fit test using the Pearson and Deviance chi-square tests. These are tests to assess whether the model fits the data well. The null hypothesis of the two tests is that the model is a good fit for the data. The outcomes are enumerated in Table 23.

Table 23: Goodness-of-Fit Test

	Chi-Square	Df	Sig.
Pearson	12.933	15	.607
Deviance	14.065	15	.521

Link function: Logit.

The findings provided in Table 23 indicate that both the Pearson Chi square test (χ^2 = 12.933, p = 0.607) and the Deviance chi square test (χ^2 = 14.065, p = 0.521) were not significant, indicating that the null hypothesis was not rejected. This implies that the fitted ordinal logic regression model was a good fit for the data.

The fitted ordinal logistic regression model on financial outcome of universities and teaching hospitals against alliance structural design is provided in Table 24. The regression coefficients and the significance of alliance structural design in predicting the financial outcome of strategic collaborations in universities and teaching hospitals is provided.

Table 24: Parameter Estimates for Alliance Structural Design on Financial Outcome of Universities and Teaching Hospitals

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Financial Outcome = 1]	-.849	1.130	.564	1	.453	-3.064	1.366
	[Financial Outcome = 2]	2.098	.659	10.131	1	.001	.806	3.389
	[Financial Outcome = 3]	4.509	.748	36.377	1	.000	3.044	5.974
	[Financial Outcome = 4]	6.687	.882	57.454	1	.000	4.958	8.416
Location	Alliance Structural Design	1.520	.222	46.913	1	.000	1.085	1.956

Link function: Logit.

The resulting ordinal regression models are;

Logit P $(Y \leq 2)) = 2.098 - 1.52X_2$

Logit P $(Y \leq 3)) = 4.509 - 1.52X_2$

Logit P $(Y \leq 4)) = 6.687 - 1.52X_2$

Where Y is financial outcome and X_2 is alliance structural design.

The findings provided in Table 24 indicate the thresholds for the different levels of the dependent variable (financial outcome) that the model would apply. The findings also provide the location estimates of alliance structural design. The results indicate that alliance structural design was a significant positive predictor of the financial outcome of universities and teaching hospitals ($\beta = 1.520$, $p < 0.05$). These findings suggest that when alliance structural design improves by one unit, there is a predicted change of 1.52 in the log odds of a university or teaching hospital moving into a higher financial outcome category. This implies that improvements in alliance structural design for collaborations are likely to enhance the financial outcomes of universities and teaching hospitals.

An ordinal logistic model of alliance structural design on learning and growth of universities and teaching hospitals was also fitted. This section provides the results of the R-squared values, the model fitness test and parameter estimates for the alliance structural design and learning and growth model for teaching hospitals. The R-squared findings are shown first in Table 25.

Table 25: R-Squared for the Model of Alliance Structural Design on Learning and Growth of Universities and Teaching Hospitals

Cox and Snell	.559
Nagelkerke	.488
McFadden	.270

Link function: Logit.

The findings in Table 25 indicate that the Nagelkerke R–squared was 0.488, implying that alliance structural design for collaboration in universities and teaching hospitals explained 58.8% of the learning and growth that the universities and teaching hospitals derived from strategic collaborations. This implies that 51.2% of learning and growth derived from strategic collaborations was explained by other factors not included in the model.

The -2-log likelihood ratio chi-square test was also used to assess the model's fitness. The model fitting information includes the -2-log likelihood ratio for the intercept only model and the model that consists of the independent variable (alliance structural design) and the chi square test to test the fitness of the ordinal logistic model relative to the intercept only model. Table 26 presents a summary of the results.

Table 26: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	94.556			
Final	43.791	50.765	1	<.001

Link function: Logit.

The findings provided in Table 26 show that there is a significant improvement in the final model relative to the intercept only model (χ^2 = 50.765, $p < 0.05$). The researcher also conducted the goodness of fit test using the Pearson and Deviance chi-square tests. These are tests to assess whether the model fits the data well. The null hypothesis of the two tests is that the model is a good fit for the data. The outcomes are enumerated in Table 27.

Table 27: Goodness-of-Fit Test

	Chi-Square	Df	Sig.
Pearson	7.274	15	.950
Deviance	8.628	15	.896

Link function: Logit.

The findings provided in Table 27 indicate that both the Pearson Chi square test (χ^2 = 7.274, p = 0.950) and the Deviance chi square test (χ^2 = 8.628, p = 0.896) were not significant, indicating that the null hypothesis was not rejected. This implies that the fitted ordinal logic regression model was a good fit for the data.

The fitted ordinal logistic regression model on the learning and growth of universities and teaching hospitals against alliance structural design is provided in Table 28. The regression coefficients and the significance of alliance structural design in predicting learning and growth from strategic collaborations in universities and teaching hospitals is provided.

Table 28: Parameter Estimates for Alliance Structural Design on Learning and Growth of Universities and Teaching Hospitals

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Learning and growth = 1]	-.390	.878	.197	1	.657	-2.112	1.332
	[Learning and growth = 2]	1.515	.650	5.426	1	.020	.240	2.789
	[Learning and growth = 3]	3.368	.685	24.152	1	.000	2.025	4.712
	[Learning and growth = 4]	5.638	.814	47.993	1	.000	4.043	7.233
Location	Alliance Structural Design	1.371	.214	41.138	1	.000	.952	1.790

Link function: Logit.

The resulting ordinal regression models are;

Logit P $(Y \leq 2)) = 1.515 - 1.371X_2$

Logit P $(Y \leq 3)) = 3.368 - 1.371X_2$

Logit P $(Y \leq 4)) = 5.638 - 1.371X_2$

Where Y is learning and growth and X_2 is alliance structural design.

The findings provided in Table 28 show the thresholds for the different levels of the dependent variable (learning and growth). The findings also provide the location estimates of alliance structural design. The results indicate that alliance structural design was a significant positive predictor of learning and growth of universities and teaching hospitals ($\beta = 1.371$, $p < 0.05$). These findings suggest that whenalliance structural design improves by one unit, there is a predicted change of 1.371 in the log odds of a university or a teaching hospital moving into a higher learning and growth category. This implies that improvements in alliance structural design for collaborations are likely to enhance the learning and growth of universities and teaching hospitals. These findings led to a rejection of the null hypothesis of the study which was; H_o: Alliance structural design does not significantly influence collaborative competitive advantage.

Discussion

The study's objective sought to establish the influence of alliance structural design on alliance competitive advantage between universities and teaching hospitals in Kenya. The hypothesis stated that;

H_{o2}: Alliance structural design does not significantly affect collaborative competitive advantage.

The results indicated that the alliance structural design construct was fit to be used as a statistically significant predictor of financial outcomes and learning and growth in strategic collaborations involving universities and teaching hospitals in Kenya.

This study resonated with the protocol used by Bos et al. (2017) where this study considered the institutions in the collaboration dyad as polylithic institutions and therefore in possession of either colleges or departments that though in the same collaboration, structurally engaged idiosyncratically. The studies however differed in theoretical anchoring where the study by Bos et al. (2017) was anchored on the Knowledge-Based View (KBV). In KBV, knowledge is considered valuable, rare, inimitable and non-substitutable. According to the KBV, knowledge generation is therefore a process of reintegration in which organizations seek new or improved amalgamations of different aspects of knowledge to supplement internal knowledge to curtail exhaustion of internal knowledge according to Karim and Kaul (2015). This forms the basis of the formation of alliances according to the KBV. This study however was anchored on the dynamic capabilities view (DCV) where focus shifts to managerial and strategic concerns that dictate the capacity of focal firms in an alliance to derive knowledge assimilation merits from collaboration partners.

This study established that the relationship between alliance structural design and financial outcome ($\chi^2 = 73.114$, $p < 0.05$) was significant. The Cramer's V statistics (CV = 0.6, $p < 0.05$) indicated a significant moderate and positive association between alliance structural design and financial outcome for strategic collaborations. The same was also investigated for learning and growth ($\chi^2 = 64.67$, $p < 0.05$) indicating a significant association between alliance structural design and learning and growth. The Cramer's V statistics (CV = 0.577, $p < 0.05$) shows a significant moderate and positive association between alliance structural design and learning and growth from strategic collaborations. These findings were congruent with Bos et al. (2017), however Li et al. (2022) established that a centralized alliance structure exhibited a partial negative mediating factor in the positive association between technology related alliances and the performance of the strategic collaborations.

This study established that close professional ties exist within the strategic collaboration network between the collaborating partners (M=4, SD = 1.047) and that relations within the strategic collaboration network are open, interactive and critical to healthcare delivery (M=3.85, SD=1.050) to which Wang et al. (2020) were keen to note that the close ties that were open and interactive relations at the micro or alliance boundary spanning level, were significant for knowledge sharing and hence learning and growth and sustained financial performance at the collaboration macro level. Wang et al. (2020) took cognizance of the risk of common method bias in the survey instrument to which this study also considered by triangulating the primary data with secondary data and establishing that the mean rank of alliance structural design from the secondary data (59.90) was higher than the mean rank from the primary data (63.27). The results of the Mann-Whitney U test, however, indicated that this difference was not statistically significant (U = 544, p = 0.767).

This study established alliance structural design was a significant positive predictor of learning and growth of universities and teaching hospitals. The findings resonate with Wang et al. (2020) who also established a significant relationship between alliance structure and alliance sustained performance ($\beta = 0.353$, $p < 0.005$), while the social structural ties in Wang et al. (2020) were anchored in social network theory, social capital was used in this study to anchor all relational aspects of strategic collaborations. The findings of this study are also in line with Bos et al. (2017) who established that the higher the number of alliances embedded within a focal firm's internal structure, the higher its influence on the focal firm's performance.

Recommendations and Areas for Further Study

The study postulated that alliance structural design possessed a significant and direct influence on alliance competitive advantage as operationalized through financial outcomes and learning and growth for both universities and teaching hospitals and when combined in a collaboration. Therefore, the study established that the alliance structure is the infrastructure through which effective collaboration takes place with knowledge co-creation seamlessly taking place as the boundaries between the collaborating institutions are well bridged through effective coordination by the boundary spanning teams. The structural design of the collaboration is also critical to the extent that it sets the stage for the identification and resolution of bottlenecks in the process of collaboration. The transmission mechanisms in the identification and the resolution of the bottlenecks however, need to be probed further.

Conclusions

The study established for universities a Nagelkerke R–squared of 0.411, implying that alliance structural design explained 41.1% of the financial outcome that universities derived from strategic collaborations. A Nagelkerke R–squared of 0.431, indicated that alliance structural design explained 43.1% of the universities' learning and growth derived from strategic collaborations. For teaching hospitals, a Nagelkerke R–squared of 0.448, established that alliance structural design explained 44.8% of the financial outcome that teaching hospitals derived from strategic collaborations. A Nagelkerke R–squared of 0.369, stipulated that alliance structural design explained 36.9% of the teaching hospitals' learning and growth derived from strategic collaborations which was also evident from the results.

Further, the results established that alliance structural design was a significant predictor of the financial outcome of universities ($\beta = 1.513$, $p < 0.05$), teaching hospitals ($\beta = 1.518$, $p < 0.05$) and both combined ($\beta = 1.520$, $p < 0.05$), effectively concluding that when alliance structural design is improved by a unit, there is a predicted change of 1.513, 1.518 and 1.520 in the log odds of a university, teaching hospital and both combined respectively being in a higher financial outcome category. The results also specified that alliance structural design was a significant predictor of learning and growth in universities ($\beta = 1.594$, $p < 0.05$), teaching hospitals ($\beta = 1.231$, $p < 0.05$) and combined ($\beta = 1.371$, $p < 0.05$), effectively stipulating that when alliance structural design is improved by a unit, there is a predicted change of 1.594, 1.231 and 1.371 in the log odds of a university, teaching hospital or combined respectively, being in a higher learning and growth category. This led to the rejection of the second null hypothesis. Therefore, the study concluded that the alliance structural design was a significantantecedent of collaboration competitive advantage in universities and teaching hospitals in Kenya.

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