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Infrastructure Operation Capability and Resilience of Domestic Airlines In Nigeria: Does Managerial Proactiveness Matter?

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Abstract

Resilient organisations continue to function no matter the odds, and adjust their internal mechanisms to have strategic fit with the business environment. Prior studies investigated the nexus between diverse variables and organisational resilience. Yet, there is scant empirical literature on the causal relationship between infrastructure operation capability and organisational resilience, with managerial proactiveness as a boundary condition; using domestic airlines in Nigeria as organisations of interest. Infrastructure operation capability was used as the independent variable, while the dependent variable, organisational resilience, was bifurcated into robustness and adaptability. It was postulated that infrastructure operation capability significantly promotes organisational resilience (robustness and adaptability); and managerial proactiveness significantly amplifies this relationship. Questionnaire was administered to 58 Managers and senior IT staff drawn from 6 domestic airlines. Quantitative data were obtained from 36 usable copies of the questionnaire. Descriptive statistics were generated with the aid of the SPSS version 22.0, while the Partial Least Square - Structural Equation Modeling was deployed to test the measurement and structural aspects of the model, via SmartPLS 3.2.6. Findings reveal that infrastructure operation capability amplifies robustness and adaptability, while managerial proactiveness positively moderates the relationship between operation capability and the two facets of organisational resilience. The study recommends that domestic airlines in Nigeria should improve information system infrastructure and top executives should encourage proactiveness at the workplace. The study suggests that the model should be tested in other sectors with moderating variables such as size of investment in information system infrastructure, organizational structure and culture.

Keywords: Infrastructure operation capability, organisational resilience, managerial proactiveness

1. Introduction

Organisational resilience has continued to attract the attention of managers and policy makers because of its contribution to performance (Mitroff, 2005), stability, and competitiveness of business entities and systems (Chaskin, 2008). Moreover, organizations increase their chances of navigating uncertainties, finding opportunities and mitigating shocks due to their resilience (Knight and Pretty 1997). Organisations are resilient by being robust (Tierney 2003; Hale & Heijer 2006) and adaptive (Vogus & Sutcliffe, 2008). Through robustness, organisations maintain their functions no matter the harm done to them by environmental factors (Durodie, 2003). Moreover, adaptability translates to the capacity of systems to adjust their internal operations and structures to have a strategic fit with the chaotic business environment (Walker, Holling, Carpenter & Kinzig , 2004).

Infrastructure operation capability empowers firms to perform tasks on a routine basis using repeated methods and scales in order to provide backup for current products and services, and for the same set of consumers (Helfat & Winter, 2011). It is also the extent to which IT infrastructure, such as computers software and digital platforms, are used and shared (Duncan 1995) to support business activities and integrate all segments of the business (Basu & Blanning 2003). Through Infrastructure operation capability, timely, reliable, adequate and secure information is acquired in line with prevailing business trends (Bharadwaj, 2000). Infrastructure operation capability is salient to organisations that wish to maintain connection and share information with customers, suppliers, vendors and other stakeholders (Davenport 1993).

Managerial proactiveness is the propensity of a manager to take personal initiative and fervently search in advance for new opportunities and information in order to introduce new products, methods, techniques and services for the organisation before competitors make similar move (Venkatraman 1989; Frese & Fay, 2001). Proactive managers change the internal business environment and create opportunities for the organisation (Bateman & Crant, 1993), and contribute to firm's innovation, competitiveness and success (Belschak & Den

Hartog, 2010). Coincidentally, resilience requires the anticipation of changes in the business environment and harvesting positively from emergent opportunities through the introduction of new services or technology (Lumpkin & Dess 1996; Hamel & Valikangas 2003). Since these actions are carried out by managers, it implies that managerial proactiveness is an important factor in promoting organizational resilience.

Extant studies on organisational resilience paid attention to its relationship with constructs such as supply chain management (Gunasekaran, Subramanian, Rahman, 2015), firm performance (Chu, 2015), knowledge management (Umoh & Amah, 2013), human resource system (LengnickHall, Beck, & Lengnick-Hall, 2011; Umoh, Amah & Wokocha, 2014), structure and culture (McManus, Seville, Vargo & Brunsdon, 2008). However, there seems to be paucity of literature on the relationship between infrastructure operation capability (which is a construct under Information System) and organisational resilience, especially in a developing country like Nigeria. Moreover, this chasm in literature was pointed out by Koslowski (2014) who says that organisational resilience deserves new streams of scholarly inquiries within the context of Information system. Besides, it appears that there is dearth of empirical studies regarding the moderating role of managerial proactiveness on the relationship between infrastructure operation capability and organisational resilience, especially in the Nigerian Aviation Industry.

Domestic airlines in the Nigerian aviation industry have been tottering on the edge of extinction (Faajir & Zidan, 2016). In fact, only nine out of the one hundred and fifty airlines that registered with the Nigerian Civil Aviation Authority are in operation (Olukoya, 2017). Generally, domestic airlines seem to have low level of robustness and adaptability since they find it difficult to maintain their functions during and after crises, such as economic recession, crashes and stiff competition. The low level of robustness and adaptability of the sector is evidenced by dwindling profitability, baggage delays, flight delays, cancelations and corporate death (Daramola, 2014; Eke, 2016; Ripples Nigeria).

We posit that management information system infrastructure operation capability is a potential promoter of organizational resilience because it assists managers in monitoring the use of resources; connecting and assimilating new locations, platforms or acquisitions and transmitting various classes of information to end users on real time basis. This argument is premised on the submission of Bhatt, Emdad, Roberts and Grover (2010) that the flexible information system infrastructure builds information which directly amplifies the capacity of organizations to respond to changing business situations.

In harmony with this view, Byrd and Turner (2000) argued that information system infrastructure is a rapid response platform for organisations to neutralize the actions of competitors. Specifically, we argue that firms will continue to function and adjust their internal mechanisms to have strategic fit with the business environment, and achieve their stated goals and objectives due to increased capabilities of the infrastructure in use. It is therefore expected that higher levels of infrastructure operation capability could increase the resilience of domestic airlines in Nigeria. This study, therefore, investigates the organisational resilience of domestic airlines in Nigeria through the lens of infrastructure operation capability. The study also investigates the moderating role of managerial proactiveness on the relationship between the chosen constructs.

Conceptual framework of the study

Based on the foregoing, a conceptual framework is developed as shown below.

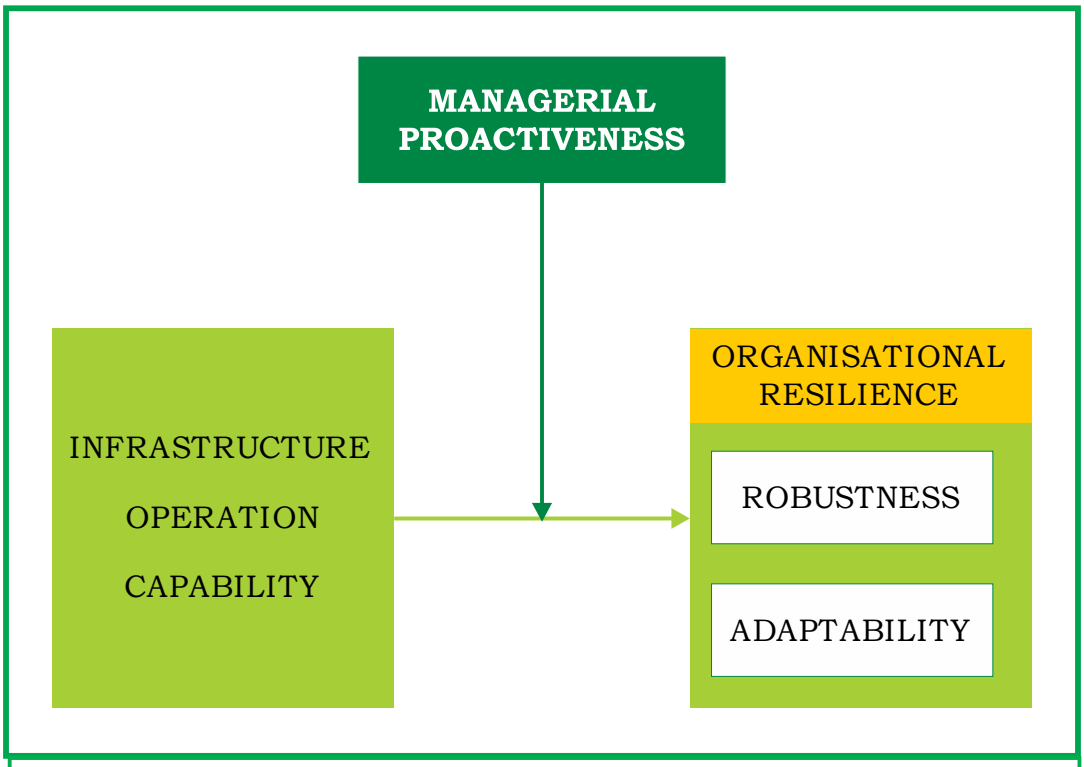

Figure 1.1: *Conceptual Framework of the study. Infrastructure Operation Capability adapted from Byrd, Lewis & Turner (2004); Ravichandran and Lertwongsatien (2005). Measures of Organisational Resilience adapted from Thao, T.P. (2012); Kantur & Iseri-say(2015). Moderating variable adapted from Byrd, Lewis & Turner (2004).*

Figure 1.1 indicates that infrastructural operation capability is the exogenous construct, while organisational resilience (decomposed into robustness and adaptability) is the target (endogenous) construct.

The following hypotheses are hereby stated for investigation:

H_{O1}: Higher levels of infrastructural operation capability significantly promote robustness.

H_{O2}: Increase in infrastructural operation capability will significantly amplify adaptability.

H_{O3a}: There is a significant relationship between managerial proactiveness and robustness.

H_{O3b}: Managerial proactiveness significantly enhances adaptability.

H_{O3c}: Managerial proactiveness significantly moderates the relationship between infrastructural operation capability and robustness.

H_{O3d}: Managerial proactiveness significantly moderates the relationship between infrastructural operation capability and adaptability.

The rest of the paper is pertains to literature review; methodology; data analysis, results and discussion; and conclusions and recommendations as well as limitations and suggestions for future research directions.

2. Literature review

2.1. Baseline Theories

2.1.1 *Socio-Technical Systems Theory*

The Socio-Technical Systems Theory (Trist & Bamforth, 1951; Emery & Trist, 1960) explains the interconnection between an employee, machine and the work condition. The theory points out that work settings have both social and technical components. Social components are the skills, knowledge, experience, aptitude, attitude, values and world-view of the employees which they take to the workplace, including organisational culture, reward system and organisational structure (Clegg, 2000). Information infrastructure (technology and artefacts) is part of technical subsystems that interact with the social component to process information (Lyytinen & Newman, 2008).

This theory suggests that the full benefit of a system will be harvested when managers consider the interrelationship and interdependence between the social and technical subsystems during decision making (Chern, 1986). Moreover, joint optimisation is achieved when the information infrastructure is designed in sympathy with social requirements. Also, a well designed socio-technical system empowers managers to deal with environmental disruptions and facilitate information exchange among members and managers.

2.1.2 *The Theory of Dynamic Capabilities*

The theory of dynamic capabilities stresses that organisations are able to achieve both their short term and long term goals when they "integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, Pisano & Shuen, 1997). According to Zollo and Winter (2002), "a dynamic capability is a learned and stable pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness". Thus, managerial dynamic capability is a manager's learned ability to decipher environmental cues and take proactive steps to side-step threats or seize opportunities for the achievement of corporate objectives.

These steps entail sensing imminent changes in the external environment, seizing emergent opportunities and mitigating shocks as well as taking the necessary actions to create organisational prosperity. Moreover, dynamic capabilities are context specific and expressed endogenously from organisational assets, evolutionary trajectory and managerial activities (Teece, Pisano et al. 1997). Organisations that have dynamic capabilities can adapt their information assets and other resources, such as managerial expertise, and exploit opportunities that emanate from environmental disturbances and varieties.

An example of dynamic capability is the recognition of technological innovations, changes in consumers' tastes/ preferences, twists in government policy and macroeconomic trends, strategic moves of rivals, and briskly adjusting resources to maintain a state of acceptable state or satisfy demand conditions.

2.2. Organisational Resilience

Resilience was introduced into organisational literature by Staw, Sandelands and Dutton (1981) and Meyer (1982) who borrowed Campbell's (1969) "variation and selection retention theory in evolution" to explain the response capacity of organisations in a dynamic business environment.

Organisational resilience is the capacity of an organistaion to anticipate disruptions, survive shocks from the business environment, learn from negative outcomes, reconfigure resources and adapt to continue to function and respond quickly to threats and opportunities. Resilient organisations generate varieties that surpass the varieties from the environment, hence having control over their processes, structures and functions (Limnios, Mazzarol,Ghadouani & Schilizzi, 2014). Resilient organisations cope with disturbances and uncertainties through structural adjustment and control mechanisms (Pfeffer 1978), learning (Carroll 1998; Weick et al. 2005), creativity (Kendra & Wachtendorf 2003) and adaptability (Vogus & Sutcliffe, 2008). Also, literature about resilience presents it as the ability to bounce back from crises by being rugged or robust (Hale & Heijer 2006).

2.2.1 Measures of Organisational Resilience

Organisational resilience suffers from semantic pluralism, hence it has multiple connotations and measures. Organisational resilience has been conceptualized as a property that comprises community, competence, connections, commitment, communication, coordination, and consideration (Horne & Orr, 1998). It is also

viewed as an expression of diversity, efficiency, adaptability, cohesion (Fiksel, 2003), competence, flexibility, malleability, convertible and restorative efficacy (Vogus & Sutcliffe, 2007). Moreover, organisational resilience is reported as a manifestation of robustness, redundancy, resourcefulness and rapidity (Tierney, 2003).

Furthermore, McManus, Seville, Brunsdon & Vargo's (2008) dimensionalised organisational resilience into "situation awareness, management of keystone vulnerabilities, and adaptive capacity", while Lee, Vargo and Seville (2013) extended McManus et al''s (2008) model and concluded that adaptive capacity and planning are representatives of organisational resilience. Also, Akgün and Keskin (2014) submit that organisational resilience is a function of "competence orientation, deep social capital, original/unscripted agility, practical habits, behavioural preparedness and broad resource networks". Moreover, Kantur and Iseri-Say (2015) identified robustness, agility and integrity as measures of organisational resilience, while Chu (2015) recommended anticipatory ability, agility, adaptability and flexibility as the archetypes of organizational resilience. Lastly, (Sylva, 2018) identified anticipatory ability, robustness, adaptability and agility as the four most repeated measures of organisational resilience.

This study shall focus on robustness and adaptability as the target variables for investigation.

2.2.1.1 Robustness

According to Bankes (2010), robustness is the capacity of a system “to withstand or survive external shocks, to be stable in spite of uncertainty” (p. 2). Also, Jen (2003) defines robustness as the “ability of a system to withstand perturbations in structure without change in function” (p. 14). Thus, a robust organization retains or maintains its functional characteristics in the event of perturbations or sudden shocks and crises. Robustness is fashioned out of the need to survive the harsh realities of a dynamic and chaotic industry environment. It is forged and embedded in the organisation’s DNA, and not necessarily the outcome of deliberate reconfiguration of internal processes, policies, programs, structure, strategy, technology, assets, infrastructure and culture. Thus, robustness is a characteristic of the organisational mechanisms that empowers a system to adapt or regain cybernetic stability after passing through distress or change. A robust organisation may be battered but does not bow to the vagaries of the business environment.

2.2.1.2 Adaptability

Adaptability is the ability of an organisation to integrate its stock of knowledge, experience and expertise to make internal adjustments as a response to changes in the corporate environment (Berkes et al. 2003). Adjustments and reconfigurations are made in strategy, information systems, allocation patterns, structures and policies to accommodate changes in customer tastes, economic fluctuations, demand pressures, supply chain disruptions and other contingencies (Moorman & Miner, 1997). Adaptive firms have a welter of solutions to variety of problems (Walker, et al., 2006).

Furthermore, adaptability is not just about making adjustments in the internal mechanisms or compositions of a system but also pertains to creating favourable outcomes from chaos (Child, 1997). Adaptive firms create promotion from commotion. Depending on the need, they can convert functional structure to matrix structure or apply proactive regulation instead of reactive regulation. Adaptable organisations are risk-takers, readily get feedback from mistakes, and create platforms for organisational renewal. Organisations display adaptability by ensuring that system infrastructure design incorporates high level redundancy to secure continuous functioning.

From the foregoing, adaptability could mean the ease with which organisations redesign and readjust existing business processes and operations, create new business processes, launch new products/services and technology, switch between suppliers, establish new supply chain partnerships, change the type of resources that they acquire from suppliers and reconfigure resources to meet changing needs of customers.

2.3. Infrastructure Operation Capability

Information system infrastructure operation capability is the combined set of support characteristics of the IS infrastructure (e.g. computers and shared devices) for applications in use and organisational processes (Weill, Subramani & Broadbent, 2002). Specifically, infrastructure operation capability is the ability of the IS infrastructure to provide reliable, accurate, timely and secure information for end users. It can also be viewed as the ability of the infrastructure to address the overarching needs of the firm as well as the extent to which infrastructure adds value to the strategic moves of the organisation (Santhanam & Hartono, 2003).

It means that high levels of information system infrastructure operation capability will deliver real-time decision support for managers and optimize satisfaction of customers and stakeholders, effectively connect firms to other firms, suppliers, customers and partners, and enhance business value within the organisation (Weill et al, 2002). This connectivity provided by infrastructure operation capability further enhances other forms of dynamic capabilities, increases organisational adaptability and reduces the cost of information transfer (Ravichandran & Lertwongsatien, 2005).

2.4. Managerial Proactiveness

Generally, proactiveness is a strategic orientation (Venkatraman, 1989) characterized by personal initiative (Frese, Kring, Soose, & Zempel, 1996) and active search for information to create visible changes in the work environment (Parker & Collins, 2010). According to Frese and Fay (2001), individual proactiveness "means dealing actively with organisational and individual problems and applying active goals, plans, and feedback. This furthers individual self-development and contributes to organizational success" (p.165). Thus, managerial proactiveness is a non-obligatory, self-initiated work behavior exhibited by managers which aims at seeking opportunities to introduce new offerings ahead of rival firms, or creating change within the organisation. Such managers take initiatives on how tasks could be carried out, continuously innovate and seek feedback, demonstrate voice behaviours and blow the corporate whistle.

Furthermore, proactive mangers rigorously pursue organisational goals (Higgins, 1997), prevent corporate obstacles and stressors, and ensure that problems solved do not reoccur. They respond swiftly to customers inquiries, discourage the use of dysfunctional infrastructure, introduce new work methods and reward systems, collaborate with employees and stakeholders to prevent failure, and create sweeping changes to ensure business continuity. In this study, managerial proactiveness means (i) self-directed behavior or initiative to collaborate with IT personnel and vendors in developing Information System solutions,(ii) monitoring of current trends in Information Systems and seize emergent opportunities,(iii) preparing ahead and quickly adjusting internal systems when required to enhance IT applications and (iv)identifying problems early to take preventive actions.

2.5. Empirical Review

Yoshikuni and Albertin (2017) investigated the impact of IT-enabled dynamic capability on performance in a survey of 845 Brazilian organisations under economic perturbation, using the balanced scorecard perspective. A partial least squares path analysis revealed that the operational and analytical measures of IT-enabled dynamic capability amplified business process improvement and firm performance. These authors concluded that IT-Enabled Dynamic Capability enables managers to understand customer needs, make timely delivery of services, and retain customer base.

Mithas, Ramasubbu and Ramasubbu (2011) studied the effect of Information Technology (IT) management capabilities on the performance of 134 firm and business units. Using archival data for regression analysis, it was found that IT infrastructure and information management capability enhance other capabilities which leads to improved firm performance. Specifically, under a one tailed test, IT infrastructure capability was found to promote customer and market focus ($t=1.50$; $p<.10$), process management ($t =2.15$; $p<.05$), and performance management (coef=0.325, $t=4.48$; $p<.01$).

Oh and Teo (2006) studied the effect of information technology capability and managerial proactiveness on organisational resilience in 125 net-enabled retail organizations. These authors used a partial least squares structural equation modeling approach to test the model and found that information technology capability and managerial proactiveness both correlate positively with organisational resilience. ($b = 0.43l$, $p < 0.001$ and $b = 0.308$, $p < 0.001$, respectively) and explained the variance in organizational resilience by 37.8 percent. These authors further explained that "an integrated IT infrastructure across the organisation links various units and provides a seamless flow of accurate, consistent, and timely information to employees and customers. Information is the key to formulating IT-enabled strategies for competing in turbulent environments. Hence, high level of IT capability is a prerequisite to provide the foundation for developing core organizational competences" (p.46). Also, managerial proactiveness was viewed as a resilience inducing characteristic since it is "an entrepreneurial orientation for executing managerial foresight to seize new opportunities in the competitive retailing environment (ibid).

Furthermore, Felipe, Roldán and Leal-Rodríguez (2016) studied 2360 high and medium-high technology Spanish firms through off-line survey to ascertain the impact of information systems capabilities on organisational agility. Using data from 172 usable surveys, the authors employed the partial least squares- SEM

and the PROCESS macro approach, and found that information systems capabilities significantly explained variation in organisational agility by 64%.

3. Methodology

3.1. *Population and Sampling Method*

The population for the survey is all the domestic airlines in Nigeria. The Nigerian Civil Aviation Authority (2015), shows 30 air operators of which Twenty eight (28) operators are active, 1 operator is inactive while another 1 has expired. However, only eight airlines were chosen as the sample frame because they are the only domestic airlines that operate commercial flights for the general public, while others operate chattered and special-client flights. Six of the eight airlines that have branches in Lagos, Abuja and Port Harcourt indicated interest in the study, and so all their managers and IT staff were considered as sample of the study. This gave rise to a sample size of fifty eight (58) workers.

3.2. *Data collection, Questionnaire Design and Instrumentation*

The study involved primary and secondary methods of data collection. The secondary data were obtained from company records, journals and government publication, while primary data were obtained from responses of the structured questionnaire administered on the subjects. Out of the 58 copies of the questionnaire distributed, 36 (which represent 62.1%) were properly filled and returned, and used for manipulation.

The questionnaire consists of four sections. Section A contains seven items which elicit demographic information of the respondents, which include gender, age, marital status, highest level of educational attainment, position in the organisation and years of experience in the organisation. Section B has 6 measurable items relating to infrastructure operation capability, which were adapted from Byrd, Lewis and Turner (2004) – e.g. *Information System Infrastructure assists the activity of monitoring the use of resources.* . Section C has 10 observable indicators for Organizational Resilience, 4 of which are for robustness while 6 are for adaptability. The four items for robustness (e.g. *Does not give up and continues its path*) were adopted form Kantur and Iseri-Say (2015). The first five items on adaptability (e.g. *Easily redesign and readjust existing business processes and operations*) were adapted from Thao (2012), while the 6th item (*Easily reconfigure resources to meet changing needs of customers/passengers*) was developed by the researchers, based on theoretical exposure. Section D contains four manifest indicators describing managerial proactiveness. Items 1-3 (e.g. *Managers are self-directed and take initiative to collaborate with IT personnel and vendors in developing Information System solutions*) were adapted from Byrd, Lewis and Turner (2004), while the 4th item (*Managers identify problems early and take preventive actions)* was developed by the researchers because it is deemed to nuance the construct. Apart from the demographic variables, all other items in the survey instrument were anchored on a five-point Likert scale of 1=Strongly Disagree to 5=Strongly Agree.

3.3. *Data analysis Techniques*

The sample characteristics and nature of the data were analysed using means and standard deviation, skewness and kurtosis with the aid of the Statistical Package for Social Science (SPSS) version 22, while the Partial Least Square- Structural Equation Modeling was used to analyze the measurement aspects of the constructs as well as the hypothesized relationships, with the aid of Smart PLS 3.2.6 (Ringle, Wende, & Becker, 2015). Partial Least Square (PLS) – Structural Equation Modeling (SEM) has been used extensively in management information system studies (e.g. Penga & Lai, 2012) and has the advantage of placing minimal demand on sample size or normality of data (Fornell & Bookstein, 1982). Moreover, PLS-SEM can estimate multiple interaction effects (Sarkar, Echambadi, & Harrison, 2001) and maintains robustness even when data are ordinal in nature (Hair Jr., Babin & Krey, 2017).

4. Data Analysis, Results and Discussion

4.1 *Demographic Characteristics of respondents*

A total of 58 Copies of the survey instrument was administered to managers and IT staff of the six domestic airlines that indicated interest in the study. Thirty six (36) copies of the questionnaire were returned which represents 62.1% response rate. These copies of the instrument were properly filled by the respondents and so were used for analysis. Moreover, a response rate of 62.1% is sufficient for analysis and to make valid conclusions (Fincham, 2008). Table 4.1 below shows the demographic characteristics of the respondents.

Table 4.1 : Demographic characteristics of Respondents

		Frequency	Percentage	Valid Percent	Cumulative Percentage
Gender	Male	25	69.4	69.4	69.4
	Female	11	30.6	30.6	100.0
Age	20-35	12	33.3	33.3	33.3
	36-50	22	61.1	61.1	94.4
	51 – Above	2	5.6	5.6	100.0
Marital Status	Single	6	16.6	16.6	16.6
	Married	26	72.2	72.2	88.8
	Separated	2	5.6	5.6	94.4
	Divorced	2	5.6	5.6	100.0
Educational Attainment	WAEC-OND	3	8.3	8.3	8.3
	HND/B.SC	24	66.7	66.7	75.0
	Masters Above	9	25	25	100.0
Position in the Organisation	Managers	4	11.1	11.1	11.1
	Supervisors	8	22.2	22.2	33.3
	Unit Heads	15	41.7	41.7	75.0
	Inspectors	9	25	25	100.0
Years of experience in Organisation	0-5	14	38.9	38.9	38.9
	6-10	17	47.2	47.2	86.1
	11 and above	5	13.9	13.9	100.0
	Total	**36**	**100.0**	**100.0**	

Source: Research Data (SPSS Output), 2018

Table 4.1 indicates the demographic details of the 36 respondents that participated in the study. For gender distribution, result shows that 25 respondents (69.4%) were males while 11 (30.6%) were females. For age distribution, respondents within 36–50 age brackets were in majority with 22 respondents (61.1%), while those who are 51years and above were the minority recording only 2 (5.6%). Those who are between the age bracket of 20-35 were 12 which represent 33.3% of the total number of respondents. For marital status, 26 respondents (72.2%) were married, 6 (16.6%) were single, 2 (5.6%) were separated, while 2 (5.6%) were divorced. On highest level of educational attainment, 24 respondents (66.7%) have Higher National Diploma and Bachelor Degree, 9 respondents (25%) have Master Degree and above, while 3 respondents (8.3%) have The West African School Certificate and Ordinary National Diploma. Moreover, with respect to position in the organisation, there are 15 unit heads, representing 41.7% of the total number of respondents, 9 (25%) inspectors, 8 (22.2%) supervisors and 4 (11.1%) managers. For years of experience in the organisations, 17 respondents representing 47.2% have worked in their organisations for 6-10 years, 14 (38.9%) have worked for 0-5 years, while 5 respondents, representing 13.9% have worked in their organisations for 11 years and above.

Thus the results in table 4.1 indicate that there more males in the Nigerian domestic airlines at both the middle and managerial levels. This may be because the Nigerian society is male dominated (Amadi, 1982) where males are encouraged through promotion to meet up their bread-winning roles, whereas women are to stay at home as helpers of parents or as housewives. Moreover, it could be that most women resign when they are promoted to the middle and managerial cadres because there may be conflict between their jobs and family roles (Kulik, 1998).

Also, majority of the respondents are between thirty six and fifty years old. Hence, most of the managers are at their vibrant years, with few getting close to retirement age. Workers in such firms must have spent a long time to obtain a degree, search for job and grow on the job. Thus, most employees clock up to thirty six years before they assume managerial position.

Furthermore, most of the respondents are married, followed by single, separated and divorced. Culturally, not getting married when one is gainfully employed and at a ripe age signifies irresponsibility. Thus, most respondents are married because they may want to be classified as responsible workers.

Also, nearly all the respondents have attained educational levels ranging from bachelor degree to master and above. The implication is that a large proportion of the respondents are adequately educated and thus may possess higher levels of abstract thinking; which may have enabled them to easily understand the survey instrument and respond appropriately. Domestic airlines are high reliability organisations which must recruit well educated employees with sound intellectual background and expertise, to carry out organisational tasks and responsibilities.

Table 4.1 also reveals that most of the respondents are unit heads, followed by inspectors, supervisors and small proportion at the managerial level. This means that the Nigerian aviation industry is heavy at the middle. Majority of the operational tasks in this sector do not require the attention of senior managers before they could be accomplished. It seems majority of the middle level managers, if properly trained, could perform tasks adequately just the way senior managers could do. Also, the prevailing structure may not be unconnected to a deliberate attempt to reduce the total salary burden of the sector, especially as warranted by the harsh economic environment.

Lastly, more than sixty percent of the respondents have stayed in their respective organizations for over 5 years. This means most of the subjects have stayed long enough to have gained enormous experience in their various organisations. Thus, data gathered from the respondents concerning the study constructs are deemed to have come from highly reasonable and reliable sources.

4.2: ***Univariate Analysis***

Data concerning the four latent variables were analysed in terms of their means, standard deviations and kurtosis. On a five-point scale, Asawo (2009) categorized mean values (*M*) between 1.0 – 2.4.0 as low, 2.5 - 3.4 as moderate, 3.5 – 4.4 as high and 4.5 above as very high, while Oxford and Burry-stock (1995) categorised data sets with mean scores between 1.0 - 2.4 as low; 2.5 – 3.4 as medium, while values between 3.5 – 5.0 are high. Hence, 2.5 was taken as the cut-off mean score for this study.

Also, in order to test for normality of the data sets (see table 4.2), skeweness (SK) and kurtosis (KU) of the responses on the items were analysed (Weston & Gore, 2006). According to Bulmer (1979), a distribution is highly skewed when the skewness value is less than -1.0 or greater than 1.0; moderate if value is between -1.0 and -0.5 or 0.5 and 1.0, and fairly symmetrical if values are between -0.5 and 0.5. Moreover, as a rule of thumb, we divided the skewness and kurtosis values of each variable by its corresponding Standard Error (S.E) and found that the outputs did not deviate much between -2 and +2, signifying no serious violation of normality (George & Mallery, 2010; Gravetter & Wallnau, 2014). Table 4.2 shows that infrastructure operation capability has low scores (M = 2.32, SD = 0.63), robustness has moderate scores (M = 2.58, SD = 0.69), adaptability has moderate scores (M = 2.63, SD = 0.82), whereas managerial proactiveness attracted high scores above the threshold (M = 3.89, SD = 0.71).

Also, since the model is tested using PLS, which is robust under conditions of mild non-normality, further manipulations to the data are not warranted.

Table 4.2: Descriptive Statistics of Latent Variables

Latent Variable	Mean	Standard Deviation	Skewness	Kurtosis	Standard Error
IOC	2.32	0.63	0.52	0.07	0.22
MGP	3.89	0.71	0.61	0.59	0.28
RBN	2.58	0.69	-0.70	0.77	0.35
ADP	2.63	0.82	0.94	0.32	0.46

Source: SmartPLS 3.2.6 output on research data, 2018

4.3: Multivariate (Inferential) Analysis

Due to the fact that this study is about relationships and explanation of target constructs, the Partial Least Square- Structural Equation Modelling is deemed appropriate (Hair, Hult, Ringle & Sarstedt, 2014). It can substitute for non-parametric approaches as it poses fewer restrictions, especially on data distribution and sample size (Esposito Vinzi, Trinchera & Amato, 2010).

The PLS-SEM algorithm has two models, viz: (i) the outer model which shows the relationship between the latent variables (LVs) and their corresponding indicators and (ii) the inner model which explains the structural links between the constructs. The exogenous construct of the study is infrastructure operation capability, while the endogenous construct is organisational resilience which is decomposed into robustness and adaptability. Moreover, the moderating effect of managerial proactiveness will be assessed after the inner direct relationships are assessed.

As a rule of thumb for partial least squares structural equation modeling (PLS-SEM), the minimum sample size should be at least 10 times the highest number of structural paths connecting a particular reflective construct (Henseler, Ringle, & Sinkovics, 2009). This study has a maximum of 2 structural paths connecting a reflexive construct, which gives a minimum sample size of 20. Thus PLS-SEM can be deployed since the sample for analysis is 36.

Next, the stages of the PLS-SEM algorithmic model evaluation include: (i) Assessment of Measurement Model, (ii) Assessment of Structural Model (direct effect), and (iii) Assessment of Moderating or interactive effect.

4.3.1 *Assessment of Measurement Model*

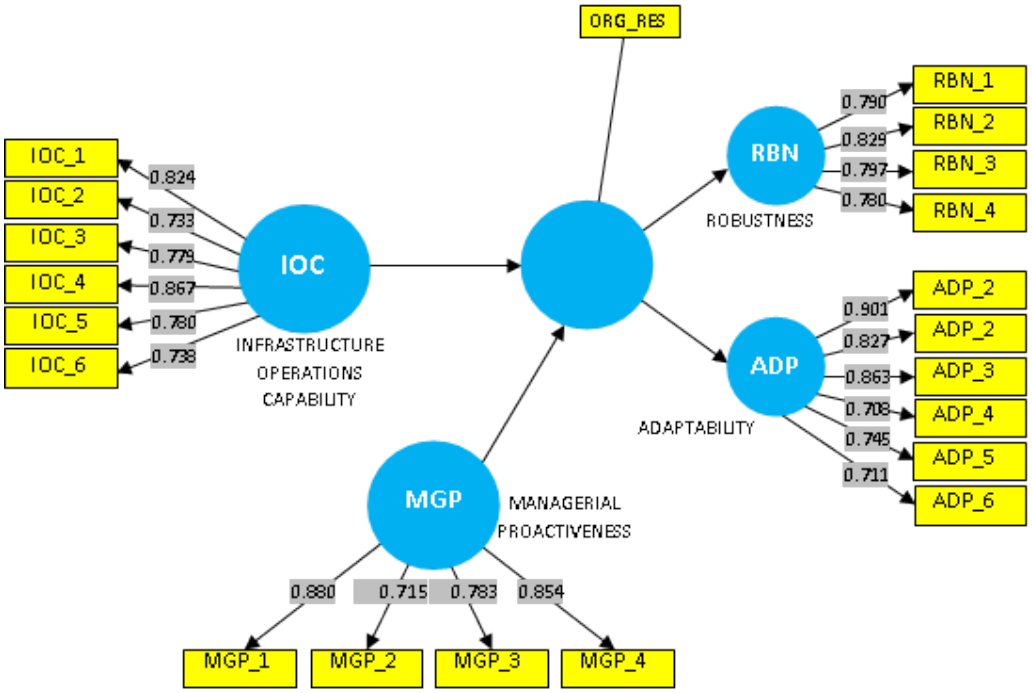

Figure 2: Smart PLS 3.2.6 output for outer loadings of indicators

Figure 2 shows the Smart PLS 3.2.6 output for outer loadings of the indicators. This result is shown in table 4.3 in order to assess reliability and convergent validity of the model.

Table 4.3: PLS-SEM Assessment Results of Measurement Model

Latent Variable	Indicators	Convergent validity			Internal consistency reliability		
		Loadings	Indicator reliability	AVE	Composite reliability ρ_c	Reliability Coefficient ρ_A	Cronbach's alpha
		>0.70	>0.50	>0.50	>0.70	>0.70	0.70 - 0.90
IOC	IOC_1	0.824	0.679	0.621	0.907	0.820	0.810
	IOC_2	0.733	0.537				
	IOC_3	0.779	0.607				
	IOC_4	0.867	0.752				
	IOC_5	0.780	0.608				
	IOC_6	0.738	0.545				
MGP	MGP_1	0.880	0.774	0.657	0.884	0.825	0.789
	MGP_2	0.715	0.511				
	MGP_3	0.783	0.613				
	MGP_4	0.854	0.729				
RBN	RBN_1	0.790	0.624	0.639	0.876	0.815	0.782
	RBN_2	0.829	0.687				
	RBN_3	0.797	0.635				
	RBN_4	0.780	0.608				
ADP	ADP_1	0.901	0.812	0.634	0.911	0.824	0.814
	ADP_2	0.827	0.684				
	ADP_3	0.863	0.745				
	ADP_4	0.708	0.501				
	ADP_5	0.745	0.555				
	ADP_6	0.711	0.506				

Note: IOC = Infrastructure Operation Capability, MGP = Managerial Proactiveness, RBN= Robustness, ADP = Adaptability

Source: SmartPLS 3.2.6 output on research data, 2018

It can be observed in table 4.3 that all the indicators met the threshold loading criterion of 0.70 (Hulland, 1999), with the minimum being ADP_4 (0.708) and the maximum being ADP_1 (0.901). Furthermore, all the latent variables reported values for Composite reliability and Reliability Coefficient that satisfied the 0.7 criterion of Hair Jr., Babin and Krey (2017). The constructs also reported satisfactory Cronbach's alpha values that were not below 0.7 or above 0.9 (Hair et al., 2017).

Moreover, convergent validity of the model was confirmed through the values of the Average Variance Extracted (AVE), which exceeded the recommended 0.50 threshold (Fornell & Larcker criterion, 1981). Next is table 4.4 which shows the output for the test of discriminant (divergent) validity.

Table 4.4: Test of Discriminant Validity - Fornell and Larcker (1981) criterion

	AVE	IOC	MGP	RBN	ADP
IOC	0.621	**0.788**			
MGP	0.657	0.291	**0.811**		
RBN	0.639	0.353	0.372	**0.799**	
ADP	0.634	0.335	0.254	0.582	**0.796**

Note: AVE = Average Variance Extracted. IOC = Infrastructure Operation Capability, MGP = Managerial Proactiveness, RBN= Robustness, ADP= Adaptability. The off-diagonal values are the correlations between latent variables, while **the diagonal values (in bold) denote the square roots of AVEs.**

Source: SmartPLS 3.2.6 output on research data, 2018

It can be deduced from table 4.4 that the model demonstrates discriminant validity since the square roots of the AVEs (**diagonal values in bold**) are higher than 0.70, and are far greater than the correlations between the constructs (the off-diagonal figures). This confirms that each construct is sufficiently distinct from any other one (Fornell & Larcker, 1981).

4.3.2: Assessing the Structural Model (Main Effect)

This stage involves testing the hypotheses via the significance of the path coefficients (β) and *t*-Statistic; and the coefficients of determination (R^2 or predictive accuracy), using the bootstrap procedure. Also, the structural model's predictive relevance or Q^2 (Stone-Geisser test) was assessed as an alternative to goodness-of-fit (Geisser, 1975; Stone 1974), using blindfolding procedure (e.g.Tenenhaus et al. 2005; Hair et al., 2014).

4.3.2.1: *Tests of Hypotheses*

Table 4.5 shows the results on the tests of hypotheses $H_{O1,}$ H_{O2}, H_{O3a} and $H_{O3b.}$ The moderating effect of managerial proactiveness on the model (H_{O3c} and H_{O3d}) is demonstrated in section 4.3.3.

Table 4.5: Results of Hypotheses Testing

Null Hypothesis	Path (Relationship)	Path Coefficient (β)	Standard Error	t-Statistic	Decision
H_{O1}:	IOC - RBN	0.256	0.082	3.233	Supported
H_{O2}:	IOC - ADP	0.278	0.079	2.009	Supported
H_{O3a}:	MGP - RBN	0.403	0.202	1.990	Supported
H_{O3b}:	MGP - ADP	0.670	0.086	2.152	Supported
IOC = Infrastructure Operation Capability, MGP = Managerial Proactiveness, RBN= Robustness, ADP= Adaptability					

Source: SmartPLS 3.2.6 output on research data, 2018

With 500 bootstrapped samples by random replacement method, the path coefficients and the resulting t-values were assessed. This provides the rationale for either confirming or disconfirming the hypotheses. As a rule, path coefficients (β values) of .10 to 0.29, .30 to .49 and .50 to 1.0 are weak, moderate and strong correlations, respectively (Cohen, 1988). Also, for a two tailed test, t values greater than 1.96 are significant, while t values less than 1.96 are non-significant (Hair et al., 2014)

Table 4.5 shows that there is a positive, weak and significant relationship between infrastructural operation capability and robustness (β=0.256, t=3.233); a positive, weak and significant relationship between infrastructural operation capability and adaptability (β=0.278, t=2.009); a positive, moderate and significant relationship between managerial proactiveness and robustness (β=0.403, t=1.990); and a positive, strong and significant relationship between managerial proactiveness and adaptability (β=0.670, t=2.152). Therefore, H_{O1}, H_{O2}, H_{O3a} and H_{O3b} were supported.

4.3.2.2: *Assessment of Predictive Accuracy (R^2) and Predictive Relevance (Q^2)*

The statistic that reveals the effects of all the exogenous latent variables on an endogenous construct is the R^2, which measures predictive accuracy (Hair, Hult, Ringle & Sarstedt, 2014). The R-Squared ranges from 0 to 1, with 1 representing complete predictive accuracy. As a rule of thumb, R- Squared values of 0.67, 0.33 and 0.19 are substantial, moderate and weak, respectively (Henseler, Ringle & Sinkovics, 2009). A related statistic to R^2 is the adjusted R^2. The adjusted R^2 is the percentage of variation explained by only the independent variables (in this case, the manifest indicators of IOC) that in reality affect the dependent variable.

The Q^2 test (Stone-Geisser's test) measures the predictive relevance of the endogenous variables (Esposito Vinzi, et al., 2010). It is an alternative to goodness-of-fit evaluation (Duarte & Raposo, 2010). A cross-validated redundancy approach (Wold 1982) of blindfolding was employed with omission distance of 7 (Hair et al., 2017). As a yardstick, when Q^2 values of endogenous variable are larger than zero (>0), it is indicative that the exogenous (explanatory) construct has predictive relevance for the endogenous variable (Hair, Ringle & Sarstedt, 2011).

Table 4.6 below shows the outputs for predictive accuracy (R^2) and predictive relevance (Q^2).

Table 4.6: Results of R^2 and Q^2

Endogenous Latent Variable	Correlation Coefficient (R)	Predictive Accuracy (R^2)	Adjusted R^2	Predictive Relevance (Q^2)
RBN	0.609	0.371	0.369	0.205
ADP	0.631	0.398	0.397	0.222
Reference values: R^2, 0.19 = weak; R^2, 0.33 = moderate; R^2, 0.67 = substantial, Chin (1988). $Q^2 > 0$ = satisfactory predictive relevance, Hair et al., 2011.				

Source: SmartPLS 3.2.6 output on research data, 2018

The figures in table 4.6 depict that there is positive, moderate correlation (R) between the infrastructural operation capability and organisational resilience (robustness, R = 60.9%; adaptability, R = 63.1%). Thus, robustness attracted a lower correlation score whereas adaptability recorded a higher on. Added to this is the R^2 which shows the predictive power (or accuracy) of the model.

The first model, RBN = f {IOC}, recorded a moderate R^2 of 0.371. This means that infrastructure operation capability explained 37.1% of the variance of robustness, while other unidentified variables are responsible for the remaining 62.9%. Thus, the model has a moderate predictive accuracy on robustness

Secondly, ADP = f {IOC} recorded moderate R^2 of 0.398. This means that infrastructure operation capability explained 39.8% of the variance of adaptability, while other unidentified variables are responsible for the remaining 60.2%. Thus, the model has a moderate predictive accuracy on adaptability.

Also, outputs for the two endogenous latent variables shows that Q^2 is 0.205 for robustness and 0.222 for adaptability. Since the Q^2 values for the endogenous variables are greater than zero, it means the structural model is relevant in predicting the endogenous latent variables' indicators.

4.3.3: *Assessment of Moderating Effect*

It was mentioned in section 4.3.2.1 that hypothesis H_{O3c} and H_{O3d} would be tested in this section. The stages of PLS-SEM stipulate that moderating effects are to be tested after main effects have been evaluated. Specifically, H_{O3c} states that *managerial proactiveness moderates the relationship between infrastructural operation capability and robustness*, while H_{O3d} states that *managerial proactiveness moderates the relationship between infrastructural operation capability and adaptability*.

For H_{O3c} , the moderating effect of Managerial Procativeness (MGP) was evaluated through the cross product of Infrastructure Operation Capability (IOC) and MGP, otherwise called the interaction term. Three features were identified at this stage, viz: the impact of IOC on RBN, the straight consequence of the moderating variable (i.e. MGP) on RBN, and the resultant interaction values. The SmartPLS 3.2.6 (Ringle et al., 2015) offers the interacting term as an automatic option with the product indicators. The attenuating effect of MGP was upheld because the beta (β) from the interaction component to the target variable was significant ($t > 1.96$) not minding other values (Baron & Kenny, 1986).

Figure 3 shows the SmartPLS 3.2.6 bootstrap output on the direct relationship between infrastructure operation capability (IOC) and robustness (RBN).

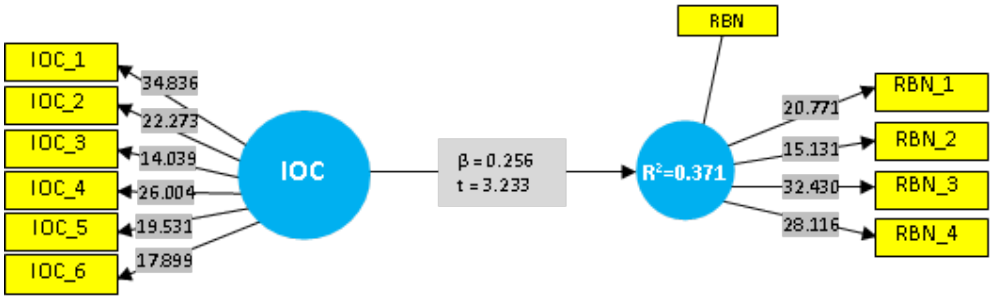

Figure 3: Bootstrapping output on relationship between IOC and RBN (without moderating variable)

Figure 3 shows that, while Managerial Proactiveness (MGP) was absent, IOC -> RBN was significant (β = 0.256, t = 3.233).
Next was the inclusion of the moderating variable (MGP). Practically, I right clicked RBN, then I specified MGP as the moderator variable, and IOC as the predictor. I then clicked the Calculation Method specified as 'Product Indicator'. Finally I clicked the "Ok" button which produced 'IOC*MGP' as interaction term of the model. Figure 4 below, shows the new bootstrapped structural link between IOC and RBN in the presence of MGP.

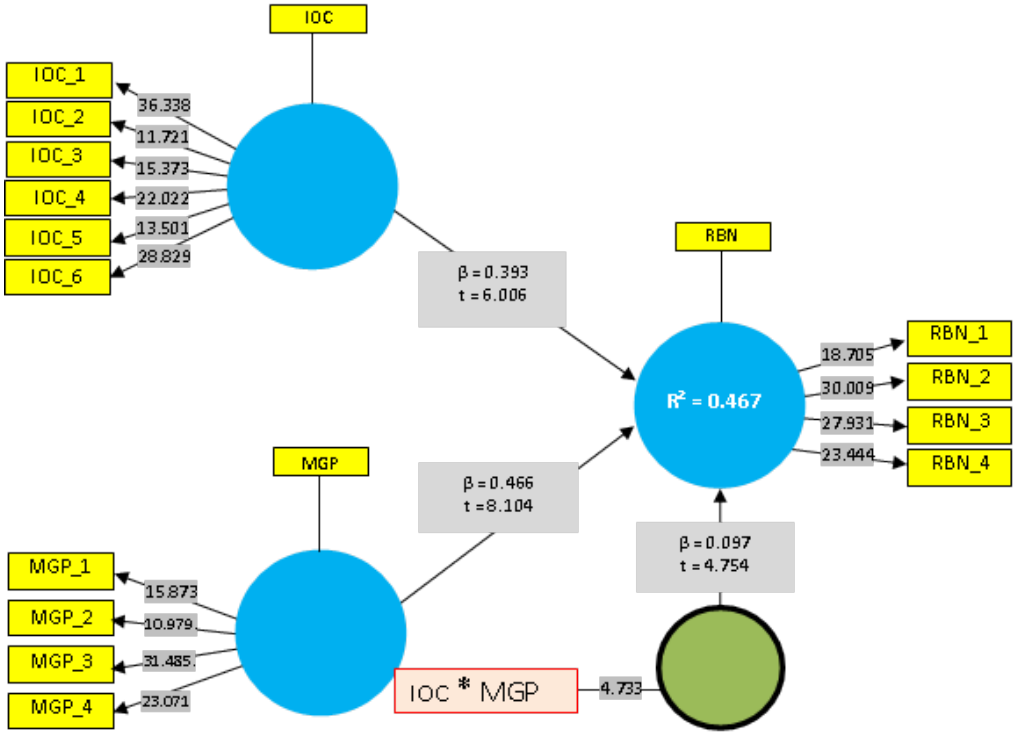

Figure 4: Moderation effect of managerial proactiveness on the relationship between IOC and RBN

The result from the structural model in figure 4 is shown in table 4.7.

Table 4.7: Test for moderating effect of managerial proactiveness on IOC -> RBN

	Path	Path coefficient (β)	t-value	Decision
Hypothesis Testing without moderating variable	IOC -> RBN	0.256	3.233	Supported
Hypothesis Testing with moderating variable	IOC -> RBN	0.393	6.006	Supported
	MGP -> RBN	0.466	8.104	Supported
	Moderating Effect 1 –> RBN	0.097	4.754	Supported

Source: SmartPLS 3.2.6 output on research data, 2018

In table 4.7, IOC -> RBN recorded significant path relationship (β = 0.256, t = 3.233) when MGP was not introduced. However, IOC -> RBN recorded increase in the path coefficient and t-value (β = 0.393, t = 6.006) upon the introduction of MGP. Moreover, the moderating Effect 1 –> RBN (β = 0.097, t = 4.754) is significant. Hence, the relationship between IOC and RBN is positively and significantly attenuated by MGP.

For H_{O3d}, the moderating effect of Managerial Procativeness (MGP) was evaluated using the same approach for testing H_{O3c}. Figure 5 shows the SmartPLS 3.2.6 bootstrap output on the direct relationship between infrastructure operation capability (IOC) and adaptability (ADP).

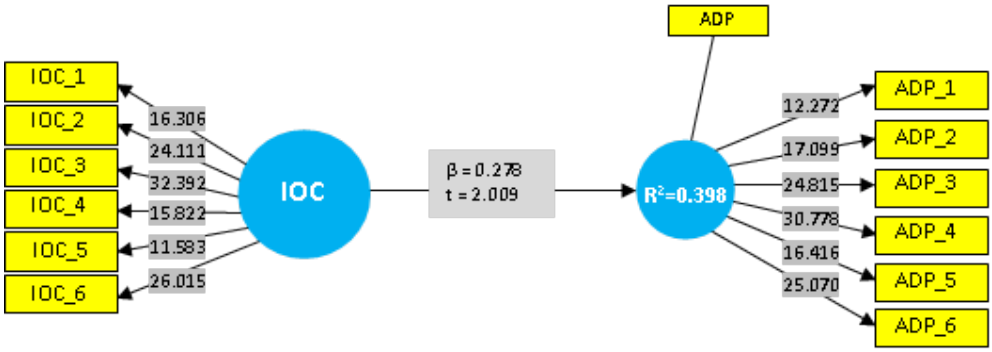

Figure 5: Bootstrapping output on relationship between IOC and ADP (without moderating variable)

Figure 3 shows that, while Managerial Proactiveness (MGP) was absent, IOC -> ADP was significant (β = 0.278, t = 2.009).

Next was the inclusion of the moderating variable (MGP), using the same product indicator method on SmartPLS 3.2.6. Figure 6, below, shows the new bootstrapped structural link between IOC and ADP in the presence of MGP.

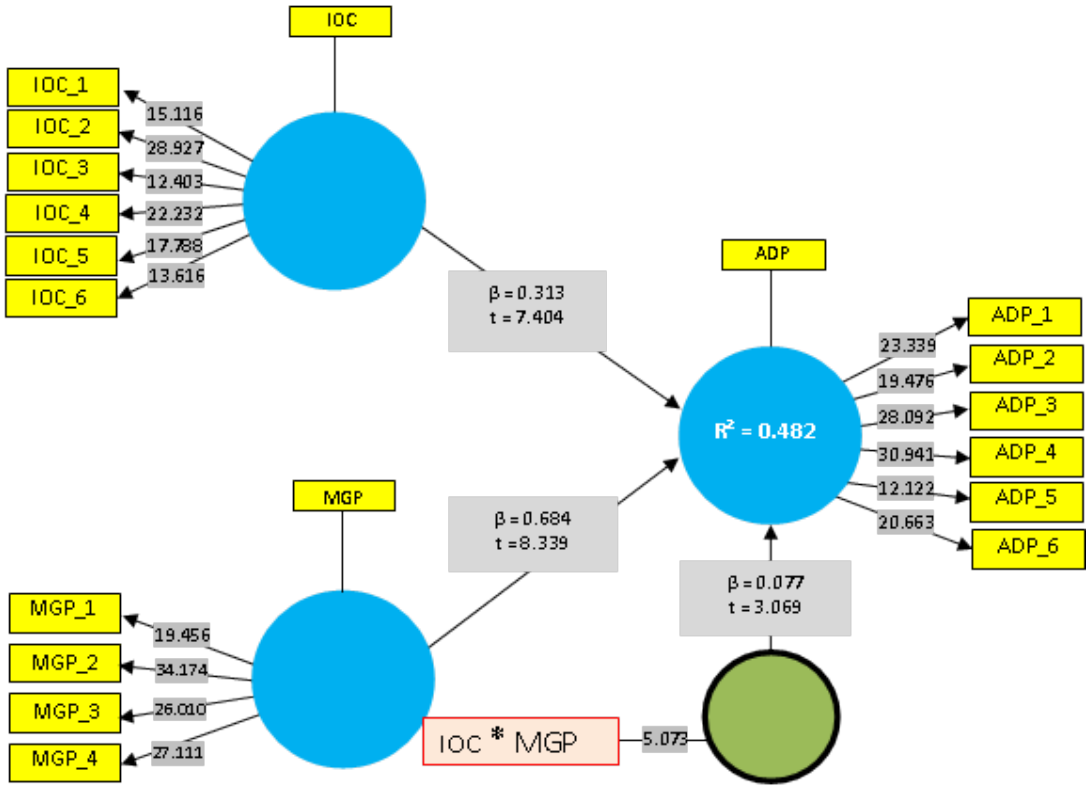

Figure 6: Moderation effect of managerial proactiveness on the relationship between IOC and ADP

The result from the structural model in figure 6 is shown in table 4.8.

Table 4.8: Test for moderating effect of managerial proactiveness on IOC -> ADP

	Path	Path coefficient (β)	t-value	Decision
Hypothesis Testing without moderating variable	IOC -> ADP	0.278	2.009	Supported
Hypothesis Testing with moderating variable	IOC -> ADP	0.313	7.404	Supported
	MGP -> ADP	0.684	8.339	Supported
	Moderating Effect 1 –> RBN	0.077	3.069	Supported

Source: SmartPLS 3.2.6 output on research data, 2018

In table 4.8, IOC -> ADP recorded significant path relationship (β = 0.278, t = 2.09) when MGP was not introduced. However, IOC -> ADP recorded increase in the path coefficient and t-value (β = 0.313, t = 7.404) upon the introduction of MGP. Moreover, the moderating Effect 1 –> ADP (β = 0.077, t = 3.069) is significant. Hence, the relationship between IOC and ADP is positively and significantly attenuated by MGP

4.3.3.1: *Determination of effect sizes (f^2) of the moderating variable*

Also, the magnitude of the moderating effect of managerial proactiveness on the relationship between infrastructure operation capability and organisational resilience (robustness and adaptability) can be determined through the effect size criterion.

The formula for effect size of the moderator is given as:

$$f^2 = \frac{R^2_{moderator\ present} - R^2_{moderator\ absent}}{1 - R^2_{moderator\ present}}$$

Where moderating effects with effect sizes f^2 of 0.02, 0.15, or above 0.35 can be regarded as low, medium, or high. However, effect-size less than 0.02 means no effect (Cohen, 1988).

Table 4.38 indicates the effect sizes of managerial proactiveness on the model.

Table 4.9: Effect Sizes of the latent variables

Exogenous Variable	Endogenous Variable	*R* with moderator	*R* without moderator	*R*-Squared with moderator	*R*-Squared without moderator	f^2-effect size	Remark on Effect Size
IOC	RBN	0.683	0.609	0.467	0.371	0.180	Medium
IOC	ADP	0.694	0.631	0.482	0.398	0.162	Medium

Source: SmartPLS 3.2.6 output on research data, 2018

Thus, table 4.9 confirms that managerial proactiveness has medium, positive moderating effect on organisational resilience ($f^2 = 0.180$ for robustness; $f^2 = 0.162$ for adaptability).

4.4: Discussion

This study investigated the nexus between infrastructure operation capability and organisational resilience of domestic airlines in Nigeria. Findings reveal that there more males in the Nigerian domestic airlines at both the middle and managerial levels. Also, majority of the respondents are between thirty six and fifty years old, with most of them married. Furthermore, most of the managers and senior staff are graduates, and most of them occupy middle management positions. Lastly, majority of them have stayed in their respective organizations for over 5 years. The findings regarding the demographic characteristics of the sector synchronize with the previous study on the industry by Gabriel (2015).

Moreover, although the managers of Nigerian domestic airlines are very proactive, the airlines have moderate levels of robustness and adaptability coupled with low level of infrastructure operation capability.

Generally, it means that local air operators have managers that are self-directed and take initiative to collaborate with personnel and partners in developing solutions, follow current trends in the market and seize emergent opportunities, prepare ahead and quickly adjust internal systems when required to enhance business applications, and identify problems early and take preventive actions. This finding is in tandem with Gabriel (2015) who found that managers of local airlines execute strategies to mitigate negative impacts of the operating environment, adjust internal components and proactively participate in planning and emergency management, monitor current developments, ensure that expertise and resources are deployed during periods of distress, do everything necessary to avert misfortune, and respond swiftly to customer demands. This researcher further inferred that "Nigerian domestic airline operators have the potentials to cope with disturbances and changes while retaining critical functions, structures, and feedback mechanisms" (p. 149).

However, the operational capability of the information system infrastructure of local operators is not encouraging. Infrastructure does not assist much in monitoring changes in business contexts, and is characterised

by low integration, poor connectivity, and low accessibility to various platforms, applications and stakeholders. Ore (2006) pointed out that Nigerian aviation industry is bedeviled by inadequate and antiquated infrastructure, while Fagbemi (2005) claimed that faulty information infrastructure is the albatross of the Nigerian aviation industry. A possible reason for this low level of infrastructure operation capability is that domestic airlines may have low levels technology adoption and diffusion.

This study also found that higher levels of infrastructural operation capability promote organisational resilience in terms of robustness and adaptability. It means that an information system that assists an organisation to monitor the use of resources, connects and assimilates new locations or acquisitions, and transmits a wide variety of information to end users and platforms within acceptable time and cost, will amplify the ability of the organisation to (i) maintain its functions and processes in times of crises and (ii) adjust and reconfigure its internal mechanisms and structures to create strategic fit and thrive in perilous environment. This is in consonance with Yoshikuni and Albertin's (2017) finding that the operational aspects of information systems promote dynamic capabilities by enabling managers to understand customer needs, make timely delivery of services, and retain customer base, which in turn amplified business process improvement and firm outcomes. Moreover, Oh and Teo (2006) found that integrated IT infrastructure helps organisations to develop core competencies and provides a "seamless flow of accurate, consistent, and timely information to employees and customers", thereby promoting resilience (p.46).

Furthermore, it was found that increased levels of managerial proactiveness not only promote robustness and adaptability but positively transform the relationship between infrastructure operation capability and resilience (robustness and adaptability). This indicates that, despite the low level of infrastructure operation capability, the more managers take initiatives to collaborate with stakeholders and partners in developing solutions, monitor market trends to seize emergent opportunities, prepare ahead and quickly adjust internal states, and identify problems early and take preventive actions, the more organizations will have the capacity to continue in business and reconfigure business models in a highly dynamic business environment. There is a scholarly handshake between this finding and that of Oh and Teo (2006) who submitted that managerial proactiveness induces resilience because it an archetype of entrepreneurial orientation which empowers managers to foresee emergent opportunities and execute strategies for strategic gains.

5. Conclusions and Recommendations

This study used hypotheco-deductive approach to investigate the nexus between infrastructure operation capability and organisational resilience of local airlines in Nigeria, while controlling for managerial proactiveness. The study empirically demonstrates that infrastructure operation capability positively and significantly influences organisational resilience, while managerial proactiveness serves as a catalyst in the relationship between infrastructure operation capability and organisational resilience. Based on the findings, the study concludes that higher levels of infrastructure operation capability amplify organisational resilience. Specifically, the study concludes that higher levels of infrastructure operation capability will give rise to higher levels of robustness and adaptability, while the proactive actions of managers will translate to reinforcement of robustness and adaptability.

The findings and conclusions of this study have far reaching implications for information systems and organisational resilience literature, as well as for organisations that operate management information systems as part of their mechanisms to build resilience. Theoretically, the study concludes that varying degrees of information system infrastructure operation capability are responsible for varying levels of organisational resilience. This validates the proposition of Schwaninger and Scheef (2016) that information systems have certain capabilities that not only leverage the coordination function in organisations but also assists organisations in mitigating perturbations and promoting systemic homeostasis. Moreover, the study also gives a theoretical boost to Rai and Tang's (2010) finding that IT infrastructure aids organisations to disseminate information, organise tasks and synchronise processes with their contractors and reduces the time firms need to coordinate inputs to support evolving requirements.

On managerial procativeness, the study lends theoretical support to the previous works of Trivellas and Santouridis (2013) who inferred that managerial collaboration, coupled with externally focused behavior such as managerial innovation, creativity, goal setting and planning, enhance performance outcomes.

Practically, the study implies that managers need to understand how they can stimulate organisational resilience through the development and exploitation of information system infrastructure operation capability. Specifically,

one of the ways organisations can build their capacity to maintain their functioning and adjust internal mechanisms is by having efficient infrastructure. Thus, it is imperative for organisations ensure speedy delivery of services through their information infrastructure. Also, the study implies that managers should recognize the need for the IS infrastructure to be well integrated in order to meet the changing needs of the organisations, facilitate information exchange with customers and suppliers, and respond to sudden shocks.

The study also underscores the need for managers to be more proactive by taking self-directed actions that create changes in their organizations in line with developments in the business environment. Moreover, the study implies that managers should not wait for things to happen to their organizations, but should act in ways that will shape the corporate environment.

Based on the foregoing, the study recommends that:

1. Domestic airlines in Nigeria should improve the operational capabilities of their organisations' information system infrastructure. They should ensure that infrastructure is designed to assist the organisations to monitor the use of resources. Domestic airlines should ensure that information system infrastructure effectively connects managers and all branches effectively; and develop infrastructure that can be assessed on diverse platforms which also transmits a wide variety of information to end users. Moreover, more robust applications, special packages, integration software or digital options such as Web Package (WP), Service-Inclined Platform (SIP) and Business Procedure Software (BPS) should be built into the information system infrastructure.
2. Top executives should encourage managers and IT staff to be more proactive by allowing them to take decisions which create changes in the workplace. In order to increase managerial proactiveness, board executives and stakeholders should reinforce a culture of openness and trust that supports proactiveness, and reward managers that take personal initiatives and risk in creating positive outcomes.
3. Managers should be made to undergo proactivity training and retraining to increase problem identification, opportunity recognition, self-efficacy, collaborative behavior and new methods of solving problems, thereby leading to organisational resilience.

5.1: *Limitations and Suggestions for Future Research Directions*

Although this study offers interesting insights and findings on the nexus between infrastructure operation capability and organisational resilience of local airlines in Nigeria, it is does not enjoy immunity from certain limitations.

Firstly, the study is a cross-sectional survey, and so did not capture the dynamic interplay between infrastructure operation capability, organisational resilience and managerial proactiveness. Thus further studies should consider a longitudinal investigation among the constructs. Secondly, the study excluded other variables that may attenuate the relationship between the study variables, such as the size of organisations' investments in information infrastructure, firm's age, structure and culture. Future research should therefore take these variables into consideration. Thirdly, the study focused on only domestic airlines in Nigeria to the exclusion of other sectors. Different conclusions may be reached concerning the theorising logic under investigation, when the study is conducted in other sectors. Therefore further studies should be positioned in other sectors such as telecommunications, banking and construction industry. This is particularly important because the specific and peculiar characteristics of each industry may give rise to different results and conclusions.

References

Akgün, A. E. & Keskin, H. (2014). Organizational resilience capacity and firm product innovativeness and performance. *International Journal of Production Research,* 52(23), 6918-6937.

Amadi, B (1982). *Ethics in Nigerian culture*. Ibadan, Nigeria, H. E. B. Nigeria Ltd.

Asawo, S. P. (2009). *Spiritual leadership and workers' commitment in the Nigerian manufacturing industry*. (A PhD thesis submitted in the Department of Management, Faculty of Management Sciences, Rivers State University of Science And Technology, Nkpolu, Oroworukwo, Port Harcourt).

Bankes, S. (2010). Robustness, adaptivity, and resiliency analysis. *Association for the Advancement of Artificial Intelligence, Papers from Fall Symposium.*

Baron, R. M. & Kenny, D. A. (1986). Moderator-mediator variables distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology,* 51(6), 1173-82.

Basu, A. & Blanning, R. W. (2003). Synthesis and decomposition of processes in organizations. *Information Systems Research,* 14(4), 337-355.

Bateman, T. S. & Crant, J. M. (1993). The proactive component of organizational behaviour. *Journal of Organizational Behavior,* 14(2), 103-118.

Belschak, F. D. & Den Hartog, D. N. (2010). Pro-self, pro-social, and pro-organizational foci of proactive behavior: Differential antecedents and consequences. *Journal of Occupational and Organizational Psychology*, 83 (2): 475-498.

Berkes, F., Colding, J. & Folke, C. (2003). *Navigating social-ecological systems: Building resilience for complexity and change*. Cambridge, UK: Cambridge University Press.

Bharadwaj, A. (2000). A resource-based perspective on IT capability and firm performance: An empirical investigation. *MIS Quarterly,* 24(1), 169-197.

Bhatt, G., Emdad, A., Roberts, N., & Grover, V. (2010). Building and leveraging information in dynamic environments: The role of IT infrastructure flexibility as enablers of organizational responsiveness and competitive advantage. *Information & Management*, 47, 341-349.

Byrd, T. A. & Turner, D. E. (2000). Measuring the flexibility of information technology infrastructure: Exploratory analysis of a construct. *Journal Management Information System,* 17(1), 167-208.

Byrd, T. A., Lewis, B. R. & Turner, D. E. (2004). The impact of IT personal skills on IS infrastructure and competitive IS. *Information Resource Management Journal*, 17(2), 38-62.

Campbell, D. (1969). Variation and selective retention in socio-cultural evolution. *General Systems,* (16), 69-85.

Carroll, J. S. (1998). Organisational learning activities in high-hazard industries: The logics underlying self-analysis. *Journal of Management Studies.* 35(6), 699-717.

Chaskin, R. J. (2008). Resilience, community, and resilient communities: conditioning contexts and collective action. *Child Care in Practice,* 14, 65-74.

Cherns, A. (1986). Principles of socio-technical design revisited. *Human Relations,* 40, 153-62.

Chu, H. (2015). Research methods in library and information science: A content analysis. *Library & Information Science Research,* 37(1), 12-24.

Clegg, S. (2000). Globalizing the intelligent organization. In J. Garrick and C. Rhodes (Eds.) *Research and Knowledge at Work*. London: Routledge.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences.* Hillside, NJ: Lawrence Erlbaum.

Daramola, A. Y. (2014). An investigation of air accidents in Nigeria using the human factors analysis and classification system (HFACS) framework. *Journal of Air Transport Management*, 35, 39-50.

Davenport, T. H. (1993). *Process innovation; reengineering work through information technology.* Boston, Harvard Business School Press.

Duarte, P. & Raposo, M. (2010). A PLS model to study brand preference: An application to the mobile phone market. In V. Esposito Vinzi, W. W. Chin, J. Henseler & H. Wang (Eds.), *Partial Least Squares.* 449-485: Springer Berlin Heidelberg.

Duncan, N. B. (1995). Capturing flexibility of information technology infrastructure: A study of resource characteristics and their measure. *Journal of Management Information Systems*, 12(2), 37-57.

Durodie, B. (2003). Is real resilience attainable? *The Monitor,* 2(6), 15-19.

Eke, E. (2016). How Nigeria lost $450.4 million in Aviation sector in 2016-NCAA. *Ripples Nigeria.* Retrieved from https://ripplesnigeria.com.

Emery, F. E. & Trist, E. L. (1960). Socio-technical systems. In C. W. Churchman, & Verhulst, M. (Ed.), *Management Science Models and Techniques,* 2, 83-97. Oxford: Pergamon Press.

Esposito Vinzi, V., Trinchera, L., & Amato, S. (2010). PLS path modelling: From foundations to recent developments and open issues for model assessment and improvement. In V. Esposito Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), Handbook of partial least squares: Concepts, methods and applications (pp. 47-82). Berlin, Germany: Springer-Verlag.

Faajir, A. & Zidan, Z. H. (2016). An analysis of the issues and challenges of transportation in Nigeria and Egypt. *The Business and Management Review*, 7(2), 18-29.

Fagbemi, K. (2005). *The Bellview plane crash*. The Guardian, Oct. 31

Felipe, C. M., Roldán, J. L. & Leal-Rodríguez, A. L. (2016). An explanatory and predictive model for organizational agility. *Journal for Business Research,* 69(10), 4624-4631.

Fiksel, J. (2003). Designing resilient, sustainable systems. *Environmental Science and Technology,* 37(23), 5330-5339.

Fincham, J. E. (2008). Response rates and responsiveness for surveys, standards, and the Journal. *American Journal Pharmaceutical Education*, 72 (2), 1-3.

Fornell, C. & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research,* 19, 440-452.

Fornell, C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research,* 18 (1), 39-50.

Frese, M., & Fay, D. (2001). Personal initiative: An active performance concept for work in the 21st century. *Research in Organizational Behavior,* 23, 133-187.

Frese, M., Kring, W., Soose, A. & Zempel, J. (1996). PI at work: Differences between East and West Germany. *Academy of Management Journal,* 39, 37–63.

Gabriel, J. M. O. (2015). *Organisational citizenship behaviour (OCB) and corporate resilience in the domestic aviation sector in Nigeria.* (An unpublished thesis, submitted to the Department of Management, Faculty of Management Sciences, Postgraduate School, Rivers State University of Science and Technology, Nkpolu-Oroworukwo, Port Harcourt).

Geisser, S. (1975). The predictive sample re-use method with applications. *Journal of the American Statistical Association,* 70(350) 320-328.

George, D., & Mallery, M. (2010). *SPSS for windows step by step: A simple guide and reference, 17.0 update* (10a ed.) Boston: Pearson.

Gravetter, F. J., & Wallnau, L. B. (2014). *Statistics for the behavioral sciences* (7th edn). Belmont, CA: Wadsworth.

Gunasekaran, A., Subramanian, N. & Rahman, S. (2015). Green supply chain collaboration and incentives. *Transportation Research Part E: Logistics and Transportation Review*, 74, 1-168.

Hair, J. F., Babin, B. J. & Krey, N. (2017). Covariance-based structural equation modelling in the journal of advertising: Review and recommendations. *Journal of Advertising,* 46(1), 163-177.

Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. (2014). *A Primer on partial least squares structural equation modelling.* Thousand Oaks, CA: Sage.

Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. (2017). *A primer on partial least squares structural equation modelling (PLS-SEM)* (2nd Ed). Thousands Oak, CA: Sage Publications.

Hair, J. F., Ringle, C. M. & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice,* 19(2), 139-151.

Hale, A. & Heijer, T. (2006). Defining resilience. In Hollnagel E, Woods, D. D, Leveson, N. (Edited). *Resilience engineering: Concepts and precepts.* 35-40. Aldershot: Ashgate Publishing Limited.

Hamel, G. & Valikangas, L. (2003). The quest for resilience. *Harvard Business Review*, 81(9), 52-63.

Helfat & Winter (2011). Untangling dynamic and operational capabilities: Strategy for the never-changing world. *Strategic Management Journal,* 32(11), 1243-1250.

Henseler, J., Ringle, C. M. & Sinkovics, R. R. (2009). The use of partial least squares path modelling in international marketing. *Advances in International Marketing,* 20, 277-320.

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist,* 52, 1280-1300.

Horne, J. F. & Orr, J. E. (1998). Assessing behaviors that create resilient organizations. *Employment Relations Today,* Winter, 29-39.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal,* 20(2), 195-204.

Jen, E. (2003). Stable or robust? What's the difference? In: *Complexity*. 8(3), 12-18.

Kantur, D. & Iseri-Say, A. (2015). Measuring organizational resilience: A scale development. *Journal of Business Economics & Finance,* 4(3), 456-472.

Kendra, J. M. & Wachtendorf, T. (2003). Elements of resilience after the world trade center disaster: Reconstituting New York City's emergency operations center. *Disasters*, 271, 37-53.

Knight, R. & Pretty, D. (1997). *The impact catastrophes on shareholder value: A research report sponsored by Sedgwick Group.* The Oxford Executive Research Briefings, Templeton College, Oxford.

Koslowski, T. G. (2014). *Resilience management information systems-Achieving sustainability in turbulent environments* (Doctoral dissertation, Albert-Ludwigs-Universität, Freiburg). Retrieved from https://d-nb.info/1123481008/34

Kulik, L. (1998). Inter-and intra-gender differences in *life* orientations and work attitudes in Israel: A comparative analysis. *International Journal for the Advancement of Counseling*, 20, 95-111.

Lee, A. V., Vargo, J. & Seville, E. (2013). Developing a tool to measure and compare organizations resilience. *Natural Hazards Review,* 14(1), 29-41.

Lengnick-Hall, C. A., Lengnick-Hall, M. L. & Beck, T. E. (2011). Developing a capacity for organisational resilience through strategic human resource management. *Human Resource Management Review*, 21(3), 243-255.

Limnios, E., Mazzarol, T., Ghadouani, A. & Schilizzi, S. (2014). The resilience architecture framework: Four organizational archetypes. *European Management Journal,* 32, 104-116.

Lumpkin, G. T. & Dess, G. G. (1996) Clarifying the entrepreneurial construct and linking it to performance. *Academy of Management Review,* 21(1), 135-172.

Lyytinen, K. & Newman, M. (2008). Explaining information systems change: A punctuated socio-technical change model. *European Journal of Information Systems*, 17(6), 589-613.

McManus, S.; Seville, E., Brunsdon, D. & Vargo, J. (2008). *Resilience management. A framework for assessing and improving the resilience of organisations.* Christchurch, New Zealand.

Meyer, A. (1982). Adapting to environmental jolts. *Administrative Science Quarterly,* 27(4), 515-37.

Mithas, S., Ramasubbu, N. & Sambamurthy, V. (2011). How information management capability influences firm performance. *MIS Quarterly,* 35(1), 237-256.

Mitroff, I. (2005). Crisis leadership: Seven strategies of strength. *Leadership Excellence,* 22, 11.

Moorman, C. & Miner, A. S. (1997). The impact of organizational memory on new product performance and creativity. *Journal of Marketing Research,* 34, 91-106.

Oh, L. B. & Teo, H. H. (2006). The impacts of information technology and managerial proactiveness in building net-enabled organizational resilience. In Donnellan, B., Larsen, T., Levine, L. & DeGross, J. (Eds.). *The Transfer and Diffusion of Information Technology for Organizational Resilience,* 206, 33-50, IFIP, Boston: Springer.

Olukoya, S. (2017). *Nigeria aviation sector, pacesetter in Africa.* http://investorsking.com/.

Ore, D. (2006). *Avoiding disasters in the nation's aviation sector*. The Guardian, Nov. 1.

Oxford, R. & Burry-Stock, J. (1995). Assessing the use of language learning strategies worldwide with the ESL/EFL version of SILL. *System*, 23, 1-23.

Parker, S. K. & Collins, C. G. (2010). Taking stock: Integrating and differentiating multiple proactive behaviors. *Journal of Management,* 36(3), 633-662.

Penga, D. X. & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. *Journal of Operations Management,* 30(6), 467-480.

Pfeffer, J. (1978). *Organizational design.* Arlington Heights, IL: Harlan Davidson.

Rai, A. & Tang, X. (2010). Leveraging IT capabilities and competitive process capabilities for the management of inter-organizational relationship portfolios. *Information Systems Research*, (21)3, 516-542.

Ravichandran, T. & Lertwongsatein, C. (2005) Effect of information systems resources and capabilities of firm performance: A resourced-based perspective. *Journal of Management Information Systems,* 21(4), 237-276.

Ringle, C. M., Wende, S. & Will, A. (2005). *SmartPLS 2.0 M3* (beta). Hamburg.

Santhanam, R. & Hartono, E. (2003). Issues in linking information technology capability to firm performance. *MIS Quarterly*, 27(1), 125-153.

Sarkar M. B., Echambadi, R. & Harrison, J. S. (2001). Alliance entrepreneurship and firm market performance. *Strategic Management Journal,* 22, 701-711.

Schwaninger, M. & Scheef, C. (2016). A test of the viable system model: Theoretical claim vs. empirical evidence. *Cybernetics and Systems*, 47(7), 544-569.

Staw, B. M., Sandelands, L. E & Dutton, J. E. (1981). Threat rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly,* 26(4), 501-524.

Stone, M. (1974). Cross valedictory choice and assessment of statistical predictions. *Journal of the Royal Statistical Society,* 36(2), 111-147.

Sylva, W. (2018). *Management information system capability and organisational resilience of the Nigerian aviation industry***.** **(**An unpublished Doctoral dissertation, University of Port Harcourt, Rivers State, Nigeria).

Teece, D. J., Pisano, G. & Schuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal,* 18(7), 509-533.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y. M. & Lauro, C. (2005). PLS path modelling. *Computational Statistics and Data Analysis,* 48(1), 159-205.

Thao, T. P. (2012). *Enterprise systems and organisational agility: Developing and exploring a causal model*. (A thesis submitted to School of Business Information Technology and Logistics, Business College RMIT University).

Tierney, K. (2003). Conceptualizing and measuring organizational and community resilience: Lessons from the emergency response following the September 11, 2001 attack on the World Trade Center. Paper presented at the *Third Comparative Workshop on Urban Earthquake Disaster Management,* Kobe, Japan.

Trist, E. L. & Bamforth, K. (1951). Social and psychological consequences of longwall coal mining. *Human Relations,* (4), 3-38.

Trivellas, P. & Santouridis I. (2013). The impact of management information systems' effectiveness on task productivity. The case of the Greek banking sector. *International Journal of Computer Theory & Engineering*, 5, 1, 170-3.

Umoh, G. & Amah, E. (2013). Knowledge management and organizational resilience in Nigerian manufacturing organizations. *Journal of Developing Country Studies*, 3(9), 104-120.

Umoh, G. I., Amah, E. & Wokocha, I. H. (2014). Employee benefits and continuance commitment in the Nigerian manufacturing industry. *IOSR Journal of Business and Management,* 16(2), 69-74.

Venkatraman, N. & Grant, J. H. (1986). Construct measurement in organizational strategy research: A critique and proposal. *Academy of Management Review,* 11, 71-87.

Venkatraman, N. (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of Management Review,* 14 (3), 423-444.

Vogus, T. J & Sutcliffe, K. M. (2007). Organizational resilience: towards a theory and research agenda. Man and Cybernetics. Quebec: Montreal. *IEEE International Conference on Systems,* 7-10.

Walker, B. H., Anderies, J. M., Kinzig, A. P. & Ryan, P. (2006). Exploring resilience in social-ecological systems: comparative studies and theory development, Special feature of *Ecology and Society,* 11.

Walker, B. H., Holling, C. S., Carpenter, S. R. & Kinzig, A. P. (2004). Resilience, adaptability and transformability in social–ecological systems. *Ecology and Society*, 9 (2), 5-18.

Weick, K. E., Sutcliffe, K. M. & Obstfeld, D. (2005). Organizing and the process of sensemaking. *Organization Science,* 16(4), 409-421

Weill, P., Subramani, M. & Broadbent, M. (2002). Building IT Infrastructure for strategic agility. *MIT Sloan Management Review,* 57-65.

Wold, H. (1982). Soft modeling: The basic design and some extensions. In, Jöreskog, K.G., Wold, H. (Eds.), *Systems under indirect observations: Causality, structure, prediction, Part 2.* 1-54. North-Holland, Amsterdam, The Netherlands.

Yoshikuni, A. C. & Albertin, A. L. (2017). IT-Enabled dynamic capability On performance: An empirical study of BSC Model. *Rev. adm. empres*., 57(3), 215-231.

Zollo, M. & Winter, S. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science,* 13, 339-351.

APPENDIX 1

A Questionnaire on Infrastructure Operations Capability and Resilience of Domestic Airlines in Nigeria: Does Managerial Proactiveness Matter?"

This questionnaire is desired to gather information to enable me carry out research on the topic "Infrastructure Operations Capability and Resilience of Domestic Airlines in Nigeria: Does Managerial Proactiveness Matter?"

I implore you to be objective while filling this questionnaire. On my part, I shall keep the data private. Please provide answers to all the stated items, even if you feel they are repeated, as this will ensure statistical validity of the instrument.

Section A

Personal Data:

1. Name of organization…….
2. Gender: Male ☐ Female ☐
3. Age: 20-35 ☐ 36-50 ☐ 51 Above ☐
4. Marital status: Single ☐ Married ☐ Separated ☐ Divorced ☐
5. Educational Qualification: WAEC-OND ☐ HND/B.Sc ☐ MSc and above ☐

Position in the organization ……

6. Years of experience in the organization: 0-5 ☐ 6-10 ☐ 11-Above ☐

Section B

Infrastructure Operation Capability Construct

Kindly, indicate the extent to which you agree or disagree that the statement reflects the situation in your organization.

(1 = strongly disagree, 2 = disagree, 3 = nor disagree nor agree, 4 =agree, 5 = strongly agree)

S/N	Infrastructure Operation Capability	1	2	3	4	5
1	Information System Infrastructure assists the activity of monitoring the use of resources					
2	New locations or acquisitions are quickly assimilated into our IT infrastructure					
3	Infrastructure connects all our branches					
4	Infrastructure transmits a wide variety of types of information to end users					
5	Our user interfaces provide transparent access to all platforms and applications					
6	Data captured in one part of our organization are immediately available to everyone in the organization					

Section C

Organizational Resilience Construct

Please tick one choice for each of the following statement that is applicable to your organization.
(1 = strongly disagree, 2 = disagree, 3 = nor disagree nor agree, 4 =agree, 5 = strongly agree)

S/N	**Robustness**	**1**	**2**	**3**	**4**	**5**
1	Stands straight and preserves its position.					
2	Successful in generating diverse solutions					
3	Shows resistance to the end in order not to lose.					
4	Does not give up and continues its path.					
	Adaptability	**1**	**2**	**3**	**4**	**5**
1	Easily redesign and readjust existing business processes and operations;					
2	Easily create new business processes					
3	Easily launch new products/services and technology; Easily switch between suppliers					
4	Easily establish new supply chain partnerships					
5	Easily change the type of resources that we acquire from our suppliers					
6	Easily reconfigure resources to meet changing needs of customers/passengers					

Section D

Managerial Proactiveness Construct

Please tick one choice for each of the following statement that is applicable to your organization.
(1 = strongly disagree, 2 = disagree, 3 = nor disagree nor agree, 4 =agree, 5 = strongly agree)

S/N	**Managerial Proactiveness**	**1**	**2**	**3**	**4**	**5**
1	Managers are self-directed and take initiative to collaborate with IT personnel and vendors in developing Information System solutions					
2	Managers closely follow current trends in Information Systems and seize emergent opportunities					
3	Managers prepare ahead and quickly adjust internal systems when required to enhance IT applications					
4	Managers identify problems early and take preventive actions					

I really appreciate your taking out time to fill this questionnaire.