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INFLUENCE OF NEURAL NETWORKS ON INFORMATION TECHNOLOGY AGILITY IN TELECOMMUNICATION COMPANIES IN NIGERIA

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ABSTRACT

This study investigated the relationship between neural networks and IT agility. The study was carried out in telecommunication firms in Nigeria.. Survey design was adopted in the generation of data. The instrument for data collection used in this study was the questionnaire. The target population of the study comprised the three hundred and sixty (360) employees in four telecommunications companies. From the population, using Krejcie and Morgan sample determination table a sample size of one hundred and eighty-six (186) respondents was used for the study. Descriptive statistics (mean, standard deviation, percentages) were used as statistical tools for analyzing the data, while Spearman Rank Order Correlation was used as statistical tools to test the hypotheses with the Statistical Package for Social Sciences (SPSS). Findings revealed that there is positive relationship between neural networks and IT agility. Hence the study concludes that hike in neural network improves the agility of telecommunication companies. Therefore, among other recommendations, the study strongly suggests that telecommunication firms greatly build a strong organizational culture in order to adapt to emerging change brought about by the adoption of neural networks.

Keywords: Neural Networks, Information, Technology, Agility, Telecommunication

INTRODUCTION

In the ever-evolving world of information technology, being able to effectively respond to market changes is a difficult but critical task. As organizational capabilities change, so must IT processes, and sometimes it can be necessary to reconfigure or completely replace information technology systems in response to new marketplace realities. An increasingly common suggestion for how businesses can achieve this is through IT agility. Simply put, IT agility is the ability to maintain your systems (replacing equipment, adding or subtracting equipment, updating subsystems and methodologies) in response to market realities. As the market changes, the way one does business changes—and as the way one does business changes, IT systems have to adapt. To be IT agile means having the systems, personnel, and tools in place to change your infrastructure, development process, and IT offerings quick, as the market changes demand. At its very core, being agile is not only about being able to effectively, efficiently, and quickly implement changes as the market dictates, but also about implementing an organizational ethos that values and prioritizes adaptability.

In general, agility is a common business term that refers to how fast an organization responds to opportunities**.** It is typically recognized as the time in between an organization becoming aware of a potential business opportunity and acting on it. IT agility, then, is a measurement of how efficiently the IT infrastructure of an organization can respond to external stimuli. This can mean how effectively it embraces the pressure to change or how successfully it creates a new opportunity. Instead of being thought of as another task to complete, IT agility should be viewed as more of an overall mind set, eventually becoming part of the company culture.

Neural networks are often used in deep leaning systems since both feedforward (acyclic) and recurrent (cyclic) neural networks have won early and present contests in object detection, pattern recognition and image segmentation (Schmidhuber, 2015). Neural network has thus proven to be a winning architecture and have had the greatest impact during the resent years of machine learning. Neural networks consist of elemental processors, each computing a sequence of a real-valued activations joined together in a network. The system is activated through input neurons being triggered by the environment, neurons along the network are then activated by weighted connections from previously activated neurons, sending impulses trough the network like an organic brain. When a system is learning, it is the weighted connections that are shifting to acquire desired behaviour i.e. learning. The future problems of deep learning neuron networks are to make them more optimized and energy saving (Schmidhuber, 2015).

Hence, in this study, we propose an extended conceptualization of IT agility. Similar to organizational agility, we argue that the agility of the IT function is comprised of two dimensions—sensing and responding (Overby *et al*., 2006). The latter dimension refers to the ability of the IT function to be adaptive to emerging business needs. It includes, for example, the IT function’s culture, the willingness to accept risk and act proactively and responsively, as well as the flexibility of IT in terms of scalability, reconfigurability and integration abilities (Fichman, 2004; Lu & Ramamurthy, 2011; Weill *et al*., 2002).

Neural Networks (NN)

Neural networks, a simple copy of biological neural networks, have very impressive results despite the superficial connections between neural networks. Neural networks have been used in many areas (Gelir, 1994). Information technology units available in neural networks might look like the neurons in the brain and neural networks consist of many information technology units which are inter-connected. Information processing units receive inputs from several different units and output is distributed to the other units as inputs.

Neural networks include input layer, hidden layer and output layer.

Input Layer: It is the layer in which input data groups are introduced to the network. Parameters in input layers have to be selected before analysis (Blackkard & Dean, 1999). The number of neurons in an input layer is equal to the number of input data; every input neuron is transmitted to the next layer – which is the hidden layer.

Hidden Layer: The hidden layer is the basic function of the network. In this layer, data received from the input layer is processed properly and then transmitted to the output layer (Dag, 2012).

Output layer: Learning takes place in the output layer. Linear units are connected to the output consisting of hidden layers (Abdi, 2003). It is the final layer in the network and it processes the data received from the hidden layer and creates the output. The number of neurons is equal to the number of outputs received by the network. Values obtained are the output values for the problem in the neural network (Dag, 2012).

In order to analyse neural networks well, it is essential to know the structure of biological neural networks constituting neural networks as well as their functioning. The human brain is a mechanism controlling the activities in the human body through billions of nerve cells (neurons) that have a complex relation with one another. In a human brain, there are more than 10 billion nerve cells and each cell is interconnected with an average of 10,000 cells. Within nerve cells are neurons, by which signals are transmitted as vibrations up to 1000 per second which are formed by a chain of very complex electro-chemical events. A typical nerve cell in this mechanism collects signals from the neighbouring cells through capillary pathways called dendrites and transmit these signals to the brain via axons – a long and slender extension of a nerve cell with thousands of branches. At the end of each axonal branch, there is a knob called a synapse. These knobs transmit the signals they receive from the axons to the brain. Thanks to the signals (data) transmitted to the brain, learning takes place. The biological neural system is a control centre receiving and interpreting information and making decisions accordingly. This control unit consists of reception and reaction nerves. The neural systemis critical that ensuring that human being is capable of understanding all behaviour as well as his surroundings (Gershenson, 2003).

Information Technology Agility

IT function's mandate expands to support transformative activities, aiming at digital value creation and innovation in addition to its traditional focus on automation and information (Dehning *et al.*, 2003). This dual focus bears the potential for tensions, as competing in the digital business world means to act fast and explore, while managing traditional enterprise IT requires stability, reliability, and exploitation of existing resources (Gregory *et al.*, 2015). In response to these tensions, some companies are even structurally separating their IT function into an agile (high-speed) and a legacy (slower-speed) IT unit (Andersson & Tuddenham, 2014; Gartner, 2014). Thus, corporate IT functions need to find a balance and amalgamation of opposing demands for speed and stability (e.g., by enabling rapid innovation releases while maintaining a reliable IT service architecture)—a capability referred to as IT ambidexterity in the IS literature (e.g., Gregory *et al.*, 2015).

As opposed to "waterfall" methods of the past, the agile methodology is an incremental process that is usually performed in bi-weekly or monthly sprints. At the end of each sprint, the work and project priorities are evaluated, which allows for bugs to be discovered as well as client feedback to be incorporated.

Agility refers to a company's ability to sense opportunities for business innovation and its ability to rapidly take action and seize opportunities (Goldman *et al.*, 1995). Many studies have provided evidence that organizational agility is a key factor for firms' success as it enables continuous improvements of how to create and capture value through product, service, process, and business model innovation (e.g., Chi *et al.*, 2010; Lee *et al.*, 2009). In the IS literature, the seminal paper of Sambamurthy *et al.* (2003, p. 238) introduced agility as a dynamic capability, stating that agility enables firms to uncover and seize business opportunities "with speed and surprise".

Much of the prior IS literature on agility perceives IT as an antecedent or platform for organizational agility that allows firms "to generate more competitive actions and greater action repertoire complexity" (Sambamurthy *et al.*, 2003, p. 244). Correspondingly, IS research has focused on the IT function's role as an enabler of organizational agility (Overby *et al.*, 2006; Sambamurthy *et al.*, 2003; Tallon & Pinsonneault, 2011).

However, the role of IT for innovation and competitive actions has changed (Bharadwaj *et al.*, 2013; Nambisan, 2013; Yoo, 2012). IT is no longer limited to enabling innovation and new ways of value creation through increasing a firm's sensing and responding capabilities. Especially with regard to digital business transformation, today, IT is a trigger of innovation. Accordingly, IT competences not only serve as a platform for developing organizational agility, but as a means for the IT function's agility itself. Tiwana and Konsynski (2010) define IT agility as the "capacity of the IT function to rapidly adapt to changing line function demands and opportunities" (p. 294). In their paper, IT agility is shown to have a positive influence on IT alignment for two major reasons: First, IT agility enables a swift modification and correction of misalignments between business needs and IT activities and applications. Second, IT agility facilitates that the IT function can respond rapidly when business functions have identified new market opportunities. We extend this perspective, arguing that the responsibilities of the IT function in its role as technology leader or business partner (Guillemette & Paré, 2012) are not limited to enabling rapid responses but also embrace the sensing of innovative opportunities that originate from emerging digital trends.

Hypotheses

H_{o1}: Neural network does not significantly correlate with information technology agility of telecommunication companies in Nigeria

Research Design

The research design adopted in this study by the researcher was the cross-sectional correlational survey design.

Population of the Study

The targeted population was obtained from four Telecommunication companies in Nigeria and with offices in Port Harcourt, Rivers State. These companies were: MTN, Global-com, Airtel, and 9mobile. The population consists of these four organizations with a size of three hundred and sixty (360) employees comprising one hundred and one (101) employees of MTN, eighty-five (85) employees of 9mobile, eight-five (85) employees of Airtel and eighty-nine (89) employees of Global-com.

Sample and Sampling Techniques

The sample size for the study was determined using Krejcie and Morgan (1970) sample size determination table. The table was used to obtained the sample size of 186 employees based on the total population of 360 employees in the four Telecommunication companies. The sampling technique was purposive sampling for top and functional management and random sampling for supervisors and workforce. Bowley (1926) proportional allocation formula was used to allocate sample size for each company.

TABLE 1 Summary of Sample Size

S/N	TELECOM COMPANIES	Top Mgt	Functional Mgt	Supervisors	Workforce	Total
1	MTN	5	10	7	30	52
2	9mobile	4	10	7	23	44
3	Airtel	5	11	7	21	44
4	Global-com	5	12	8	21	46
	Total	19	43	29	95	186

Source: Field Survey, 2019.

Methods of Data Analysis

The copies of questionnaire were coded for analysis using SPSS version IBM 23. Descriptive statistics of percentage, mean and standard deviation was and Inferential statistics (Spearman's Rank Order Correlation Co-efficient) were used for data analysis.

Results

Analysis of Relationship between Neural Network and Organizational agility.

			NN	ITA
Spearman's rho	ANW	Rho	1.000	.173*
		Sig. (2-tailed)	.	.020
		N	181	181

Source: SPSS Data Output, 2020

The result of the correlation analysis in the table 4.15 showed that Neural Network was significantly and positively correlated with Information Technology Agility with the r= 0.173 at $p<0.05$. Following the values presented in the table, there is a very weak positive correlation between neural network and IT agility. On this premise, the null hypothesis was rejected and the alternative hypothesis accepted.

CONCLUSIONS

The study having taken cognizance of necessary precautions and carried out the research, carefully handling data and analyses it, concludes that there is a positive and significant relationship between study variable (neural network and IT agility). Based on the result it is concluded the use of various aspects of neural network has a great effect on the IT agility of telecommunication companies.

RECOMMENDATIONS

Judging from the findings of the study, the researcher hereby makes the following recommendations:

1. Since neural network positively correlates organizational agility, telecommunication firms should improve on their adaptation to neural network system as well as other emerging technological advancement in to further improve their organizational agility.
2. Since Competitiveness of a telecom firm's product in the market is dependent on its agility which is dependent on strong cultural practice, it is therefore important that

telecommunication firms greatly build a strong organizational in order to adapt to emerging change brought about by the adoption of neural network system.

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