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Big Data Analytics and Performance: Evidence from Retail Supply Chains in Rivers State of Nigeria

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Abstract: *This present study employs explorative and quantitative survey and, adopted the simple random sampling method in order to collect data from selected retailers. Data for this study were collected by means of a survey conducted mainly in Port Harcourt metropolis, and its environs from October to December 2019. Primary data were assessed through a structured pre-tested questionnaire, and the total number of retailers contacted via questionnaire was 390. Though, 394 responses were received and after establishing the validity of the questions 296 (75.1%) respondents were vital for executing descriptive and inferential analysis. The collected data were analyzed with the Statistical Package for Social Sciences (SPSS) version 22.0, using the frequency and contingency tables, and the ordinary square regression method. The findings reveal that descriptive data analytics, predictive data analytics and prescriptive data analytics contribute significantly to performance. The study therefore, concludes that the elements of big data analytics significantly predict performance of retail supply chains in Rivers State of Nigeria, and recommends amongst others that the management of retail supply chains should focus on descriptive data analytics to endear and sustain performance.*

Keywords: *Big data analytics, Descriptive data analytics, Performance, Predictive data analytics, Prescriptive data analytics.*

1. INTRODUCTION

In this current era of our existence, we are experiencing a sudden increase of data (Choi *et al*., 2017), and to be factual, big data analytics (BDA) capability has fascinated momentous interest from academia and management practitioners. Chen and Zhang (2014) dispute that big data has an adequate amount of prospective to transform several spheres as well as business, scientific research and public administration. Thus, a greater part of business organizations are trailing BDA-related development schemes (Kiron *et al.*,2014). The deciding factor at the rear of big data analytic is digitalization, with greater than before social and media recognition in the middle of electronic device users (Hellerston *et al.*, 2008; Lohr 2012). The size of big data go beyond the existing capability of software tools and storage systems for capturing, storing, managing, and processing data in a good enough time (Kubick, 2012). Substantial data has become the most imperative resource for potential company wealth against the backdrop of the unremitting growth of information technology and Industry 4.0 (Tukas *et al.*, 2019). Being an extremely rapid increase (Manyika *et al.*, 2016), this outburst of big data is paying attention on quite a lot of areas of actions contributing to the amplification of universal modernization in science and technology.

Big data analytics allude to technologically enabled ability which can aid in routing huge amount,

high rapidity and numerous assortments of data to haul out consequential and functional insight; hereby facilitating the firms to gain competitive advantage (Fosso Wamba *et al.,* 2017). Additionally, Galbraith (2014) noted that historically, supply chain managers used to evaluate data assembled from time-honored data warehouses to achieve insights. What is more, Hazen *et al.* (2014) disputed that the helpfulness of decision making in supply chains frequently pivots upon the worth of the data processed through organizational infrastructure, which allows the supply chain managers to speedily get hold of, develop and examine data. Papadopoulos *et al.* (2017) argued that insights achieved by the use of improved information dispensation competence can trim down improbability, particularly when operational tasks such as disaster relief operations are exceedingly composite.

Data management and integration turn out to be decisive in dealing with the face up to of connecting supply chain management organisms to producers and suppliers including their partners. Addressing supply chain management challenge at every intensity and actions requires that data management and integration make certain the visibility of both producers and suppliers including their partners, thus contributing to enhanced dealings of trust and long-standing collaboration. Supply chain specialists have contact to data, which is ad infinitum engendered by conventional mechanisms such as POS, RFID, and in addition GPS to an immeasurable quantity of data produced from amorphous data sources such as digital click streams, camera and surveillance footage, imagery, social media postings, blog/wiki entries and round-table deliberations (Sanders & Ganeshan, 2015).

The current supply chains are exceedingly sustained by advanced networking technologies – sensors, tags, tracks and other smart devices, which are congregating data on instantaneous foundation (Wang *et al.,* 2016; Gunasekaran *et al.,* 2017), which supplies uninterrupted demand and supply visibility (Gunasekaran *et al.,* 2017; Srinivasan & Swink, 2017). Schoenherr and Speier-Pero (2015) argued that supply chain managers need to develop a large quantity of data to formulate decisions that may help trim down costs and boost the product accessibility to the customers.

Organizations with a closely controlled policy of implementing big data analytics have had healthier results with investments (Accenture, 2019). Implying that an apparent and methodical policy of big data analytics can supply a superior return on investment (ROI) in definite areas of the supply chain, such as marketing, purchasing, shipping, and storage (Benabdellah *et al.,* 2016). After all, an extended supply chain is a multifaceted system that bond firms through collaboration and integration, as competition between supply chains is professed as superior than between individual firms (Antai & Olson, 2010).

The use of big data analytics in the field of marketing and other related areas is on the increase. Nonetheless, the operations and supply chain professionals are hitherto to take advantage of the factual prospective of the big data analytics capability in order to advance the supply chain operational administrative proficiency (Srinivasan & Swink, 2017). This is because many firms still do not comprehend how to apply analytical techniques to attain better-quality performance contained by the supply chain.

Besides, despite this background literature, there exists a dearth of scholarly inquiries on the influence of big data analytics on performance in the retail supply chain in Nigeria. Against this background, the present study investigates the impact of big data analytics and performance in retail supply chain in Rivers State of Nigeria, and bridge the gap in knowledge.

LITERATURE REVIEW

Big Data Analytics

Big data analytic has different approaches, since the volume of current datasets in big data is a noteworthy feature, well thought-out to be barred from the conventional management systems of databases); velocity (the rate at which data is composed); and variety (unstructured data are produced by sources such as social media, e-mails, and communication) (Wisner, Tan & Leong, 2012). Big data analytic is defined as a holistic technique for managing, processing, and evaluating data sizes (volume, variety, velocity, veracity, and value) that are desirable to create action-oriented information for unrelenting delivery, performance measurement, and competitive advantage (Wamba, *et al.*2015), Big data analytic entails the

application of sophisticated analytical procedures for mining essential information from huge volumes of data to smooth the progress of decision-making (Tsai *et al.*, 2015). Extraordinary type of all-encompassing data that cannot be stored, stage-managed, and investigated by means of a conservative system simultaneously with an unspecified source, an assortment of dimensions and its affiliation cannot be straightforwardly considered owing to its complication and vibrant nature (Sun, Chen & Yu, 2016).

This concept emanates from the field of operational research, and as a highly developed analysis has had diverse categorization (Chae, 2015) among which are descriptive, predictive, and prescriptive analysis (Lustig, 2010). This study adopts descriptive, predictive, and prescriptive analysis as the dimensions of big data analytics.

Descriptive data analytics is founded on the analysis of data unfolding past business situation, inclinations, prototype, and expostulations. The modus operandi used for descriptive analytics can be differentiated as standard reports and scoreboards, ad hoc reporting, query drilldown (OLAP) alerts, and viewing (Siegel, 2013).

Predictive data analytics is founded on instantaneous data analysis and historical data to envisage the probability of upcoming proceedings. This technology learns from accessible data by means of machine learning procedures and computational algorithms (Siegel, 2013). Big data analytics is frequently used with the purpose to predict. Prediction is the talent to anticipate the future, based on applying convinced modus operandi on datasets. Predictive analytics is a process whereby information hauled out from a mixture of data sources is exploited to illuminate prototypes as well as envisage the future (Elragal & Klischewski, 2017). Predictive analytics has the prospect to convey enormous business worth to companies and persons uniformly. Further, prediction has been acknowledged as a major research area of the future (Elragal & Klischewski, 2017).

Prescriptive data analytics is founded on data-based predictions to bring up to date and offer proposed action deposits that can be beneficial or keep off from definite results and may embrace: (1) studies dealing with the inconsistency of projected outcomes by examining the scenario game theory; and (2) optimization and simulation under situation of unique significance in the perspective of vagueness based on computational stochastic programming of random variables (Monte Carlo).

Performance

Performance is an expression engaged by scholars in the field of marketing to weigh up the efficiency and effectiveness of a careful marketing strategy (Maclayton & Nwokah, 2012). Quite a few researchers have unpredictable point of view on performance and it persists to be a controversial issue in the midst of researchers. Cho and Dansereau (2010), refers to the performance of a firm as measured up to its goals and objectives. Further, performance is an all-encompassing indicator which integrates productivity and quality, consistency and other factors. In defining performance, efficiency allied actions which are linked to the input/output relationship and effectiveness correlated actions, which engross apprehensions, like employee satisfaction and business growth ought to be integrated. Performance is a fundamental construct in the strategy literature. The concept of performance is three fold, as it can be approached as the critical aspiration of management, an end in itself, and can be underscored at the level of individual managers, teams, businesses and conglomerates (Ikegwuru & Harcourt, 2019) in the supply chain management.

The supply chain management concept has been defined as management along with and contained by a network of upstream and downstream businesses, both of which have interactions and flows of material, information and resources (Christopher, 2011).The supply chain can be well thought-out to be an amalgamation of four independent and unified bodies (marketing, sourcing, inventory management, and transport). Supply chain management is in charge for building and preserving associations amid the dissimilar units (Halo, 2018) to achieve organizational goals, if well harmonized. Supply chain management aims at amalgamating business processes that cover the organizational porch of supply network partners to generate value for each stakeholder such as consumers, buyers, suppliers, and shareholders, as well as improve on its performance measurement.

A good number of firms use the expression performance in unfolding an assortment of measurements which consist of output efficiency, input efficiency and also transactional efficiency. So, the term performance may not be fully explained by a single measure. There has also been unpredictability in the measuring of performance as many researchers have used numerous variables in the measurement of performance. Performance has been predictable by means of non-financial (subjective) and financial (objective) measures from equally perceptual and objective sources. It is discernible that as supply chain is a set of connections of divergent organizations, functioning in collaboration is intrinsic for most favorable performance (Santanu, 2012), all aspects of performance measurement need to be perceived with accurate performance metrics, measurement procedure, investigation, plentiful estimation and lastly the vital process (Tian et al., 2003).Therefore, supply chain performance enhancement is an interminable process that requires an analytical performance measurement structure (Ikegwuru & Harcourt, 2018).

Big Data Analytics and Performance

Innovative technologies such as big data analytics harmonize supply chain management in a detached flow (Edwards, Peters & Sharman, 2011) and consent to companies to confine, route, evaluate, stockpile, and swap over data regarding their procedures(Smith, *et al.*, 2007). The following are the computer systems employed for this rationale: Electronic Data Interchange (EDI), Vendor Managed Inventory (VMI), Efficient Consumer Response (ECR), Collaborative Planning Forecasting and Replenishment (CPFR), Collaborative Planning System (CPS), Sales Force Automation (SFA), Point of Sale (POS) data, and Customer Relationship Management (CRM) (Barrat & Oke, 2007).

Among all SCM information flows, big data analytics focuses on data analysis and tools are included in the "analytics" domain. Analytics applies mathematics and statistics to large amounts of data. Big data without analytics is just a lot of data, and analytics without big data is simply math, statistical tools, and applications (Sanders, 2018).

Big data analytics has been well thought-out as a prime capability that can advance a firm's performance (Ghasemaghaei, Hassnein & Turel, 2017; Wamba, *et al.*, 2015). The development of big data analytics capability and the classification of the features that could optimistically power that capability edifice ought to be able to maximize a firm's performance. Accordingly, greater firms performance in a big-data–driven milieu originates from a just right mishmash of all wherewithal, as well as big data analytics management, Information Technology (IT) infrastructure, and analytics skill or knowledge, which should be peerless and incomparable (Barton & Court, 2012; Akter, *et al.*, 2016).

Xu *et al*. (2019) assert that sustainable investment in a supply chain stimulates the co-creation of value by plummeting risks, with big data helping to curtail supply chain stages by broadening economic marginalization and making possible sustainable planning of well turned-out investments. Big data analytic also, gives explanation for the social risk of a supply chain and how it can contribute to realizing ecological, economic, and social sustainability (Lue, Li & Oi, 2019). Other consultants have established the significance and contribution of big data analytics to supply chain management by: (1) improving manufacturing performance by connecting internet of things and big data to manufacturing systems to curtail blockages by developing forecasting techniques (Bi & Cochran, 2014); (2) observing existing inclinations in supply chain management by using Twitter and developing a new conceptual framework in this regard (Chae, 2015).

Empirical Review

Oncioiu *et al.*(2019)study bordered on supply chain management and big data analytics can in Romanian supply chain firms. The study employed a quantitative method based on a sampling survey, using a questionnaire as a data collection tool. The population was 205 managers and assembled data were analyzed with the Statistical Package for the Social Sciences (SPSS) package by means of frequency tables, contingency tables, and main component analysis. The findings highlight that companies are anxious about recognizing new statistical methods, tools, and approaches, such as cloud computing and security technologies, that required to be scrupulously investigated.

Vitari and Raguseo (2018)based their investigation from a dynamic capability perspective, and examine whether firms' facility to power digital data dynamic capability, show the way to enhanced financial performance, and whether there are moderating effects on this association. The study raised the following research questions to accomplish these goals: 1) To what extent do firms that develop Digital Data dynamic capabilities achieve better financial performance? 2) To what extent do organizational and industry-related environmental conditions moderate the relationship between a firm's Digital Data dynamic capability and financial performance? The hypotheses were tested with partial least square modeling by means of a financial database and a survey of sales managers from 125 firms. It was discovered that the development of digital data dynamic capability supplies value in terms of firm financial performance and that the moderating effects are prominent: under high levels of dynamism and munificence in younger firms, the relationship is stronger.

Brinch *et al.,* 2018) study was based on a sequential mixed-method, a Delphi study that focused on rank applications of big data in supply chain management by means of an adjusted supply chain operations reference (SCOR) process framework, and a questionnaire-survey among supply chain executives to expound the Delphi study findings and to assess the practical use of big data. The study's findings illustrates that big data terminology seems to be more about data collection than of data management and data utilization; the application of big data is most applicable for logistics, service and planning processes than of sourcing, manufacturing and return, and supply chain executives seem to have a slow adoption of big data.

Based on the review of literature, the following research model was developed:

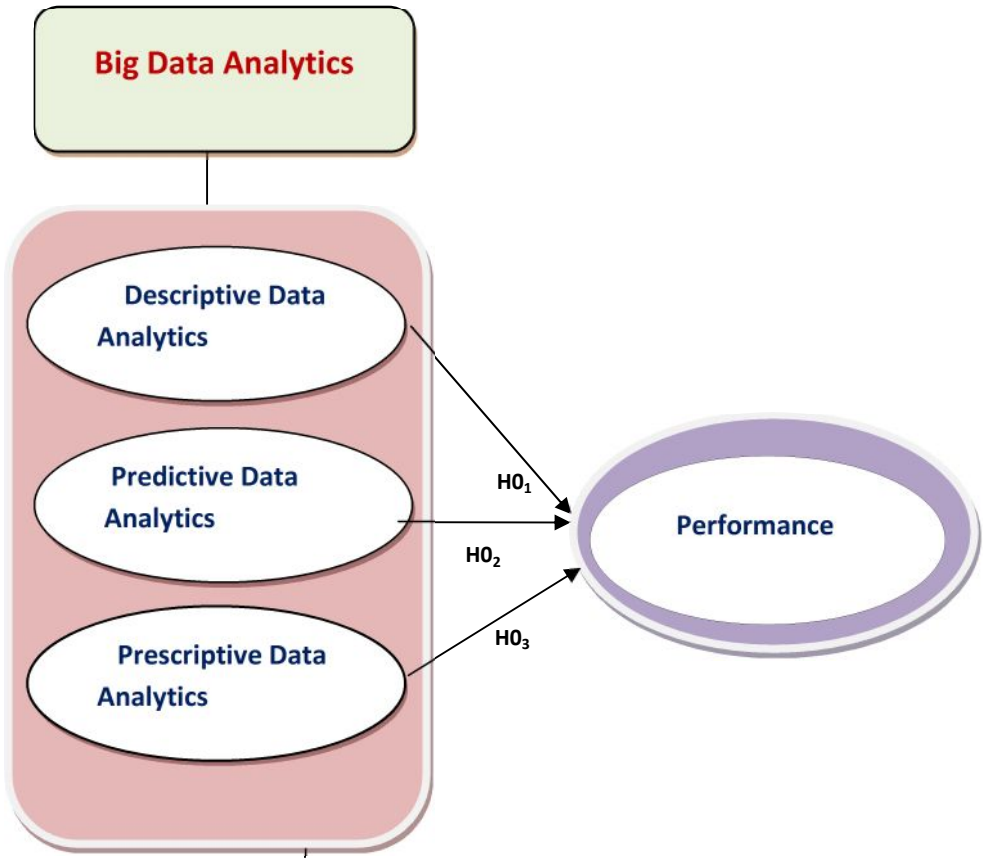

Figure 1: Research Model of Big Data Analytic and Performance
Source: Adopted from Lustig, I., Dietrich, B., Johnson, C. & Dziekan, C. (2010). The analytics journey. *Anal. Mag. 2010, 3, 11–13.*

From the research model, the following hypotheses were formulated.

Ho_1: There is no significance influence of descriptive data analytic on performance of retail supply chain..

Ho_2: There is no significance influence of predictive data analytic on performance of retail supply chain.

Ho_3: There is no significance influence of prescriptive data analytic on performance of retail supply chain.

RESEARCH METHODOLOGY

Research Design

According to Dhar (2015) big data analytics research applies machine learning, data mining, statistics, and visualization techniques in order to collect, process, analyze, visualize, and interpret results. Yet, big data analytics research either employs exploratory data analysis to generate hypotheses, or alternatively pursues predictions relying heavily on advanced machine learning, data mining and statistical algorithms. This present study employs explorative and quantitative survey and, adopted the simple random sampling method in order to collect data from selected retailers. Each retailer is chosen entirely by chance, as each of the retailers has the same possibility of being chosen (Bryman & Bell, 2003).

The study's classification of retailers considered the following:

1. Retail sale via stalls and markets

2. Retail sale of food, beverages and tobacco in specialized stores

3. Retail sale of information and communication equipment in specialized stores

4. Retail sale of other household equipment in specialized stores

This database enclosed all enviable information to reach the retailers. The key informants were the CEO's, logistics/purchasing/marketing/store managers. Data for this study were collected by means of a survey conducted mainly in Port Harcourt metropolis, and its surrounding environs from October to December 2019. Primary data were assessed through a structured pre-tested questionnaire, and the total number of retailers that made contact with via questionnaire was 390. Though, 394 responses were received and after establishing the validity of the questions 296(75.1%) respondents were vital for executing descriptive and inferential analysis. The collected data were analyzed with the Statistical Package for Social Sciences (SPSS) version 22.0, using the frequency and contingency tables, and the ordinary square regression method.

Model Specification

Model 1

The model is specified as follows:

$P = f(DDA)$….equ (i) β

$P = \beta o + \beta 1X1 + \mu t$…(ii)

$P = \beta o + \beta DDA + \mu$…equ (iii)

Where:

P – Performance

DDA – Descriptive Data Analysis

Model 2

The model is specified as follows:

P = f (PREDDA)….equ (i) β

P = βo + β1X1+ µt…(ii)

P = βo + β PREDDA + µ…equ (iii)

Where:

P – Performance

PREDDA – Predictive Data Analytic

Model 3

The model is specified as follows:

P= f (PRESDA)….equ (i) β

P= βo + β1X1+ µt…(ii)

P = βo + β PRESDA + µ…equ (iii)

Where:

P – Performance

PRESDA – Prescriptive Data Analytic

The apriori expectation is β1 > 0. This implies that the independent variable in the models have positive relationship with performance.

DATA PRESENTATION AND ANALYSIS

Reliability Analysis

Reliability Coefficient was computed for the composite scale and each of the subscales, and the results are reported in table 1. As we can see, the value of the Alpha coefficient for the composite scale and the subscales are all above the threshold ($\alpha \geq 0.70$); hence, they are all reliable. Table 1 shows the reliability

assessment of our predictor variables using Cronbach's alpha. It indicates how the items for each factor were internally related in the manner expected.

Table 1: Test of Reliability (n=296)

Scale	Dimension	Items	Reliability
DDA	Descriptive Data Analytics	5	0.841
PREDDA	Predictive Data Analytics	5	0.828
PRESDA	Prescriptive Data Analytics	5	0.812
Overall Reliability Scale		15	0.892

Source: SPSS 22.0 Window output (based on 2020 field survey data).

Table1. summaries the reliability result of big data analytics and performance, which also includes the individual item reliability test). Significantly, all items are reliable and are used to study big data analytics and performance of retail supply chain in Port Harcourt, Rivers State. The extent of the relationship between big data analytics and performance can be operationalised using Descriptive Data Analytics (.841) with 5-items measure; Predictive Data Analytics (.828) with a 5-item measure and Descriptive Data Analytics (.812).

Types of Big Data Analytics used by Firms

The study examined the extent of the use of the three dimensions of big data analytics (Descriptive data analytics, Predictive data analytics and Prescriptive data analytics) in the Nigerian retail supply chain. The result is presented in Table 2:

Table 2:Types of Big Data Analytics Employed (n=296)

S/n	Dimension	Frequency	Percentage
1.	Descriptive Data Analytics	216	73
2.	Predictive Data Analytics	71	24
3.	Prescriptive Data Analytics	9	3
	Total	296	100.0

Source: **SPSS Window Output, Version 22.0 (based on 2020 field survey data).**

Table 1 demonstrates that 216 or 73% of the respondents use the descriptive data analytics, 71 or 24% use the predictive data analysis, while 9 or 3% use the prescriptive data analytics. This implies that there is a considerable usage of the big data analytics in the Nigerian retail supply chain studied. This is further illustrated in Figure 1.

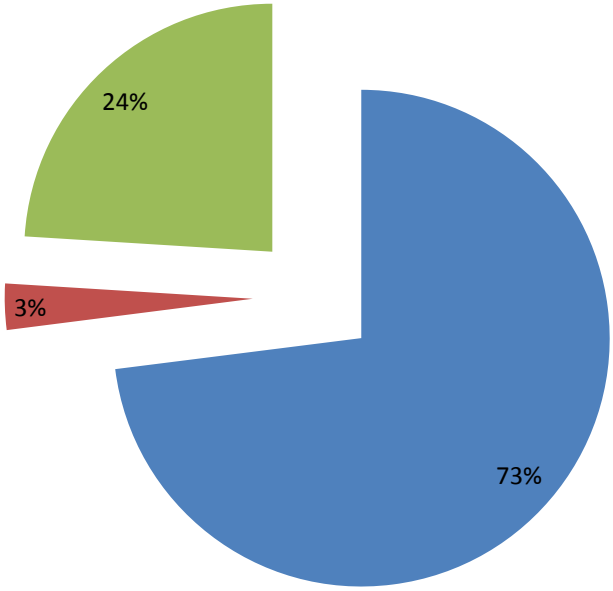

Figure 1: **Types of Big Data Analytics used by Firms**

Test of Hypothesis
To test the model and the hypotheses, the ordinary square regression method was used.

Model 1

Dependent variable: Performance

Method: Ordinary Least Square

Sample: 296

Table 3: Regression Analysis of Descriptive Data Analytics and Performance

Variables	**Coefficient**	**Std Error**	**T-Statistic**	**VIF**
CONSTANT	0.819	0.523	1.410	
LOG (DDA)	0.864	0.479	4.748	1.000

Source: Regression Result (2020)

R2 (Coefficient of determination) = 0.747

R2 (Adjusted coefficient of determination) = 0.745

Durbin Watson =2.02277

F – value = 506.939

Model 2

Dependent variable: Performance

Method: Ordinary Least Square

Sample: 296

Table 4: Regression Analysis of Predictive Data Analytics and Performance

Variables	**Coefficient**	**Std Error**	**T-Statistic**	**VIF**
CONSTANT	1.440	0.893	1.614	
LOG (PREDDA)	0.787	0.584	2.044	1.004

Source: Regression Result (2020)

R2 (Coefficient of determination) = 0.620

R2 (Adjusted coefficient of determination) = 0.584

Durbin Watson =1.039

F – value = 3.329

Model 3

Dependent variable: Performance

Method: Ordinary Least Square

Sample: 296

Table 5: Regression Analysis of Prescriptive Data Analytics and Performance

Variables	Coefficient	Std Error	T-Statistic	VIF
CONSTANT	0.819	0.534	11.533	
LOG (PRESDA)	0.735	0.88	4.748	1.000

Source: Regression Result (2020)

R2 (Coefficient of determination) = 0.717

R2 (Adjusted coefficient of determination) = 0.701

Durbin Watson =1.193457

F – value = 10.013

DISCUSSION S OF FINDINGS

The study examined the impact of big data analytics on performance of retail supply chains in Rivers State of Nigeria. The ordinary least square (OLS) method was used in analyzing data. The findings of the study reveal that: Descriptive data analytics contribute significantly to performance and the t-test showed that descriptive data analytics has a significant impact on performance in Nigeria retail supply chains, Predictive data analytics contribute significantly to performance, and the t-test indicated that Predictive data analytics has a significant impact on performance, and Prescriptive data analytics contribute significantly to performance, the t-test portrayed that Prescriptive data analytics has a significant impact on performance.

The f-test illustrates that descriptive data analytics, predictive data analytics and prescriptive data analytics have a significant impact on performance in Nigeria retail supply chains at 5% level of significance. The adjusted coefficient of determination (R2) in model1show that 84.9% variations in performance is being accounted for by descriptive data analytics 74.5% shows a good fit for model 1, in model 2, the adjusted coefficient of determination (R2) show that 58.4% variations in performance is being accounted for by predictive data analytics. 58.4% shows a good fit for the model, and in model 3, the adjusted coefficient of determination (R2) show that 70.1% variations in performance is being accounted for by prescriptive data analytics. 70.1% shows a good fit for the model.

From the regression result, Durbin Watson (WC) values are: for model 1, 2.02277, model 2,1.039, while that of model 3 is1.193457.These values are closer to zero than two and indicate that that there is perfect positive autocorrelation in the models. The variance inflation factors of the variables are less than 10, entailing that, there is no multicollinearity in the explanatory variable. There is no heteroskedasticity in the models. Based on the statistical analysis. This study therefore establishes that

big data analytics can add value and provide a new outlook by improving descriptive, predictive and prescriptive analysis and modeling them to boost performance in retail supply chains. Nigerian retail supply chains are anxious about big data analytics, and the fact that the development of this dynamic capability can direct the way to supply chain performance, however, these retail supply chain companies have not fully assessed their experience, strategies, and professional capabilities in successfully implementing big data analytics, as well as assessing the tools needed to achieve the goals of implementation and performance achievement based on them. These findings support that of Oncioiu *et al.* (2019) who reveal that companies are anxious about recognizing new statistical methods, tools, and approaches that required to be scrupulously investigated, Birinch *et al*. (2018) who revealed that supply chain executives seem to have a slow adoption of big data.

CONCLUSION

The purpose of this present research was to assess the influence of big data analytic dimensions (descriptive data analytic, predictive data analytic and prescriptive data analytic) on performance in retail supply chains in Rivers of Nigeria. Toward this end, the meanings of big data analytics and performance were elucidated. The finding of significant influence of the independent variables on the dependent variable has confirmed that the retail supply chains in Rivers State of Nigeria are anxious about big data analytics and its role in enhancing performance in supply chains. The study therefore, concludes that the elements of big data analytics significantly predict performance of retail supply chains in Rivers State of Nigeria.

PRACTICAL IMPLICATIONS

The result of this study can be used as a principle by management of retail supply chains to improve on their dig data analytics implementation strategy. Specifically, the blueprint and organization of dig data analytics may be improved upon, if managers stress on the finding of this study. This study confirms that dig data analytics is an important contributor to performance of retail supply chains in Rivers State of Nigeria.

RESEARCH RECOMMENDATIONS

The study recommends that the management of retail supply chains should focus on descriptive data analytics to endear and sustain performance.

Also, management of retail supply chains should enhance big data analytics evaluations to influence performance.

CONTRIBUTION OF RESEARCH

The major contribution of this study is that, for the first time to the best of our knowledge, some big data analytics dimensions (descriptive data analytics, predictive data analytics and prescriptive data analytics) are being illuminated empirically in the context of retail supply chains in a developing country such as Nigeria. Moreover, the findings of the explorative investigation of this study suggest that the retail supply chains can be improved upon, focusing on big data analytics as a holistic entity.

LIMITATION OF THE STUDY

The limitations of this research study pertained to the generalizability, trustworthiness, authenticity, and evenness of the three hypotheses analyzed in this study, making use of ordinary least square regressions, to establish the predictive effect of big data analytics elements on performance.

DIRECTION FOR FUTURE STUDIES

(1) Further studies should consider the opportunities, challenges, advantages and disadvantages of big data in large firms and/or SMEs in the public or private sector of Nigeria.

(2) There should be emphasis on research on the capabilities and benefits of adopting big data analytics in optimizing supply chain management.

REFERENCES

Akter, S. (2017). Big data and predictive analytics for supply chain and organizational performance. *Journal of Business Research, 70, 308-317.*

Akter, S., Wamba, S.F., Gunasekaran, A., Dubey, R. & Childe, S.J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *Int. J. Prod. Econ,182, 113–131*.

Antai, I. &Olson, H.(2013). Interaction: A new focus for supply chain vs. supply chain competition. *Int. J. Phys. Distrib. Logist. Manag., 43, 511–528.*

Barratt, M. & Oke, A.(2007). Antecedents of supply chain visibility in retail supply chains: A resource-based theory perspective. *J. Oper. Manag. 25, 1217–1233*.

Barton, D. & Court, D. (2012). Making advanced analytics work for you. .*Harv. Bus. Rev,90, 78–83.*

Benabdellah, A.C., Benghabrit, A., Bouhaddou, I. & Zemmouri, E.M. (2016). Big data for supply chain management: Opportunities and challenges. *In Proceedings of the IEEE/ACS 13th International Conference of Computer Systems and Applications (AICCSA), Agadir, Morocco, 29 November—2 December.*

Bryman, A. & Bell, E. (2003). *Business research methods*. Oxford : Oxford University Press.

Chae, B., Sheu, C.,Yang, C. & Olson, D. (2014). The impact of advanced analytics and data accuracy on operational performance: A contingent resource based theory (RBT) perspective. *Decis. Support Syst, 59, 119–12*6.

Chen, C.P. & Zhang, C.Y. (2014). Data-intensive applications, challenges, techniques and technologies: a survey on big data, *Information Sciences, Vol. 275, pp. 314- 347*

Cho, J. & Dansereau, F. (2010). Are transformational leaders fair? A multi-level study of transformational leadership, justice perceptions, and organizational citizenship behaviors, *The Leadership Quarterly, 21(3), 409- 421*.

Choi, T.M., Wallace, S.W. & Wang, Y. (2017). Big data analytics in operations management, *Production and Operations Management, doi: 10.1111/poms.12838.*

Dhar, V. (2013). Data science and prediction. *Commun ACM, 56(12),64–73.*

Du, B., Liu, Q. & Li, G. (2017). Coordinating leader-follower supply chain with sustainable green technology innovation on their fairness concerns. *Int. J. Environ. Res. Public Health, 14, 1357.*

Dubey, R. & Gunasekaran, A. (2015). Education and training for successful career in big data and business analytics. *Industrial and Commercial Training, 47(4),174- 181,*

Edwards, P., Peters, M. & Sharman, G. (2001). The effectiveness of information systems in supporting the extended supply chain. *J. Bus. Logist, 22, 1–27.*

Elragal, A. & Klischewski, R.(2017). Theory-driven or process-driven prediction? Epistemological challenges of big data analytics. *J Big Data* 4**(**19).

Fosso Wamba, S., Gunasekaran, A., Akter, S., Ren, S.J.F., Dubey, R. and Childe, S.J. (2017). Big data analytics and firm performance: effects of dynamic capabilities.*Journal of Business Research,70,356-365.*

Galbraith, J.R. (2014). Organization design challenges resulting from big data. *Journal of Organizational Design, 3(1), 2-13.*

Ghasemaghaei, M., Hassanein, K. & Turel, O (2017). Increasing firm agility through the use of data analytics: The role of fit. .*Decis. Support Syst.,101, 95–105.*

Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S.F., Childe, S.J., Hazen, B. and Gupta, M. & George, J.F. (2016), Toward the development of a big data analytics capability. *Information & Management, 53(8), 1049-1064.*

Hazen, B.T., Boone, C.A., Ezell, J.D. & Jones-Farmer, L.A. (2014). Data quality for data science, predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications, *International Journal of Production Economics, 154, 72-80.*

Hazen, B.T., Boone, C.A.,Ezell, J.D. & Jones-Farmer, L.A. (2014). Data quality for data science,

predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications. Int. J. Prod. Econ., 154, 72–80.

Ikegwuru, M. I. & Harcourt, H. (2018). Understanding the impact of cloud computing service adoption on supply chain performance: An empirical study. *RSU Journal of Strategic and Internet Business, 3(2), 182-204.*

Ikegwuru, M. I. & Harcourt, H. (2019). Platform as a service and supply chain performance: Evidence from Nigerian retail petroleum marketing firms. *Journal of Emerging Technologies and Innovative Research, 6(12), 232-245.*

Kiron, D., Prentice, P.K. and Ferguson, R.B. (2014), The analytics mandate.*MIT Sloan Management Review, 55(4), 1-25.*

Liu, L., Li, F. & Qi, E.(2019). Research on risk avoidance and coordination of supply chain subject based on blockchain technology. *Sustainability, 11, 2182*.

Lustig, I., Dietrich, B., Johnson, C. & Dziekan, C. (2010). The analytics journey. *Anal. Mag. 2010, 3, 11–13.*

Santanu, M. (2012). Supply chain performance: Review of empirical literature. *Romanian Review of Social Sciences, 3, 24-35.*

Maclayton, D.W. &Nwokah, N.G. (2012). Measuring business excellence. *Journal of Marketing 10(4), 65-76.*

Mani, V., Delgado, C., Hazen, B.T. & Patel, P.(2017). Mitigating supply chain risk via sustainability using big data analytics: Evidence from the manufacturing supply chain. *Sustainability, 9, 608.*

Papadopoulos, T., Gunasekaran, A., Dubey, R., Altay, N., Childe, S.J. and Fosso-Sanders, N.R. and Ganeshan, R. (2015). Special issue of production and operations management on big data in supply chain management. *Production and Operations Management, 24(7), 1193-1194.*

Sanders, N.R. (2014). *Big data driven supply chain management: A framework for implementing analytics and turning information into intelligence*, (1st ed.). Pearson: Hoboken, NJ, USA.

Schoenherr, T. & Speier-Pero, C. (2015). Data science, predictive analytics, and big data in supply chain management: current state and future potential. *Journal of Business Logistics, 36(1), 120-132.*

Siegel, E. (2013). *Predictive analytics: The power to predict who will click, buy, lie, or die.*Wiley Publishing: Hoboken, NJ, USA.

Smith, G.E. Watson, K.J. Baker, W.H. & Pokorski, J.A. (2007). A critical balance: Collaboration and security in the IT-enabled supply chain. *Int. J. Prod. Res., 45, 2595–2613.*

Srinivasan, R. & Swink, M. (2017). An investigation of visibility and flexibility as complements to supply chain analytics: organizational information processing theory perspective. *Production and Operations Management, doi: 10.1111/poms.12746.*

Sun, E.W., Chen, Y.T. & Yu, M.T. (2015). Generalized optimal wavelet decomposing algorithm for big financial data. *Int. J. Prod. Econ. 2015, 165, 194–214.*

Tsai, C.W., Lai, C.F., Chao, H.C.& Vasilakos, A.V. (2015). Big data analytics: A survey. *J. Big Data, 2, 21*.

Waller, M.A. & Fawcett, S.E. (2013). Click here for a data scientist: Big data, predictive analytics, and theory development in the era of a maker movement supply chain. *Journal of Business Logistics, 34(4),249-252*.

Wamba, S. (2017). The role of big data in explaining disaster resilience in supply chains for sustainability. *Journal of Cleaner Production,142,1108-1118.*

Wamba, S.F., Akter, S., Edwards, A., Chopin, G. & Gnanzou, D. (2015). How big data can make big impact: Findings from a systematic review and a longitudinal case study.*Int. J. Prod. Econ.,165, 234–246*.

Wang, G., Gunasekaran, A., Ngai, E.W. & Papadopoulos, T. (2016). Big data analytics in logistics and supply chain management: Certain investigations for research and applications, *International Journal of Production Economics, 176, 98-110.*

Xu, L., Gao, R., Xie, Y. & Du, P. (2019). To be or not to be? Big data business investment decision-

making in the supply chain. *Sustainability, 11, 2298.*

Zeng, X., Lin, D. &Xu, Q. (2011). Query performance tuning in supply chain analytics. *In Proceedings of the 4th International Conference on Computational Sciences and Optimization (CSO), Kunming and Lijang City, China, 15–19 April 2011; p. 32.*

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