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Technology on knowledge management and organizational resilience of manufacturing firms

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The study examined the relationship between knowledge management and organizational resilience of manufacturing firms in Rivers State. The study objects comprised one hundred and twenty eight (128) employees from the thirty four manufacturing companies registered with the manufacturers Association of Nigeria, Rivers State Council. The study utilized both quantitative data (questionnaire) and qualitative data (interview). The Spearman’ rank order correlation coefficient (rho) and partial correlation were utilized for the analysis of data. Findings revealed a positive and significant relationship between knowledge management and organizational resilience, also technology was found to have had a significant moderating influence on the relationship between the variables (knowledge management and organizational resilience); more specifically, knowledge acquisition, knowledge storage, knowledge sharing and knowledge utilization were revealed to have a positive and significant influence on organizational resilience. It was concluded therefore that technological advantage possessed by any given organization ultimately affects knowledge management and consequently enhances organizational resiliency; the dimensions of knowledge management such as knowledge acquisition, knowledge storage, knowledge sharing and knowledge utilization made possible through technology adaptation enhanced organizational adaptation, organizational resourcefulness, and organizational learning. We then recommended that manufacturing institutions should adapt modern technology in order to adequately manage knowledge acquired as to effectively and efficiently utilize resources of such forms so that favorable organizational outcomes are achieved.

Key words: Knowledge Management, Organizational Resilience and Technology.

INTRODUCTION

Organizations are faced with variety of complexities which proliferates because of the changes that occur in the environment they are operating in. These complexities are disturbances which can be internal and external. As Weihrich and Koontz (1999) succinctly puts it “organization does not exist in a vacuum rather it is mutually dependent on its external environment.” These external disturbances include: labor strikes, availability of raw materials, change in customer taste and preferences, power supply, terrorist attacks and natural disasters like (e.g. flood, earthquakes, etc.). The world also is becoming a global village and as Stephenson (2010) rightly argues “investment choices on one side of the world can affect the cost of living on the other” and organizations in Nigeria have not been immune to the impacts of the recent global financial crises. However, according to Weick and Sutcliffe (2001), organizations prepare themselves for failure, much like nuclear aircraft carriers, and this preparation alone is the main ingredient to the organization’s resilience—they are always preparing for the worst, and therefore, attempts at dismantling such an organization have remained a monumental task. Anyanwu (2000) and Olu-Daniels and Nwibere (2014) listed low level of technology, low level of capacity utilization rate, low investment, high cost of production, inflation and poor performing infrastructure as the lingering problems facing the Nigerian Manufacturing Sector. The biggest problem facing manufacturers over the past decade has been inadequate infrastructure in general and lack of power supply in particular (Corporate Nigeria, 2010). They went on to state that between 2000 and 2010, more than 850 manufacturing companies were either shut down or temporarily halted production. Capacity utilization in manufacturing is around 53%.
Imports of manufactured goods dwarf sales of home-grown products – manufactured goods have constituted the biggest category of imports since the 1980s. Other problems facing the Nigeria manufacturing industries, include; heavy tax payment, corruption, counterfeiting, kidnapping/youth restiveness, flood, poor purchasing power, etc.

On his part, MacKenzie (2006) argues that “as the networks that connect us become ever more intricate and finely tuned, modern civilization is becoming increasingly vulnerable”. Mackenzie (2008) further argues that “once organizations develop beyond a certain level of complexity they become increasingly fragile, where a minor disturbance may bring everything crashing down”.

In the midst of all these disturbances, however, organizations strive to make profit and continue to exist no matter the circumstances surrounding them. These natural and man-made crises and disasters have raised an awareness of the need for organizational resilience. According to Umoh (2009) “only variety absorbs variety.” This implies that organizations cannot control the variety unless they possess the requisite variety to bring the organization to a state of acceptable space. Within today’s litigious environment, corporations and their leadership can no longer claim “we didn’t know” as an excuse for corporate resilience failures. Business resilience is now an established need within corporations and should be an embedded institutional capability and defining ethos within the day-to-day business operations of a company (Stephenson, 2012). Hence, the need for resilience in organizations gave rise to this study, which seeks to examine the relationship between knowledge management and organizational resilience. Hence, it is important for organizations to develop resilience for two key reasons: firstly because community and organizational resilience are interdependent in a complex environment (Dalziell and McManus, 2004) and secondly because being resilient can provide organizations with a competitive advantage (Parsons, 2007). The importance of resilience cannot be over emphasized because the benefit outweighs the cost.

Bell (2002) defines organizational resilience as “the capability to respond rapidly to unforeseen changes, even chaotic disruption. It is the ability to bounce back-and, in fact bounce forward- with speed, grace, determination and precision”. For an organization to be able to continue and even increase turnover in the midst of crises is resilience; it is a continuously moving target which contributes to performance during business-as-usual and crisis situations (Mitroff, 2005). It requires organizations to adapt and to be highly reliable (Weick and Sutcliffe, 2001) and enables them to manage disruptive challenges (Durodie, 2003). Seville et al. (2008) discuss organizational resilience as an organization’s “ability to survive, and potentially even thrive, in times of crisis”. Similarly, Flin, Mearns and Bryden (2000) argue that leading indicators, “may reduce the need to wait for the system to fail in order to identify weaknesses and to take remedial actions”. In the context of resilience, this is very important because leading indicators can provide organizations with information on their resilience strengths and weaknesses before a crisis happens.

LITERATURE REVIEW

Theoretical Framework

Resource-Based View Theory

As a complement to this line of research, the resource-based view of the firm (Barney, 1991) contends that firm’ performance is a function of resource mix. When resources are heterogeneous, specific, and difficult-to-replicate and when firm offering creates more value for its customers than its competitive equivalent(s) (DeCastro and Chrisman, 1995; Ansoff, 1965), then competitive advantage is achieved. Thus, differences in performance across firms result from variance in resource portfolios. Resources are valuable when they provide organizations with the ability to implement strategies that enhance efficiency and effectiveness. Accordingly, the proposition of resource-based view theory asserts that competitive advantage is derived from effectively and efficiently utilizing organizational resources and capabilities which are directed at developing the competencies within the business organization for enhanced performance levels (Gibbert, Hoegl, and Välikangas, 2007; Hunt, 2010). Thus technological advantage as a rare resource will enhance performance levels for the organization.

The Theory of Learning Organization

The concept of learning organization was introduced by Senge (1992). Organizations in this category are such ones who continuously expand their abilities to increase the capacity and culture to become ‘learning organizations’; to achieve this, the traditional model of control and hierarchy, bureaucracy and authority in which top management are tasked with ‘thinking’ and organizational members ‘acting’ has to give way for the structure that encourages the systematic thinking and acting at all levels within the organization.

Senge (1992) identified five core competencies in building a learning organization (Zbar, 1994); (i) Building a shared vision; this is to ensure that people are focused on a similar vision which is shared by the entire organization. If there is no shared vision about the company you work for there will be no synergy in a crisis situation. Therefore, it is important to build a shared vision, values and beliefs within an organization.
(ii). Personal mastery; this is the process of encouraging individual creativity and innovation within an organization. In a learning organization mistakes are not punished, yet innovation is encouraged to obtain the long term benefit. (iii) Working with mental models; this is similar to the above point where people are given freedom to use their assumptions and to take risks in doing things differently. The main objective is to encourage organizational learning and to create a learning friendly organizational culture. (iv) Team learning; it is extremely important to encourage teamwork as it actually gives a synergetic advantage as opposed to individual learning. Personal mastery has to be supported and accompanied by team work so that this could be practiced collectively, which will provide learning for more people in the organization. (v) Systems thinking: This is where the organization gives greater emphasis on understanding the interrelationships rather than breaking problems in to small parts.

TECHNOLOGY

The capacity to manage the flow of knowledge as to be adequately harnessed for organizational innovativeness and enhanced levels of performance is what technology proffers to any business organization that has it. Technical know-how and competency is the key factor that ensures success for the organization as it differentiates the business unit from the many substitutes in the market. Nonaka and Takeuchi (1995) viewed technology as the medium through which knowledge is internalized, transferred and incorporated across all facets of the organization. Technological advantage ultimately enables the organization leverage on corporate knowledge to better meet the needs of its market base by reducing the cost of production, improving service quality, ensuring employee satisfaction and customers’ delight, by leveraging on technology in corporate knowledge; business organizations acquire relevant information required for decision making, process information generated into priorities, put up structures to incorporate the priorities, eliminate routine tasks and enhance creativity, empower employees by facilitating organization wide access to information and ensures adequate transmission of information across all levels and lastly with the basic technological capacity possessed constantly scanning the environment for continuous improvement as to remain competitive and resilient in the industry (Zyngier, 2003).

Knowledge Management

The search for knowledge has always been a focal point in the evolution of mankind. As the earliest civilizations appeared in Mesopotamia, Egypt, India and China, they were heavily influenced by their environment, diminishing the impact of the environment on their civilization. Through the centuries, humans have acquired and constructed new knowledge that permitted them to understand and adjust to the world they inhabited, as well as transforming it to suit their needs. As suggested by Scaruffi (2003), knowledge has helped humans to become the “subject” of change, as opposed to being the “object” of change.

The current literature on knowledge management is replete with distinctions among knowledge, information, data and wisdom (Nonaka and Takeuchi, 1995; Awad and Ghaziri, 2004, Wiig, 2004). It is also common to see distinctions drawn between different kinds of knowledge, such as tacit and explicit (Nonaka and Takeuchi, 1995), actionable and passive (Wiig, 2004), or knowledge and meta-knowledge (Wiig, 2004).

There are several definitions of knowledge; Davenport and Prusak (1998) define knowledge as a fluid mix of experiences, values, contextual information and intuition that provides a structure to evaluate and incorporate new experiences and information. On the same note, Liebowitz (1999) defines knowledge as “the full utilization of information and data, coupled with the potential of people’s skills, competencies, ideas, intuitions, commitments and motivations”, while Nonaka and Takeuchi (1995) regard knowledge as true and justified belief. On his part, Braf (2000) suggest that one option is by splitting knowledge into two parts and define them separately: explicit knowledge and tacit knowledge.

Similarly, Nonaka and Takeuchi (1995) have categorized knowledge into tacit knowledge and explicit knowledge and further state that tacit knowledge is that which resides in the people’s minds and is difficult to articulate. Given that tacit knowledge resides within the mind of a person, individuals who are rich in tacit knowledge constitute a wealth of intangible assets of an organization. This also implies that as long as they stay in employment with an organization, they continue playing a competitive figure through effective decision-making, communication and contribution (Nonaka and Takeuchi, 1995).

Accordingly, it is required for organizations to gather and retain this knowledge through various means at work, meetings, workshops and seminars or in tutor and apprentice roles. In this way Nonaka and Takeuchi (1995) argue that there will be little risk that the know-how of the company will leave at the same time as the employees’ retirement.

Tacit knowledge can only be transmitted via training or gained through personal experience. Nonaka (1994) describes tacit knowledge as “know-how” - as opposed to “know-what” (facts), “know-why” (science), or “know-who” (networking). Therefore knowledge management will entail all the processes required to effectively utilize these potentials in organizational members for success, survival and sustainability.
Knowledge Acquisition

Scarborough, Swan and Preston (1998) proposed five phase processes which are consisted of knowledge generation, processing, storage, dissemination and use/reuse. Holzner and Marx (1979) proposed a set of five knowledge management processes; construction is the process through which new material is added or replaced within the collective stock of knowledge. Organization is the process by which bodies of knowledge are related to each other, classified or integrated. Once a new observation or experience has passed the test and been socially ratified as knowledge, it is concerned with storing. Distribution is a critical issue in any organization. Application is concerned with possibility of obtaining the kind of performance improvement. Probst (1998) suggested eight building blocks which are composed of knowledge goal, identification, acquisition, development, distribution, preservation, use and measurement; he presents more detailed knowledge management processes.

Knowledge Storage

Ruggle (1997) proposed generation, codification and transfer. Knowledge generation includes all activities which bring to light knowledge which is new, whether to the individual, to the group, or to the world. Knowledge codification is the capture and representation of knowledge so that it can be re-used either by an individual or by an organization. Knowledge transfer involves the movement of knowledge from one location to another and its subsequent absorption. Schuppel, Muller-Stewens and Gomez (1998) suggested four knowledge management processes that are composed of use and multiplication, development and acquisition, transfer, institutionalization. On their part, Stein and Zwass (1995) suggested mnemonic functions which are composed of knowledge acquisition, retention, maintenance, search and retrieval. Szulanski (1996) focused on knowledge transfer process, which is composed of initiation, implementation, ramp-up, and integration. Spek and Spijervet (1997) divided act process into developing, distributing, combining, holding operations. Nevis, Anthony and Gould (1995) split knowledge into acquisition, sharing and utilization. Knowledge acquisition is the development or creation of skills, insights, and relationships. Knowledge sharing is the dissemination of what has been learned. Knowledge utilization is the integration of learning so it is broadly available and can be generalized to new situations.

Knowledge Sharing

Knowledge sharing contributes to the retention of organizational knowledge, Nonaka (1994) states that effective transfer of organizational tacit knowledge generally requires extensive personal contact and trust. For knowledge and skills transfer (for retention purposes) in organizations to take place there has to be some degree of mutual trust between the individual employees (DeLong, 2004). On the other hand, explicit knowledge refers to knowledge which is transmitted in formal and systematic language (Nonaka and Takeuchi, 1995). Explicit knowledge is found in an organization’s documents, data bases, manuals and procedures manual, policies, code of conduct, annual reports, records and archives. Explicit knowledge is easy to share unlike tacit knowledge. According to Nonaka and Takeuchi (1995:8) “Explicit knowledge can be expressed in words and numbers and easily communicated and shared in the form of data, scientific formulae, codified procedures, or universal principles.” Nonaka and Takeuchi, (1995) further point out that explicit knowledge can easily be processed by a computer, transmitted electronically or stored in databases…” Since explicit knowledge is codified, many find it easy to transfer and it is regarded as leaky and migratory.

Organizational Resilience

In a competitive environment, an organization that is aware of its resilience strengths is also more equipped to find opportunities out of a crisis situation (Knight and Pretty, 1997). McManus, Seville, Vargo and Brunsdon (2008) argued that the resilience of organizations directly contributes to the speed and success of community recovery following a crisis or disaster, Buckle (2006) reflects this when he discusses organizations as a level of social resilience. McManus et al. (2008) went on to discuss communities’ expectations of organizations and argue, “Consumers and communities are increasingly demanding that organizations exhibit high reliability in the face of adversity and that decision makers are able to address not only the crises that they know will happen, but also those that they cannot foresee”. As stated by Bell (2002) "It is not just the terrorist acts of September, 11, but a decade of unprecedented change, wrenching economic instability and business discontinuities that demand organizational agility and organizational resilience.

In many respects, resilience represents the next phase in the evolution of traditional place-centric enterprise structures to highly virtualized, people-centric structures that enable people to work anytime, anywhere.’’

Technology on knowledge management and Organizational Resilience

Technological advancements lend support to effective knowledge management by enhancing the system and frameworks which ultimately affect performance positively.
Table 1. Correlation between Knowledge Management and Organizational Resilience.

<table>
<thead>
<tr>
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<th>Knowledge Management Correlation Coefficient</th>
<th>Organizational Resilience Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman's rho</td>
<td>1.000</td>
<td>.923**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>1.000</td>
</tr>
<tr>
<td>N</td>
<td>128</td>
<td>128</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS output for field survey, 2017

with the resultant outcome of enhanced competitiveness for the firm; in a study by West and Noel (2008) found a positive relationship between procedural knowledge resources and the performance of new ventures. They did not find a relationship between knowledge acquired through the CEO’s previous experience and performance of ventures — perhaps, as they argue, such knowledge tends to rapidly become obsolete in technology companies.

Lee and Lai (2007) used the Balanced Scorecard framework to assess the performance of KM systems in high-technology companies. They concluded that of the four components of the Balanced Scorecard correlated with the strategic assessment of knowledge management systems. Chong and Lin (2008), for example, studied 427 middle managers in 194 information technology companies and found a positive relationship between their use of knowledge management systems and performance of knowledge management. Similarly, Fornstonlechner et al. (2007) studied ten global law firms and concluded that lawyers perceive knowledge management to be a contributor to their firms’ success by impacting the efficiency and quality of their operations. These are examples of co-variation methodologies widely used in knowledge management research. There is a distinction in the literature between factors leading to the performance of the knowledge system itself, and factors affecting the performance and success of the entire organization (Coff, 1999). For example, Huang et al. (2007) compared the performance of knowledge management among rival companies as an instrument for improving the quality of executive decision-making processes, hence leading to better competitiveness. Such studies that combine knowledge management and organizational performance are few and inconclusive.

The Objective of the Study is to determine if technology moderates the relationship between knowledge management and organizational resilience.

Research Hypothesis

H01: Technology does not significantly moderate the relationship between knowledge management and organizational resilience.

METHODOLOGY

This study adopts the quasi experimental research design as the variables in this study are not under the control of the researcher. The Cluster sampling technique was used to determine the sample for this study. Cluster sampling is ideal since the target population is heterogeneous. In all, there are thirty four (34) manufacturing companies that are registered with the Manufacturers Association of Nigeria (MAN), Rivers State council.

The study objects comprised one hundred and twenty eight (128) employees from the thirty four manufacturing companies registered with the manufacturers Association of Nigeria, Rivers State Council. The Krejcie and Morgan (1970) table of sample size determination gave rise to the number of employees studied.

Operational Measurement of Variables

Operational definition of a variable is a definition which is based on the observable characteristics of that variable (Baridam, 2001). The independent variable in this study is knowledge management and it has four components; knowledge acquisition, knowledge storage, knowledge sharing and knowledge utilization. On the other hand, the independent variable in this study is organizational resilience has three measures: organizational adaptation, organizational resourcefulness and organizational learning. Knowledge management is operationalised using Dewah (2012) KM questionnaire. On the other hand, three different instruments were utilized in operationalising organizational resilience. Resilience scale was used to measure adaptation of the organization; the measures for resourcefulness were based on the earlier study of Valikangas (2010); while the measures for organizational learning was based on the earlier study of Watkins and Marsie (2002). The
Table 2. Test of the moderating effect of Technology on Knowledge management and Organizational Resilience

<table>
<thead>
<tr>
<th>Control Variables</th>
<th>Knowledge Management</th>
<th>Organizational Resilience</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correlation</td>
<td>1.000</td>
<td>.937</td>
</tr>
<tr>
<td>Knowledge Management</td>
<td>Significance (2-tailed)</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>df</td>
<td>0</td>
<td>126</td>
<td>126</td>
</tr>
<tr>
<td>Correlation</td>
<td>.937</td>
<td>1.000</td>
<td>.996</td>
</tr>
<tr>
<td>df</td>
<td>126</td>
<td>0</td>
<td>126</td>
</tr>
<tr>
<td>Technology</td>
<td>Significance (2-tailed)</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>df</td>
<td>126</td>
<td>0</td>
<td>126</td>
</tr>
<tr>
<td>Correlation</td>
<td>.940</td>
<td>.996</td>
<td>1.000</td>
</tr>
<tr>
<td>df</td>
<td>126</td>
<td>0</td>
<td>126</td>
</tr>
<tr>
<td>Technology</td>
<td>Significance (2-tailed)</td>
<td>.002</td>
<td>.000</td>
</tr>
<tr>
<td>df</td>
<td>125</td>
<td>0</td>
<td>125</td>
</tr>
</tbody>
</table>

Sources: SPSS output for field survey, 2017

response mode followed a five-point Likert' type scale with 5= ‘agree strongly’, 4= ‘agree slightly’, 3= ‘neither agree nor disagree’, 2= ‘disagree slightly’ and 1= ‘disagree strongly’.

Data Analysis Technique

Data for this study was analyzed using the Spearman’s rank order correlation coefficient. The strength of relationship existing between the variables and test of hypotheses is enabled with this statistical tool; hence the relationship between two sets of ranked observations and degree of relatedness among ordinal variables is determined as follows;

The Spearman’ rank order correlation coefficient value reported above showed a significant positive relationship between knowledge management and organizational resilience (rho = .923**, n = 128, p = .000 < 0.05 (alpha value); this is statistically significant having that the p-value is less than 0.05 alpha value indicative that there exists significant relationship between the dimensions of knowledge management and the measures organizational resilience.

The partial correlation output indicates that there is a strong positive partial correlation between knowledge management and organizational resilience while controlling for technology which reported a statistically significant value (r (125) = .978, n = 153, p = .000); the zero-order correlation examined the effect of technology on the relationship between knowledge management and organizational resilience. On the other hand, when technology is not controlled, the result also reported statistically significant strong positive correlation between the variables (r (126) = .937, n = 128, p = .000) implying that technology had much influence in controlling for the relationship between knowledge management and organizational resilience thus we reject the null hypothesis.

DISCUSSION OF FINDINGS

Empirical findings revealed significant relationship between knowledge management and organizational resilience, hence knowledge management as a strategic organizational practice was evident in helping organizations achieve resiliency. Findings corroborate the position of Anand (2011) in asserting that new opportunities, value creation, competitive advantages and improved performance levels are outcomes from knowledge management which have high potency in granting resiliency to modern corporations.

Nonaka and Takauchi (1995) views technology as very essential in acquisition, storage, sharing and utilization of knowledge across all facets of the organization and that such technological advantage ultimately enables the organization leverage on corporate knowledge to better meet the needs of its market base by reducing the cost of production, improving service quality, ensuring employee satisfaction and customers’ delight, by leveraging on technology in corporate knowledge; business organizations acquire relevant information required for decision making which will enhance corporate resiliency; this theoretical position again supports our empirical findings.
CONCLUSION
Based on the above it was concluded that knowledge acquisition enhances organizational adaptation, organizational learning, and organizational resourcefulness within manufacturing organizations in Nigeria. These findings may be explained by the fact that most of the manufacturing organizations engaged in continuous acquisition of relevant knowledge. They consider the ideas, experience and skills of workers; they scanned their environment to know if there are changes and bring the change to their organizations; they develop the capacity of worker periodically by sending them for trainings, seminars and workshops; and they also draft in experts from other organizations.

Also, technology remarkably influences effectiveness and efficiency in the process of knowledge management within the organization and the consequent effect on organizational resiliency in the designated industrial environment within which the firm operates.

RECOMMENDATIONS
Based on the findings and conclusion above, the following recommendations are made:

Firstly, Nigerian manufacturing organizations should continue to strengthen their knowledge management practices especially knowledge acquisition, knowledge storage, knowledge sharing and knowledge utilization in their everyday activities as this is a sure guarantee for their resilience; one strategy is the creation of posts of knowledge management officers (KMOs) who should oversee the implementation of a knowledge management programmes in the organization.

Nigerian manufacturing organizations should adapt to modern techniques, approaches and frameworks derived from technology so that best practices are derived from knowledge management as this will grant resiliency for the firms.

REFERENCES
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