

LINKING INTANGIBLE STRUCTURAL CAPITAL AND COMPETITIVENESS'

ENHANCEMENT AMONG TELECOMMUNICATION COMPANIES IN RWANDA

Abstract

This paper measures the relationship between intangible structural capital variables (systems and programs, research and development and corporate reputation) and competitiveness' enhancement among telecommunication companies in Rwanda. Factor and multiple linear regression analysis were employed for the data analysis. The results indicate that systems and programs, research and development and corporate reputation combined together has a high statistical significant effect on competitiveness's enhancement among telecommunication companies in Rwanda. The study concludes that intangible structural capital play an important role in enhancing the competitiveness among telecommunication companies in Rwanda.

Keywords: *intangible, competitiveness, reputation, programs, telecommunication, Rwanda*

Introduction

Intangible Structural capital (ISC) can be owned and thereby traded (Bontis, 2000). It represents the codified knowledge bases that do not exist within the minds of employees (Bontis & Fitzenz, 2002). It includes processes, systems, structures, brands, intellectual property, vision, mission, infrastructure and other intangibles (Roos et. al., 2001, Bharathi, 2010). Structural capital of an organization represents the capabilities that meet its internal and external challenges (Cabrita & Vaz, 2006). Ordóñez de Pablos, (2004) sub-divides structural capital into organizational and technological capital. Organizational capital includes all aspects that are related with the organization of the company and its decision-making process, such as organizational culture, structural design, coordination mechanisms, organizational routines, planning and control systems, infrastructure, information systems, and many more. Technological capital, on the other

hand, includes all technical and industrial knowledge, such as the results from research and development and process engineering.

Baron and Armstrong (2007) view structural capital as embedded or institutionalized knowledge that may be retained with the help of information technology on readily accessible and easily extended databases. It can include explicit knowledge that has been recorded on a database or in manuals and standard operating procedures, or tacit knowledge that has been captured, exchanged and codified, (Fiala & Borůvková, 2012). Evenson and Westphal (1995) define organizational capital as the knowledge used to combine human skills and physical capital into systems for producing and delivering want-satisfying products.

Structural capital, the supportive non-physical infrastructure, processes and databases of the organization that enable human capital to function (Maddocks & Meaney 2002). Structural capital includes processes, patents, and trademarks, as well as the organization's image, organization, information system, and proprietary software and databases.

Intangible Structural Capital and Competitiveness

Organizational capital includes the organization philosophy, techniques, procedures, systems and programs for leveraging the organization's capability and competitiveness. Structural capital can be considered as glue for an organization as it represents all the non-human storehouses of knowledge including databases, organizational charts, process manual, strategies, routines and policies (Ngugi, 2012; Bontis et al, 2000; Wu & Tsai, 2005; Khalique, et al., 2011). Roos et al (1998) stated that structural capital is "what remains in the company when employees go home for the night" structural capital provides the environment that support individuals to invest their human capital to create and leverage to enhance the business performance and competitiveness.

Systems and programs; research and development; and corporate reputation are valuable intangible structural features owned by organizations which have become key strategies in contemporary business organizations for their competitiveness and other organizational performances. The measures for competitiveness in this study include cost reduction, market share, innovative products and customer attraction and retention.

2.5.2.1 Systems and programs

Edvinsson & Malone (1997) opine that these are the programs, the institutionalized knowledge possessed by an organization and which is stored in databases manuals, it is often the knowledge owned by the organizations. They can be in form of management philosophy, corporate culture, management processes, corporate values and information infrastructure and these calls for the organizations to have succession training programs for each and every major position, the company's culture and atmospheres should be supportive and comfortable. Companies should have in place an elaborate and well developed reward systems related to performance. The companies' systems and programs also need to support their employees by constantly upgrading their skills and education whenever it is necessary and this yield better performance of organizations (Youndt, 2000) and improves organization's competitiveness.

An exploratory study done in Italy by Ciasullo and Troisi in 2013 discovered that ethics and value systems play a significant role in devising sustainable corporate strategy. Competitive strategies, innovation, quality and responsibility are reflected in management procedures and the supply network system involving partners in sustainable innovation processes, (Ciasullo & Troisi, 2013). Systems can be designed with the motive of increasing organizational productivity, and rewarding those who achieve an expected level of performance.

2.5.2.2 Research and Development

The expansion of technology based communication and industry sectors that heavily depend on human innovation and capabilities such as research and development are examples of intangible structural capital (Bontis & Dzinkowski, 2000). The intellectual capital represents a subset of such assets not recognized in financial statements. Disclosure of intellectual capital becomes important to signal investors about affairs of firm in an intense globally competitive economic environment. The telecommunication industry is research intensive and highly innovative and therefore relies heavily on research and development of their products. In the United Kingdom, for example, Prime Minister Tony Blair wrote in a Government White Paper that intangible resources such as creativity and inventiveness are the greatest source of economic success but that too many firms have failed to put enough emphasis on R&D and developing skills, (DTI, 2003, Marr 2006).

2.5.2.3 Corporate reputation

Corporate reputations are the actions which lead to a favorable social perception. This includes: Codes of organizational behavior, corporate governance code and Social action. It is clearly not possible to buy or to sell reputation except insofar as it may be construed to reside in a registered brand name. Reputation, which represents the knowledge and emotions held by individuals about a product range, can be a major factor in achieving competitiveness through differentiation; it also contributes to a defensible position because of the time which can be involved in matching a reputation which is strong in both fame and esteem (Hall 2006). Corporate reputation of a firm should be considered as an asset and wealth that gives that firm a competitive advantage because the firm will be regarded as reliable, credible, trustworthy and responsible for employees,

customers, shareholders and financial markets (Awang & Jusoff, 2009). Although reputation is an intangible concept, research universally shows that a good reputation demonstrably increases corporate worth and provides sustained competitive advantage (Iwu-Egwuonwu, 2011). A business can achieve its objectives more easily if it has a good reputation among its stakeholders, especially key stakeholders, such as its largest customers, opinion leaders in the business community, financiers, and suppliers as well as current and potential employees (Iwu-Egwuonwu, 2011).

Methodology

Quantitative method was used for this study. The quantitative data was analyzed using IBM SPSS statistics version 22 and presented in the form of tables and graphs. A field based survey questionnaire was directed to the employees of telecommunication companies in Rwanda using a five point Likert scale for the resource variables and data was collected from 183 employees ranging from top level to lower level management.

Multiple linear regression analysis was used to test the relationship between intangible resources variables and competitiveness. This statistical technique can predict changes in a dependent variable (DV) by taking into consideration the effect of various independent variables (IV). Correlations between variables were also used to test the hypothesis. In addition, data collected was checked for normality of distribution and described using normal P-P plot and Kolmogorov-Smirnov Test.

Results

This study was guided by the assumption that the combination of intangible structural capital variables can significantly enhance competitiveness among telecommunication companies in Rwanda. The multiple regression model advocated for the study:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where:

Y = Competitiveness of telecommunication companies

β_0 = Constant (coefficient of intercept)

$\beta_1 + \beta_2 + \beta_3$ = slopes coefficients representing the influence of the associated independent variables over the dependent variable.

X_1 = Systems and Programs (SM)

X_2 = Research and Development (RD)

X_3 = Corporate Reputation (CR)

$\mathcal{E}$ = Error Term

Thus:

$$Y = \beta_0 + \beta_1 SM + \beta_2 RD + \beta_3 CR + \varepsilon$$

Reliability and Validity Measurement

Cronbach's alpha was computed for overall analysis on reliability and validity for this study. The Cronbach's alpha reliability coefficient ranges between 0 and 1. The higher the coefficient, the more reliable is the test.

Table 1: Reliability and Validity Measurement Results

Factor	N of Items	Cronbach's Alpha Based on Subvariables	Cronbach's Alpha
INTANGIBLE STRUCTURAL CAPITAL	27		0.904
Systems and programs	9	0.781	
Research and development	9	0.848	
Corporate reputation	9	0.738	
COMPETITIVENESS	16		0.876

Cronbach's coefficient alpha was determined for the whole instrument and was applied to each dimension to ensure inter-item consistency reliability (Sekaran, 2003). Reliabilities ranging from 0.5 to 0.60 are sufficient for exploratory studies (Nunnally & Bernstein, 1994), in the range of 0.70 are acceptable and over 0.80 are good (Sekaran, 2003). The overall alpha for the 27 items of intangible structural capital under investigation had a Cronbach's alpha of 0.850 indicating good

internal consistency. This includes: systems and programs (0.781), research and development (0.848) and corporate reputation (0.738). All the 16 items on competitiveness with coefficient of 0.876 indicate that the items form a scale that has good internal consistency and reliability. All concepts depict that the value of Cronbach's Alpha are above the suggested value of 0.5, hence, the reliability and validity of the study, (Nunnally & Bernstein, 1994).

Exporatory Tests of Normality

The standard assumption in multiple linear regression is that the sample distribution is normal. Exploratory data analysis was done by the researcher using graphical normal probability plot and numerical Kolmogorov-Smirnov Test to check for the normality of the data set.

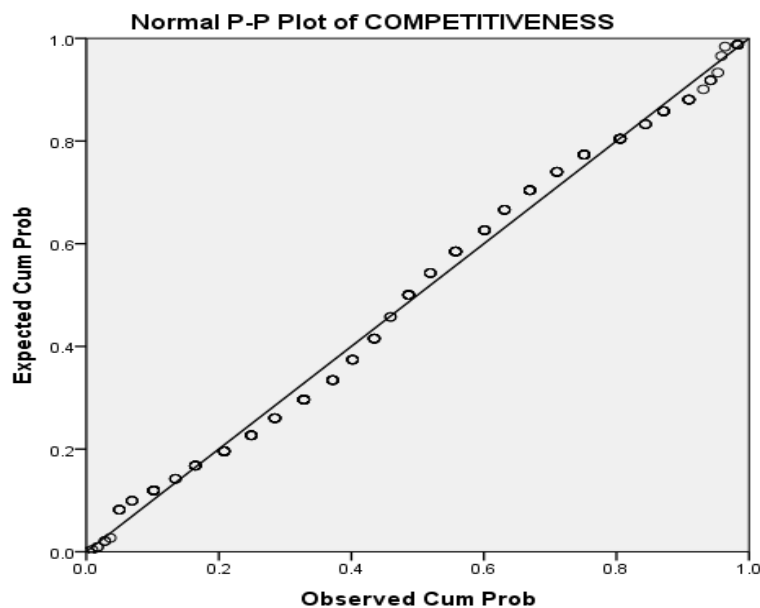


Figure 1: Normal P-P Plot of Competitiveness

The data was analysed to produce a Normal P-P Plot. Figure 1 shows that the error term is normal, the residual errors are within the normal curve but not perfect. From this graph, the researcher concluded that the data appears to be normally distributed as it follows the diagonal line closely and does not appear to have a non-linear pattern.

Table 2: Kolmogorov-Smirnov Test of Normality

	Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.
COMPETITIVENESS	.059	183	.200 [*]

The numerical normality tests are supplementary to the graphical assessment of normality. The tests compare the scores in the sample to a normally distributed set of scores. Kolmogorov-Smirnov Test was used as numerical means of assessing normality. The K-S Test is more appropriate for sample sizes >50. If the Significant value of the K-S Test is greater than 0.05, the data is normal. If it is below 0.05, the data significantly deviates from a normal distribution. The same data was analysed to produce the numerical significant value and since the p value=0.200>0.05, the researcher concludes that the sample data was normally distributed.

Table 3: Correlations Matrix

		COMPETITIVENESS	SP	RD	CR
COMPETITIVENESS	Pearson Correlation	1	.665 ^{**}	.698 ^{**}	.705 ^{**}
	Sig. (2-tailed)		.000	.000	.000
	N	183	183	183	183
SP	Pearson Correlation	.665 ^{**}	1	.657 ^{**}	.588 ^{**}
	Sig. (2-tailed)	.000		.000	.000
	N	183	183	183	183
RD	Pearson Correlation	.698 ^{**}	.657 ^{**}	1	.699 ^{**}
	Sig. (2-tailed)	.000	.000		.000
	N	183	183	183	183
CR	Pearson Correlation	.705 ^{**}	.588 ^{**}	.699 ^{**}	1
	Sig. (2-tailed)	.000	.000	.000	
	N	183	183	183	183

The positive linear relationship between intangible structural capital and competitiveness of telecommunication companies in Rwanda was further supported by the correlation matrix table. From the correlation matrix (Table 3), it can be seen that all the intangible structural capital sub-variables are positively correlated with competitiveness. The first column displays the correlations of the sub-variables with competitiveness as Systems and Programs (SP) $r = 0.665$, Research and Development (RD) $r = 0.698$ and Corporate Reputation (CR) $r = 0.705$ are highly

correlated with competitiveness. Although there were some significant inter-correlations between independent variables, however, all the inter-correlation coefficients are below the level considered undesirable, which is generally 0.80 or higher. Therefore, the inter-correlations between the study independent variables were less than the starting point (0.80) that is considered problematic, consequently, there was no presence of multi-collinearity among the independent variables, (Nunnally, 1978). This implies that there is a strong positive relationship between intangible structural capital and competitiveness. Intangible structural capital is an important source of competitive advantage to the organizations since it cannot be imitated. The result conforms to previous studies done by (Zerenler, 2008; Ngari, 2013; Cabrita, & Bontis, 2008; Wan Fadzilah, 2008).

Table 4: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.789 ^a	.623	.616	5.78138	1.893

a. Predictors: (Constant), CR, SP, RD

b. Dependent Variable: COMPETITIVENESS

Table 5: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	9870.027	3	3290.009	98.431	.000 ^b
Residual	5982.967	179	33.424		
Total	15852.995	182			

a. Dependent Variable: COMPETITIVENESS

b. Predictors: (Constant), CR, SP, RD

Table 6: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	5.605	3.143		1.783	.076		
SP	.503	.111	.284	4.522	.000	.536	1.865
RD	.464	.125	.263	3.712	.000	.419	2.389
CR	.663	.124	.355	5.362	.000	.482	2.074

a. Dependent Variable: COMPETITIVENESS

The regression model summary (table 4) shows that the multiple correlation coefficient illustrates a positive linear relationship ($R=0.789$), when all the predictors are combined together. R-square is the amount of variance in a dependent variable in a multiple regression explained by a combination of all of the independent variables. In this study, all the three independent variables together explained 62.3% of the variance ($R^2=0.623$) and 61.6% of the variance (adjusted $R^2=0.616$) in relation to competitiveness.

The ANOVA (table 5) shows that the p value is highly significant $F(3, 179) = 98.431$. This indicates that the combination of the intangible structural capital variables measured by Corporate Reputation, Systems and Programs and Research and Development have significant joint effect on competitiveness among telecommunication companies in Rwanda with ($p<0.05$).

The Coefficients (table 6) indicates that the overall model fits the data well as expressed by the standardized beta coefficients, CR contributes more ($\beta=0.663$), followed by SP ($\beta=0.503$) and RD ($\beta=0.464$) and unstandardized beta coefficients: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \Rightarrow Y = 5.605 + 0.503 SP + 0.464 RD + 0.663 CR$. The t value and the Significance columns opposite each independent variable indicates its significant contribution to the equation for predicting competitiveness from the whole set of predictors. Thus, it is obvious that intangible structural capital sub-variables jointly and significantly contribute to the prediction of competitiveness with a high p value of ($p<0.05$).

Still, the Collinearity Diagnostics given as Tolerance and Variance Inflation Factor (VIF) in Table 6 indicate lack of effect of multi-collinearity (lack of overlap between predictors). A VIF of greater than 5 and a tolerance below 0.20 are generally considered evidence of multi-collinearity. In this study, the Tolerance for the data are all above 0.2 while the VIF are all less than 5, hence, there is no multi-collinearity.

Conclusion

The results show that intangible structural capital with emphasis on organizational systems and programs; research and development; and corporate reputation can significantly and positively enhance market share, cost reduction, innovative products and customer attraction and retention thereby enhance competitiveness as the correlation coefficient indicates a linear, positive and significant relationship $R=0.789$, $R^2=0.623$ at $p<0.05$ between intangible structural capital and competitiveness among telecommunication companies in Rwanda.

These findings were supported by Youndt and Snell 2004; Longo et al., 2009; and Kong, 2010, who emphasized that structural capital is the skeleton and the glue of an organization because it provides the tools and architecture for retaining, packaging and moving knowledge along the value chain.

The result is also supported by relevant literature, which to a large extent maintains the fact that firm performance is positively and significantly impacted by the presence of structural capital (Ngari, 2013; Cabrita & Bontis, 2008). The basic assumptions of RBV holds true that resources possessing specific characteristics such as being valuable, rare, inimitable and non-substitutable are the key determinants of a firm's competitiveness and success and are referred to as strategic assets (Barney & Hesterly, 2006; Newbert, 2007, 2008).

The researcher, therefore, concludes that intangible structural capital with emphasis on organizational systems and programs; research and development; and corporate reputation can significantly and positively enhance market share, cost reduction, innovative products and customer attraction and retention thereby enhancing competitiveness among telecommunication companies in Rwanda.

242 **Implications for Managers**

243 Since it was discovered that an increase in intangible structural capital (ISC) leads to an increase
 244 in competitiveness, companies should therefore, enhance their systems and programs; research
 245 and development; and corporate reputation by enhancing the level of company's systems
 246 provision for succession training programs for every position, company's culture and atmosphere
 247 are supportive and comfortable, following bureaucratic principles rigidly, has a well-developed
 248 reward system and incentives related to performance, continuous development of work processes
 249 and self-re-organization based on R&D, follows up and adopts the latest scientific and technical
 250 development around the world, determines appropriate and adequate budget for R&D,
 251 continuous trust and support of the R&D department. Enhancing the foregoing will lead to
 252 enhancement of competitiveness via innovative products, market share, customer attraction and
 253 retention and cost reduction.

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