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Innovation as a Mediator Between Information Technology and Competitive Advantage of Selected Manufacturing Companies in Northern Nigeria

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ABSTRACT

The study examined the mediating role of innovation in the relationship between information technology (IT) and competitive advantage (CA) of selected manufacturing companies in Northern Nigeria. A survey was conducted in a cross-sectional examination of members of the Manufacturers Association of Nigeria (MAN) in 2018, where a sample of 144 companies responded to the questionnaire. The partial least squares structural equation modeling revealed that IT and innovation had significant effects on CA. The R2 values obtained for the full model were moderate at 0.362 and 0.330 for innovation and CA respectively, while the variance accounted for (VAF) of 36% indicated that organizational innovation as a mediator has moderate effect on CA. It, therefore, implies that innovation can play a positive and significant role in supporting manufacturing companies to gain a CA. Despite the abundance of information technologies, it was recommended that managers of manufacturing companies should encourage individuals within their organizations to be innovative, both in process and products, as it will better support their abilities to gain CA.

Keywords: Structural equation modelling, competitive advantage, information technology, manufacturing, mediation, innovation.

INTRODUCTION:

A company's CA is its ability to achieve a position superior to that of its competitors (Bustinza, Bigdeli, Baines & Elliot, 2015; Chumaidiyah, 2014; Singh, 2012). Companies achieve this through better quality, timely reaction to the market, competitive pricing and delivery of customized products. The company with a CA pursues a strategy that is not being executed by a rival company(s) and in order to gain and maintain CA, organizations can adopt three basic strategies: cost leadership; differentiation; and innovation (Bocij, Chaffey, Greasley, & Hickie, 2003).

Innovation involves new methods in a firm's practices (Caiazza, Volpe, & Stanton, 2016; Organization for Economic Co-oporation and Development [OECD], 2005) and encompasses changes in procedure with regards to technology, innovation, productivity, competitiveness and performance (Volberda, Van Den Bosch, & Heij, 2013), which can be measured by process and product innovations (Prajogo, Power, & Sohal, 2004). Process innovation is the application of an improved method, while product innovation is the introduction of an improved product with respect to its features or intended uses (OECD, 2005). Innovation could emanate from information technology (Naidoo & Hoque, 2018; Turulja & Bajgoric, 2016).

IT refers to all of the computer-based technologies that collectively facilitate the construction and maintenance of the information system used by organizations in order to achieve the business objective and it provides an excellent tool for collecting, storing and presenting facts that are transforming the operations of firms, industries and markets (Chaffey & Wood, 2005; Laudon & Laudon, 2013; Oz, 2009). Organizations that appropriately deploy infirmation technology could effectively gain CA (Breznik, 2012; Chukwunonso, Omoju, Ikani, & Ribadu, 2011).

Ideally, IT as a driver of business activities should influence CA of manufacturing companies positively (Arora & Rahman, 2015; Madadipouya, 2015). However, it has been discovered that, left alone, IT does not always deliver the desired results (Cakmak & Tas, 2012; Carr, 2003; Gunasekaran, Subramanian, & Papadopoulos, 2017). Thus, under the circumstance, a mediator variable could be considered (Baron & Kenny, 1986; Hair, Hult, Ringle, & Sarstedt, 2014; Preacher & Hayes, 2008). In this study, innovation is advanced as a mediator, because it serves well as a driver of business activities (Heikkilä, Chaoji, & Martinsuo, 2016).

The study set out to: (1) examine the relationship between IT and CA of manufacturing companies, (2) determine the relationship between IT and innovation activities of manufacturing companies, (3) evaluate the relationship between innovation and CA of manufacturing companies, and (4) examine the mediating effect of innovation in the relationship between IT and CA of manufacturing companies.

A model was proposed for the study, wherein the independent variable was IT; innovation the mediating variable, while CA was the dependent variable. Data were collected in 2018 from manufacturing companies in Northern Nigeria that are members of the MAN.

LITERATURE REVIEW:

Competitive advantage:

The strategy implemented by the firm with CA provides the opportunity for a reduction in costs (i.e. low cost) in the provision of a product and/or service with some proximity on product and/or service attributes to the providers of the alternative differentiation strategy in a broad market segment (Porter, 1985). Firms obtain sustained CA through responding to environmental opportunities while neutralizing the external threat Barney (1991). However, after reviewing several kinds of literature, Sigala and Economou (2013) identified several drawbacks and fallacies relating to current conceptualization of CA, and therefore, concluded that there is an urgent need for more robust definition, which could better serve the needs of both empirical research and management practice.

Information technology:

IT refers to all of the computer-based technologies that collectively facilitate the construction and maintenance of the information system used by organizations in order to achieve the business objective and provides an excellent tool for collecting, storing and presenting facts that are transforming the operations of firms, industries and markets (Chaffey & Wood, 2005; Laudon & Laudon, 2013; Oz, 2009). IT drives innovation and business success (Aboualloush, Bataineh, & Aladwan, 2017), and smart, connected products could leverage embedded IT to create value (Porter & Heppleman, 2015).

Innovation:

Organizational innovation is the change in the arrangement and procedures of an organization (Armbruster, Bikfalvi, Kinkel, & Lay, 2008), or as an innovation involving new management practices, a new organization, new marketing concepts and new corporate strategies (Battisti & Stoneman, 2010). Four types of innovation are identifiable: product, process, market and organization (Edison, Ali, & Torkar, 2013; OECD, 2005) and literature in the field of management emphasizes the importance of integrating product, process, and organization to translate new ideas into market success (Heikkilä et al., 2016). While process innovation affects the average cost of production, and a change is process is typically only seen and valued internally, product innovation is visible to the customer; displace existing products and therefore have mixed effects on total sales (Mairesse & Mohnen, 2010). The aim of organizational innovativeness is to obtain better performance and gain CA. Thus, when firms decide to allocate resources to innovation, they expect to gain a CA.

Innovations come from different sources, such as changes in industry structure, in market structure, in local and global demographics, in human perception, mood, and meaning, in the amount of already available scientific knowledge, logistics, and these can be internal or external (Drucker, 1998; Loucanova, Parobek, Palus, & Kalamarova, 2016).

Information technology and competitive advantage:

IT refers to all of the computer-based technologies that collectively facilitate the construction and maintenance of the information system used by organizations in order to achieve the business objective and provides an excellent tool for collecting, storing and presenting facts that are transforming the operations of firms, industries and markets (Chaffey & Wood, 2005; Laudon & Laudon, 2013; Oz, 2009). IT capabilities are organizational skills and capabilities related to IT, which enable a firm to leverage and exploit its existing IT assets more successfully (Bharadwaj, 2000; Chae, Koh, & Prybutok, 2014), and IT can affect business processes, inter-organizational relationships, and performance (Bhatt & Grover, 2005).

Information technology and innovation:

Innovation activities are components for organizational growth and development and IT often helps in providing an important function and the same time facilitates the development of innovation (Aboualloush, et al., 2017). IT drives innovation in business and is the path to business success. Business organizations that successfully innovate are known to have adopted IT (Karadal & Saygin, 2011; Mohsin, Bashir, & Latif, 2013; Naidoo & Hoque, 2018; Penalba, Guzman, & Mojica, 2015). Firms that innovate are more efficient, performs better and highly likely to survive (Damanpour & Schneider, 2006; Leal-Rodriguez, Ariza-Muntes, Roldan, & Leal-Millan, 2014).

Innovation and competitive advantage:

Innovations in business practices are changes in workplace organizations or in the company's external relations, while marketing innovations reflect changes in product design, packaging, placement, promotion or pricing (Mairesse & Mohnen, 2010). Thus, CA could be derived from different innovation sources:, such as environmental innovation (Forsman, 2013), human resources management innovation (Amarakoon, Weerawardena, & Verreynne, 2016), knowledge management (Sook-Ling, Choo-Kim, & Abdul Razak, 2013), new product development (Soltani, Ramazanpoor, & Eslamian, 2014), market innovation (Ren, Xie, & Krabbendan, 2010), supply chain (Lau & Hurley, 2001), information systems (Breznik, 2012) or information technology (Sook-Ling, Tee, & Eze, 2013). Studies have shown that innovation influences CA (Aziz & Samad, 2015; Brem, Maier, & Wimschneider, 2016; Dustin, Bharat, Jitendra, 2014; Goksoy, Vayvay, & Ergeneli, 2013; Gupta, Malhotra, Czinkota, & Foroudi, 2016; Lee & Hsieh, 2010; Reed, Storrud-Barnes & Jessup, 2012; Tuan, Nhan, Giang, & Ngoc, 2016; Wong, 2012). It has been established that organizational innovations are necessary for the successful exploitation of new technologies (Teece, 2007) and has strong effects on CA (Aziz & Samad, 2015; Eidizadeh, Salehzadeh, & Esfahani, 2017; Jiménez-Jiménez & Sanz-Valle, 2011; Kising'u, Namusonge, & Mwirigi, 2016).

This study applied the resource-based view (Barney, 1991), the IT capability theory (Wade & Hulland, 2004) and the Roger's (2003) diffusion of innovations theory to explain and analyze firm-level value creation logic across a broad range of industries and firms to the diagnosis of CA.

Theoretical framework and hypotheses development:

Achieving CA begins with an effort to develop deeper organizational expertise in performing certain competitively critical innovation activities, where organizations deliberately attempt to harness those capabilities that strengthen the firm's strategy and competitiveness (Porter, 1985). The proposed model indicates that gaining CA is affected by IT and innovation, which is demonstrated in Figure 1.

IT capabilities, as resources (Barney, 1991) are organizational skills and capabilities related to IT, which enable a firm to leverage and exploit its existing IT assets more successfully (Bharadwaj, 2000; Chae et al., 2014), and IT can affect business processes, inter-organizational relationships, and performance (Bhatt & Grover, 2005). Studies have shown that IT has a significant positive relationship with a CA (Arora & Rahman, 2015; Colin, 2016; Lai, Zhao, & Wang, 2006; Madadipouya, 2015; Tian, Wang, Chen, & Johansson, 2010). However, there was still no consensus among information system researchers on whether IT can provide a sustained CA (Cakmak & Tas, 2012; Carr, 2003; Duliba, Kauffman, & Lucas Jr., 2001; Gunasekaran, et al., 2017). In spite of this, the consensus was that companies with IT capabilities should have resources at their disposal to outperform competitors, as such it was proposed that:

H_1: Information technology has a significant relationship with the competitive advantage of manufacturing companies.

Managing IT is a capability that can create uniqueness and at the same time enhance productivity (Bharadwaj, 2000; Santhanam & Hartono, 2003). Studies have shown that IT enables innovation in products, processes, business models and productivity (Abri & Mahmoudzadeh, 2014; Bartel, Ichniowski, & Shaw, 2007; Chou, Chuang, & Shao, 2014; Satapathy & Mishra, 2013). Thus, the following postulation:

H_2: Information technology significantly relates to innovation of manufacturing companies.

Innovation is a strategy that companies use to create a competitive advantage, producing things that nobody else can, doing things better than everyone else, or introducing superior, cheaper, and faster services (Aziz & Samad, 2015). This strategy enables the organization to create long-term competition by gathering knowledge, skills in technology, and experience in creativity and development and introducing new ideas in the form of innovation, or business model innovation. Several studies have linked innovation to the CA of companies and the relationships are significant (Chatzouglou & Chatzoudes, 2018; Conto, Júnior, Valle, & Vaccaro, 2016; Ionescu & Dumitru, 2015). It was therefore theorized that:

H_3: Innovation significantly relate with the competitive advantage of manufacturing companies.

The relationship between IT and CA was explained by the IT capability theory (Wade & Hulland, 2004) and it was discovered that there existed an association between the two variables (Arora & Rahman, 2015; Cakmak & Tas, 2012; Carr, 2003; Duliba, et al., 2001; Lai et al., 2006; Madadipouya, 2015; Tian et al., 2010). Meanwhile, the variation in the levels of IT accounts significantly for the variations in innovation (Karadal & Saygin, 2011; Mohsin, et al., 2013; Naidoo & Hoque, 2018; Penalba, et al., 2015). Similarly, the variation in the innovation accounts significantly for the variation in CA (Aziz & Samad, 2015; Eidizadeh, et al., 2017; Jiménez-Jiménez & Sanz-Valle, 2011; Kising'u, et al., 2016). The suspicion is that something outside the model is interfering or missing, and it could be organizational innovation. There is, therefore, a possibility that innovation could mediate the relationship between IT and CA. It was for this reason that the model was proposed to determine the mediating role of innovation in the relationship. Thus, it was proposed that:

H_4: Innovation mediates the relationship between information technology and competitive advantage of manufacturing companies.

METHODOLOGY:

Design:

This study adopted the survey research design and it is a cross-sectional examination of members of MAN. The primary data was obtained through the administration of the questionnaire, while the analysis was conducted through the PLS-SEM using the Smartpls 3.0 (Ringle, Wende, & Becker, 2015) software. The analytical procedure, for the stages of the PLS-SEM algorithm, was adopted from (Hair, et al., 2014; Henseler, Ringle, & Sarstedt, 2012).

Population and Sample:

The target population of the study is all manufacturing companies operating in Northern Nigeria (except those in Abuja, due to the absence of manufacturing facilities and the Adamawa/Borno/Yobe branches, due to the ongoing insurgency), registered with MAN as at March 2018. MAN is structured into 11 sectors with five branches and has 225 members in the study area (MAN, 2017). Using Israel (1992) formula for determining sample size, a sample of 144 companies was obtained from the population. Area sampling technique was used to draw samples from the population since the research involves a population within an identifiable geographical area, which is Northern Nigeria.

Measurement and instrumentation:

A 7-point Likert scale questionnaire coded Strongly Disagree (1 point); Disagree (2 points); SomeWhat Disagree (3 points); Undecided (4 points); SomeWhat Agree (5 points); Agree (6 points), and Strongly Agree (7 points) was used to collect the data. The survey instruments for measuring IT was adopted from Grover (1993) and Mishra, Konana, and Barau (2001). The process and product innovation measures were adopted from (Prajogo et al., 2004). To measure CA, the Koufteros, Vonderembse, and Doll (1997) instrumentation was adopted.

FINDINGS AND DISCUSSION:

Two primary software for analysis were used in the study, the IBM Statistical Packages for the Social Sciences (SPSS) version 21, and the PLS-SEM SmartPLS 3.0.

Collinearity diagnosis:

Multicollinearity is a problem associated with a correlation matrix when variables are highly correlated, i.e., 0.90 and above (Tabachnick & Fidell, 2007). As a rule of thumb, predictor variables can be correlated with each other as much as 0.8 before there is cause for concern about multicollinearity. The tolerance value should be high, which means a small degree of multicollinearity, while the variance inflation factor (VIF), should be small. A VIF value of 5 and higher indicate a potential collinearity problem (Hair, Ringle, & Sarstedt, 2011). The highest value was 4.932 (PC3), which shows that the collinearity was not an issue because the values are all less than 5.

Research model:
For the proposed model, the measurement model displays the relationships between the constructs and the indicator variables, while the structural model displays the relationships between the constructs. The IT consisted of 8 items; innovation: Process (2 items), product (4 items); and CA (11 items). However, as a consequence of factor analysis, the following residues were used: IT (7 items), process (4 items), product (3 item), and CA (3 items).

Measurement model:
IT, innovation and CA are modeled as reflective measures, based on (Chin, 1998; Diamantopoulos & Winklhofer, 2001). An examination of the PLS-SEM estimates focuses on understanding how to assess the quality of the results through the evaluation of the reliability and validity of the construct measures. Composite reliability was used to evaluate internal consistency, while the average variance extracted (AVE) was used to evaluate convergent validity. The Fornell-Larcker criterion and cross-loadings were used to assess discriminant validity.

Reliability:
The composite reliability served as the upper bound for the true reliability with the following values: CA (0.924), IT (0.938), and VC (0.861) as shown in Table 1. The results reveal that all the constructs have high levels of internal consistency reliability above the threshold of 0.70 (Nunally & Bernstein, 1994) and therefore confirmed reliability.

Validity:
Content validity:
The factor loading was used to assess the content validity of the constructs in the study as suggested by (Chin, 1998; Hair, Black, Babin, & Anderson, 2010). All items meant to measure a particular construct loaded highly on the construct they were designed to measure, thus confirming content validity (Table 2).

Convergent validity:
Convergent validity was confirmed by examining the composite reliability and the AVE (Table 1). The composite reliability measures are all above the threshold of 0.70 for construct reliability as recommended (Hair et al., 2010). A satisfactory level of convergent validity was also maintained when the AVE values [CA (0.687), IT (0.701), IN (0.626)] are all above the recommended threshold of 0.50 (Wong, 2013). Based on the assessments of the composite reliability as well as AVE values, the measures of the constructs have high levels of convergent validity.

Discriminant validity:
Discriminant validity was examined by following the Fornell-Larcker criterion, which compares the square root of the AVE values with the latent variable correlations, where the square root of each construct's AVE should be greater than its highest correlation with any other construct (Fornell & Larcker, 1981). The discriminant validity is assumed if the diagonal elements are higher than other off-diagonal elements in their rows and columns. As presented in Table 3, the Fornell-Larcker criterion provides evidence for discriminant validity. Alternatively, an assessment of the cross-loadings (Table 2) shows that an indicator's loading on a construct was higher than all of its cross-loadings with other constructs, thus further confirming discriminant validity.

Structural model and hypotheses testing:
Once reliability and validity were confirmed, the constructs are therefore suitable for inclusion in the path model. Thus, the next step involves examining the model's predictive capabilities and the relationships between the constructs.

Path coefficients coefficient of determination (R^2):
The path coefficient represents the hypothesized relationships linking the constructs, and the values are standardized on a range from – 1 to + 1, with coefficients closer to + 1 representing strong positive relationships and coefficients closer to – 1 indicating strong negative relationships (Hair et al., 2014). The R^2 is a measure of the model's predictive accuracy and represents the exogenous variable's combined effect on the endogenous variables. This effect ranges from 0 to 1, with 1 representing complete predictive accuracy, while values of 0.75, 0.50, and 0.25 represent substantial, moderate and weak effects respectively (Hair et al., 2011; Henseler, Ringle, & Sinkovics, 2009). As shown in Figure 2, the R^2 values obtained for innovation (0.362) and CA (0.330) indicate

relatively moderate effects. Based on the results, the exogenous latent variables had different effects on the endogenous construct. Thus, with the path coefficient value of 0.596, innovation had the largest effect on CA, compared to the IT (0.019).
A bootstrapping procedure was used to assess the path coefficients' significance at 5000 minimum bootstraps, and the critical t-values for a two-tailed test is 1.96 at 5% significant level. Thus, when the empirical t-value is larger than the critical value, the coefficient is significant at the stated significant level. As shown in Table 4, the paths: IT —> CA (5.699); IT —> IN (9.599); and IN —> CA (9.949) have coefficient values larger than the critical value.

Predictive relevance of the model (Q^2):
To assess the predictive power of the model, R^2 and cross-validated redundancy were utilized. The values of the cross-validated redundancy were obtained by running the blindfold procedure to generate the communality and redundancy at 300 maximum iterations, a stop criterion of $1{\cdot}10^{-5}$ (0.00001) and an omission distance of 7. The predictive power of the model was based on Cohen's (1988) guidelines [0.26: substantial; 0.13: moderate; 0.02: weak]. A model is considered to have predictive quality if the cross-validated redundancy values were found to be more than zero, otherwise, the predictive relevance of the model cannot be confirmed (Fornell & Cha, 1994). The cross-validated redundancy of the endogenous variable was greater than zero, therefore, the hypothesized model indicates good overall substantial predictive power, since the Q^2 value of 0.266 was positive, in line with (Hair et al. 2014; Henseler et al., 2009).

Innovation as a mediator:
Mediation focuses on a theoretically established direct path relationship on an additional theoretically relevant component, which indirectly provides information on the direct effect through its indirect effect (Hair et al., 2014). Following the recommendations of Baron and Kenny (1986), the (Preacher & Hayes, 2004, 2008) procedure was adopted, and the sampling distribution of the indirect effect was bootstrapped. The direct effect of IT on CA had a coefficient of 0.347, while the indirect effect via innovation had a value of 0.193 (0.700*0.275). Thus, the total effect had a value of 0.540 (0.347+0.193). The VAF is the direct effect divided by the total effect and had a value of 0.193/0.540 = 0.360. VAF can have values less than 20%, which indicates no mediation and the value can be above 80%, which indicates full mediation; when the VAF is larger than 20% but less than 80%, the mediation is partial (Hair et al., 2014). Based on the VAF value of 0.360 (36%), innovation as a mediator had a partial mediation effect on CA.

Hypotheses testing:
The research model developed to predict the relationship between the IT, innovation and CA was a two-tailed test that was guided by two hypotheses at a 5% level of significance. Based on the results of the study achieved through PLS-SEM statistical procedure as shown in Table 4, it was discovered that:

1. IT had a positive, direct and significant relationship with CA ($\beta = 0.378$, $t = 5.699$, $p = 0.000$). Thus, the alternate hypothesis was accepted.
2. IT had a positive, direct and significant relationship with innovation ($\beta = 0.602$, $t = 9.559$, $p = 0.000$). Thus, the alternate hypothesis was accepted.
3. Innovation had a positive, direct and significant relationship with CA ($\beta = 0.596$, $t = 9.949$, $p = 0.000$). Thus, the alternate hypothesis was accepted.
4. Innovation partially (VAF = 0.360) mediated the relationship between IT and CA of manufacturing companies, with a positive, direct and significant relationship ($\beta = 0.359$, $t = 6.947$, $p = 0.000$). Thus, the alternate hypothesis was accepted.

Summary of findings:
Based on the results of the analysis, the following were the findings:

i. IT had a significant effect on the CA of manufacturing companies in Northern Nigeria.
ii. IT had a significant effect on innovation of manufacturing companies in Northern Nigeria.
iii. Innovation had a significant effect on the CA of manufacturing companies in Northern Nigeria.
iv. With a VAF value of 36%, innovation partially mediated the relationship between IT and CA of manufacturing companies in Northern Nigeria.

Discussion:
The broad objective of the study was to consider the mediation effect of innovation on the relationship between IT and CA of manufacturing companies and the results of the study obtained through PLS-SEM statistical procedure, as indicated in Figures 2 and Table 4, underscores the importance of the mediation relationships and the implications therein.

Information technology and competitive advantage:
The objective was to examine the relationship between IT and CA of manufacturing companies. It was therefore hypothesized that IT would significantly affect the CA of manufacturing companies. It was discovered that the relationship (β = 0.378, t = 5.6990, p = 0.000) was positive, direct and significant. For every unit increase in IT, there would be a 37.8% increase in CA. Therefore, IT capabilities, which is the ability of a firm to mobilize and deploy IT -based resources in combination with other resources and capabilities, could be used to gain a CA for manufacturers. The result of this study supported the alternate hypothesis and in agreement with the results of other studies (Arora & Rahman, 2015; Colin, 2016; Lai et al., 2006; Madadipouya, 2015; Tian et al., 2010).

Information technology and innovation:
The objective was to determine the relationship between IT and innovation of manufacturing companies. Thus, it was theorized that IT would significantly affect innovation of manufacturing companies. Results showed that the relationship (β = 0.602, t = 9.559, p = 0.000) was positive, direct and significant. Thus, every unit increase in IT increases innovation by 60.2%. Therefore, IT capabilities, which is the ability of a firm to mobilize and deploy IT -based resources in combination with other resources and capabilities, could be used to improve innovativeness for manufacturers. The findings supported the alternate hypothesis and in agreement with the outcomes of other studies (Abri & Mahmoudzadeh, 2014; Bartel, et al., 2007; Chou, et al., 2014; Satapathy & Mishra, 2013).

Innovation and competitive advantage:
The objective was to evaluate the relationship between innovation and CA of manufacturing companies, and it was postulated that innovation would significantly affect CA of manufacturing companies. It was discovered that the relationship (β = 0.596, t = 9.949, p = 0.000) was positive, direct and significant. A unit increase in innovation would yield a 59.6% increase in CA. By implication, the activities involved in process and product innovation can be geared towards gaining CA for manufacturers. This finding supports the hypothesis and consistent with the results of (Aziz & Samad, 2015; Eidizadeh, et al., 2017; Jiménez-Jiménez & Sanz-Valle, 2011; Kising'u, et al., 2016).

Mediation effect of innovation:
The objective was to examine the mediating effect of innovation in the relationship between IT and CA of manufacturing companies. It was discovered that the relationship (β = 0.359, t = 6.947, p = 0.000) was positive, direct and significant. Directly and indirectly, the relationship between IT and CA was found to be significant. With a VAF value of 0.36, innovation as a mediator has a moderate effect on CA as it relates with IT, accounting for 36% of the variance. This implies that IT can influence a manufacturer's ability to gain CA through the effective and efficient management of both process and product innovation.

CONCLUSION AND RECOMMENDATIONS:

Results obtained indicated that both IT and innovation have positive and significant effects on the CA of manufacturing companies. Furthermore, innovation was found to partially mediate the relationship between IT and CA. Innovation can, therefore, be said to play a positive role in supporting manufacturing companies to gain a CA. It was therefore recommended that managers of manufacturing companies should encourage individuals within their organizations to be innovative, both in process and products, as it will better support their abilities to gain CA.

IMPLICATIONS, LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH:

Based on the findings, to gain CA, manufacturing companies require much more than the procession of IT capabilities; process and product innovative activities have to be efficiently and effectively managed. A notable limitation of the study was the PLS bias, which relates to the assessment of model fit and consistency of the parameter estimates. Scholars should confirm the model, and then consider ways of improving the model.

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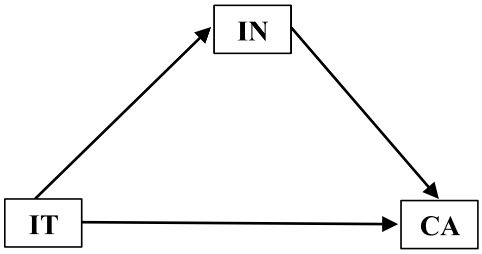
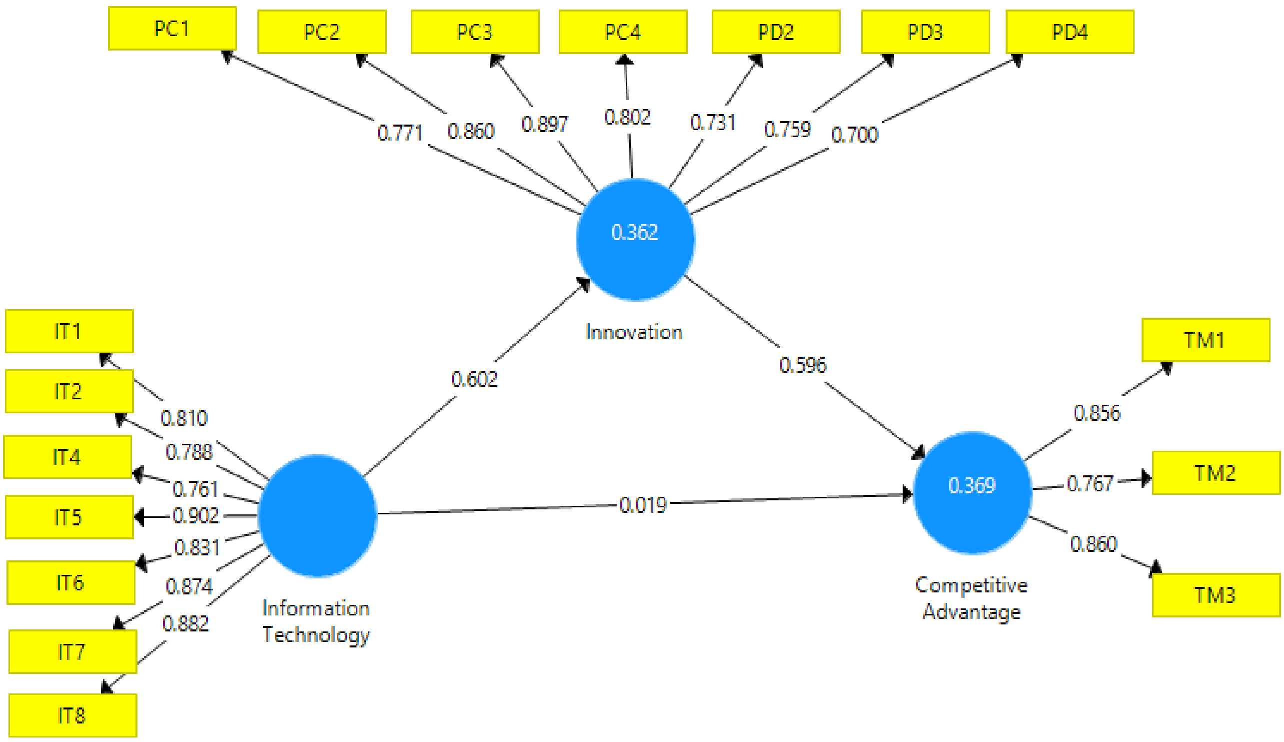
FIGURES:

Figure 1: Theoretical Framework



IT: Information Technology; **IN:** Innovation; **CA:** Competitive Advantage

Figure 2: Path Coefficient and R^2



TABLES:

Table 1: Measurement Model Evaluation

Constructs	Composite Reliability	AVE
Competitive Advantage	0.868	0.687
Information Technology	0.942	0.701
Innovation	0.921	0.626

Table 2: Cross Loading of Items

Items	CA	IT	IN
TM1	0.856	0.338	0.534
TM2	0.767	0.368	0.352
TM3	0.860	0.263	0.579
IT1	0.353	0.810	0.541
IT2	0.384	0.788	0.448
IT4	0.193	0.761	0.368
IT5	0.318	0.902	0.500
IT6	0.281	0.831	0.433
IT7	0.255	0.874	0.534
IT8	0.378	0.882	0.632
PC1	0.380	0.352	0.771
PC2	0.524	0.474	0.860
PC3	0.577	0.454	0.897
PC4	0.596	0.561	0.802
PD2	0.336	0.354	0.731
PD3	0.246	0.522	0.759
PD4	0.554	0.544	0.700

Table 3: Discriminant Validity

	CA	IT	IN
CA	0.829		
IT	0.378	0.837	
IN	0.607	0.602	0.791

Table 4: Hypotheses Testing

	R/ships	Beta	t-value	p-values	Decision
H_1	IT –> CA	0.378	5.699	0.000	Supported
H_2	IT –> IN	0.602	9.559	0.000	Supported
H_3	IN –> CA	0.596	9.949	0.000	Supported
H_4	IT –> IN –> CA	0.359	6.947	0.000	Supported
