



British Journal of Economics, Management & Trade
12(2): 1-8, 2016, Article no.BJEMT.23234
ISSN: 2278-098X



SCIENCEDOMAIN *international*
www.sciencedomain.org

Linking Intangible Structural Capital and Competitiveness' Enhancement among Telecommunication Companies in Rwanda

Irechukwu Eugenia Nkechi^{1*}, Fred Mugambi Mwirigi² and Jaya Shukla²

¹Kigali Institute of Management, Rwanda.

²Jomo Kenyatta University of Agriculture and Technology, Kenya.

Authors' contributions

This study was carried out by author IEN. Author IEN designed the study, wrote the literature and analyzed the data. Author IEN wrote the draft of the manuscript. Authors FMM and JS reviewed the draft manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJEMT/2016/23234

Editor(s):

(1) John M. Polimeni, Associate Professor of Economics, Albany College of Pharmacy & Health Sciences, New York, USA.

Reviewers:

(1) Kostyantyn Stryzhychenko, Simon Kuznets Karkiv National University of Economics, Ukraine.

(2) Uju Sussan Muogbo, Formerly Anambra State University, Nigeria.

Complete Peer review History: <http://sciencedomain.org/review-history/13271>

Original Research Article

Received 21st November 2015
Accepted 21st December 2015
Published 11th February 2016

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 the combination of systems and programs; research and development; and corporate reputation has a high statistical significant effect on competitiveness's enhancement among telecommunication companies in Rwanda. The study concludes that intangible structural capital plays an important role in enhancing competitiveness among telecommunication companies in Rwanda.

Keywords: Intangible; competitiveness; reputation; programs; telecommunication; Rwanda.

*Corresponding author: E-mail: irenkechi@yahoo.com;

1. INTRODUCTION

Intangible Structural capital (ISC) can be owned and thereby traded [1]. It represents the codified knowledge bases that do not exist within the minds of employees [1]. It includes processes, systems, structures, brands, intellectual property, vision, mission, infrastructure and other intangibles [2,3]. Structural capital of an organization represents the capabilities that meet its internal and external challenges [4]. Ordóñez de Pablos [5] 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 [6] 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 [7]. Evenson and Westphal [8] 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 [9]. Structural capital includes processes, patents, and trademarks, as well as the organization's image, organization, information system, and proprietary software and databases.

2. 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 [10,11]. Roos et al. [2] 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.

2.1 Systems and Programs

Edvinsson and Malone [12] 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 [13] and improves organization's competitiveness.

An exploratory study done in Italy by [14] 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 [14]. Systems can be designed with the motive of increasing organizational productivity, and rewarding those who achieve an expected level of performance.

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. If an organization has poor systems and procedures by which to track its actions, the overall intellectual capital will not reach its fullest potential. Organizations with strong structural capital will have a supportive culture that allows individuals to try new things, to learn, and to fail [15]. Intangible structural capital represents a subcategory of such resources not recognized and recorded in organization's financial statements. Exposure of these types of capital are important to give an indication to investors about the activities of the organization 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 such resources 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 [16].

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 [17]. 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 [18]. Although reputation is an intangible concept, research universally shows that a good reputation demonstrably increases corporate worth and provides sustained competitive advantage [19]. 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 [19].

3. 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.

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

4. 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)

ε = Error Term

Thus:

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

5. 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.

Cronbach's coefficient alpha was determined for the whole instrument and was applied to each dimension to ensure inter-item consistency reliability [20]. Reliabilities ranging from 0.5 to 0.60 are sufficient for exploratory studies [21] in the range of 0.70 are acceptable and over 0.80 are good [20]. 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 [21].

6. EXPLORATORY 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.

The data was analysed to produce a Normal P-P Plot. Fig. 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.

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 2. Kolmogorov-Smirnov test of normality

	Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.
Competitiveness	.059	183	.200

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, [21]. 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 [22,10,23].

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:

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

$$Y = 5.605 + 0.503SP + 0.464RD + 0.663CR.$$

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-variates 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.

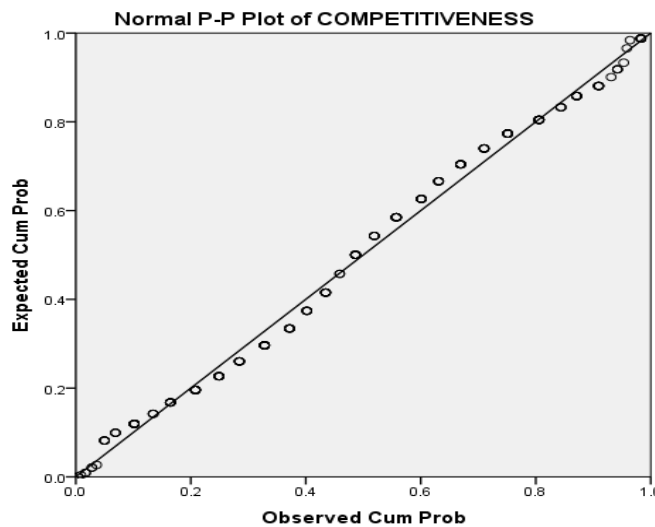


Fig. 1. Normal P-P plot of competitiveness

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

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

7. 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 [13,24,25] 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 [10,23]. 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 [26,27,28].

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.

8. IMPLICATIONS FOR MANAGERS

Since it was discovered that an increase in intangible structural capital (ISC) leads to an increase in competitiveness, companies should therefore, enhance their systems and programs; research and development; and corporate reputation by enhancing the level of company's systems provision for succession training programs for every position, ensure supportive and comfortable company's culture and atmosphere, follow bureaucratic principles rigidly, ensure a well-developed reward system and incentives related to performance, ensure continuous development of work processes and self-re-organization based on R&D, ensure continuous follow-up and adoption of the latest scientific and technological development around the world, determine appropriate and adequate budget for R&D, ensure continuous trust and support of the R&D department. Enhancing and ensuring the foregoing factors will lead to enhancement of competitiveness.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bontis N, Fitzenz J. Intellectual capital ROI: A current map to human capital antecedents and consequences. *Journal of Intellectual Capital*. 2002;3(3):223-247.
2. Roos J, Roos G, Dragonetti N, Edvinsson L. *Intellectual capital: Navigating the new business landscape*. London: Macmillan Press Ltd; 1997.
3. Bharathi GK. *Intellectual capital and corporate performance in Indian Pharmaceutical Industry*. *Journal of Intellectual Capital*. 2010;9:684-704.
4. Carbrita M, Vaz J. Intellectual capital and value creation: Evidences from the Portuguese banking industry. *The Electronic Journal of Knowledge Management*. 2006;4:11-20.
5. Ordóñez de Pablos P. Measuring and reporting structural capital: Lessons from European learning firms. *Journal of Intellectual Capital*. 2004;5(4):629-647.
6. Baron A, Armstrong M. *Human capital management: Achieving added value through people*. London: Kogan Page; 2007.
7. Fiala R, Borůvková J. The valuation of organizational capital. *Journal of Competitiveness*. 2012;4(4):123-132.
8. Evenson RE, Westphal LE. *Technological change and technological strategy*. In *Handbook of Development Economics*. Amsterdam: North Holland; 1995.
9. Maddocks J, Beaney M. See the invisible and intangible. *Knowledge Management*. 2002;16-17.
10. Ngari JM, et al. Analysis of the relationship between intellectual capital accounting and business performance of Pharmaceutical Companies in Kenya. *African Journal of Business and Management*. 2013;3:3-4.
11. Khalique M, et al. Relationship of intellectual capital with the organizational performance of pharmaceutical companies in Pakistan. *Australian Journal of Basic and Applied Sciences*. 2011;5(12):1964-1969.
12. Edvinsson L, Malone M. *Intellectual capital: Realizing your company's true value by finding its hidden brainpower*. New York: Harper Business; 1997.
13. Youndt MA, Subramaniam M, Snell SA. Intellectual capital profiles: An examination of investments and returns. *Journal of Management Studies*. 2004;41(2):335-361.
14. Ciasullo MV, Troisi O. Sustainable value creation in SMEs: A case study. *The TQM Journal*. 2013;25(1):44-61.
15. Bontis N, et al. Intellectual capital and business performance in Malaysian industries. *Journal of Intellectual Capital*. 2000;1(1):85-100.
16. DTI. *Critical success factors: Creating value from your intangibles*. London: Department of Trade and Industry; 2004.

17. Hall R. The strategic analysis of intangible Resources. Strategic Management Journal. 2006;13:135-144.
18. Awang ZH, Jusoff K. The effects of corporate reputation on the competitiveness of Malaysian telecommunication service providers. International Journal of Business and Management. 2009;4:5.
19. Iwu-Egwuonwu RC. Corporate reputation & firm performance: Empirical literature evidence. International Journal of Business and Management. 2011;6:4.
20. Sekaran U. Research Methods for Business. A skill building approach. (4th ed.), New York: John Willey & Sons, Inc; 2003.
21. Nunnally J. Psychometrics theory (2nd ed.). McGraw-Hill, New York; 1978.
22. Zerenler, Hasiloglu, Mete. Intellectual capital and innovation performance: Empirical evidence in the Turkish automotive supplier. Journal of Technology, Management & Innovation. 2008;3(4):31-40.
23. Cabrita M, Bontis N. Intellectual capital and business performance in the Portuguese banking industry. International Journal of Technology Management. 2008;43(1-3): 212-37.
24. Kong E. Analyzing BSC and IC's usefulness in non-profit organizations. Journal of Intellectual Capital. 2010;11(3): 284-304.
25. Longo M, Marcello M. The effect of intellectual capital attributes on organizational performance. The case of the Bologna Opera House, Knowledge Management Research & Practice. 2009; 7(4):365-376.
26. Barney JB, Hesterley WS. Strategic management and competitive advantage. New Jersey: Pearson Education Incorporation; 2006.
27. Newbert SL. Empirical Research on the Resource-Based View of the Firm: An Assessment and Suggestions for Future Research. Strategic Management Journal. 2007;28:121-146.
28. Newbert SL. Value, rareness, competitive advantage, and performance: A conceptual level empirical investigation of the resource-based view of the firm. Strategic Management Journal. 2008;29: 745-768.

© 2016 Irechukwu et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/13271>