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Business Intelligence Dashboards and Improved Performance of Farmers in Bayelsa State, Nigeria

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Abstract:- Digitalizing the information system into a dashboard mechanism makes it easy for executives to interpret data processed by professionals in different field even with little knowledge on the technicalities in the background. Farmers with little knowledge in Information technology, business management, accounting principles and can make use of a computer or a smart phone can use a professional dashboard with ease to make informed decisions. This research uses a explanatory cross-sectional design. Context diagram, use case diagrams and data flow diagrams are designed to show clarity on the study content. The study analyses two research Hypotheses; (1) There is no statistically significant relationship between dashboard acceptability and age of farmers in Bayelsa State, Nigeria. (2) There is no statistically significant relationship between dashboard acceptability and educational level of farmers in Bayelsa State, Nigeria. The total population of this study is 150 farmers in Bayelsa State, Nigeria. This research uses SPSS as its statistical tool for analyses. Hypotheses are tested with spearman correlation. The key findings of this research shows that farmers would be willing to make use of a business information dashboard to enable them have access to professional insight to their business and increase profitability. Among the recommendations of this study are (1) Dashboard service providers should be willing to train farmers on the use of the system and (2) They should provide accounting analytics that would ease complexities.

Keywords:- *Business Intelligence Dashboard, Accounting Analytics, Improved Performance.*

I. INTRODUCTION

The basic role of a digital dashboard is to track the flows inherent in the business processes that they monitor. Graphically, users may see the high-level processes and then drill down into low level data. This level of detail is often buried deep within the corporate enterprise and otherwise unavailable to the senior executives (Wikipedia, 2012). Digitalizing the information system into a dashboard mechanism makes it easy for executives to interpret data processed by professionals in different field even with little knowledge on the technicalities in the background. With the use of graphs and other metrics information are better interpreted so people can easily make preference, make choices, identify what is making progress or what is retrogressing and decide what changes need to be made, what area requires changes and when will be the appropriate time to implement the desired changes. Farmers with little knowledge in Information technology and can make use of a computer or a smart phone can use a professional dashboard with ease. This is because; the information displayed will be simplified with graphics and explained in a layman language.

Dashboards have become a standard business tool over the last decade. Dozens of dashboard building solutions have sprung up to meet the demand. Yet in the flurry of technology and enthusiasm, little attention has been paid to how to design focused, thoughtful, and user-friendly dashboards (Gemignani, 2009). The idea of developing dashboard is been borne in the mind of different persons. Different kind of dashboard has been developed to suite different business conditions and different departmental activities. The nature of dashboard developed over the years have been improved over time due to different short. Traditional dashboard design focuses almost exclusively on defining the right success metrics, then piecing together a bunch of charts and gauges on a single page. These techniques yield dashboards with a hodgepodge appearance and confusing information (Gemignani, 2009). The dashboards produced were less user friendly and still had lots of complexity that would be difficult to interpreted by a lay man. (Gemignani, 2009). Dashboards as a concept are not new, but with new technologies and maturing user demands, the scope of dashboards has widened from just a static state of information to a highly interactive and dynamic source of both strategic and operational information that is fully integrated as a BI solution. It covers all aspects of BI from summarized views to the ability to dig into details for root cause analysis, thereby helping organizations improve their performance and ensuring that the right people are making the right decisions at the right time. Different users have a different perspective of what a dashboard means, or how it should be designed, and how it should function. This varies not only with the collection of graphic types but also the aesthetics of layout, color, size and shape. Some users would look at dashboards just as collection of key business metrics, and some can say that it is a complete reporting solution or a BI application. It can be difficult to decipher the differences between dashboards and get a proper understanding of which solution best fits the needs of the organization (Chitale, 2012).

Modern dashboards tends to follow organizational preferences to develop personalized systems that will give proper KPIs that would be more standardized, present clear and rich visual interface, use integration mechanism to

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provide consistent results and constantly using audience feedback to keep improving the quality of metrics and the presentation of information.

Business intelligence and analytics (BI &A) and the related field of big data analytics have become increasingly important in both the academic and the business communities over the past two decades. Industry studies have highlighted this significant development. For example, based on a survey of over 4,000 information technology (IT) professionals from 93 countries and 25 industries, the IBM Tech Trends Report (2011) identified business analytics as one of the four major technology trends in the 2010s (Chen et al., 2012). The implementation of a business intelligence (BI) system is a complex undertaking requiring considerable resources. Yet there is a limited authoritative set of critical success factors (CSFs) for management reference because the BI market has been driven mainly by the IT industry and vendors. This research seeks to bridge the gap that exists between academia and practitioners by investigating the CSFs influencing BI systems success. The study followed a two-stage qualitative approach. Firstly, the authors utilized the Delphi method to conduct three rounds of studies. The study develops a CSFs framework crucial for BI systems implementation. Next, the framework and the associated CSFs are delineated through a series of case studies. The empirical findings substantiate the construct and applicability of the framework. More significantly, the research further reveals that those organizations which address the CSFs from a business orientation approach will be more likely to achieve better results (Yeoh and Koronios, 2010).Expectations by the implementation manager of ERP projects are important factors (Somers and Nelson, 2001). Dashboard should be available via a web browser so everyone who needs to can access it, rather than being housed on one individual's desktop (Lavinsky, 2013). This study use of dashboard.

Vanderbeck (2010) posits that, cost counting, provides detailed cost information needed by management to manage current operations and plan future operations. Management then uses this information to determine how to allocate resources to business areas more efficiently and cost-effectively. Cost can be tracked objectively, using reliable and meaningful cost measures that contributes to a confident decision making (Sanzhar and Alinur 2019). Undererstanding and relying on these cost measure, provides the basis for making predictions and making decisions. Careful implementation of cost objects and other accounting details would be highly benefitial to local farmers in Bayelsa State. Most farmers in Bayelsa State, Nigeria, do not pay special concern to the leverage information systems brings. This study identifies the backward state of the agricultural sector in Bayelsa state, as most of its food items are been imported. Based on the aforementioned, this study aims to examine the relationship between Business Information dashboards and improved performance of farmers in Bayelsa State, Nigeria.

II. LITERATURE REVIEW

The part of Information Technology that focuses on reporting and analysis currently goes by the name Business Intelligence (BI) (Few, 2006). BI systems combine data gathering, data storage, and knowledge management with analytical tools to present complex and competitive information to planners and decision makers (Negash and Gray, 2008). Monitoring and controlling business processes is a challenging task: different data sources need to be combined, appropriate visualizations need to be defined to observe certain goals or Key Performance Indicators (KPI) (Kintz, 2012). The idea of dashboards service is to use visualization to interpret financial and economic data at its complexity to the simplest form. Visualization helps people interpret data by exploiting human perception to reduce cognitive load (McLachlan et al., 2008). A dashboard provides a rich user interface that displays the information in a graphical form using a variety of elements including charts, tables and gauges. These elements reduce the time spent on analyzing the data using databases and thus assist in automating the business decision making process (Hansoti, 2010). The purpose of data collection and graphical display is to allow viewers to quickly detect trends or dips in service and then be able to zoom in on trouble spots to understand the cause (Nagy et al., 2009). A performance dashboard may consist of one or more dashboards, scorecards, reports, and analytical tools that run off a common set of data and metrics. Collectively, they enable users to identify problems and opportunities, collaborate on an approach, take action, and adjust plans and goals as needed (Eckerson, 2009). Metrics are ultimately the key to the success of any dashboard or scorecard. They are the linchpin between the business and technical architectures (Eckerson, 2006).

According to Frolick, & Ariyachandra (2006), developing a business performance management system would require strategies beginning from identifying what the organizations want to achieve (their goals). This has been described as a key value driver required to attain the strategy, and to measure business performance over time. in the planning step they developed a program of action on how to carry out the business strategy. With the use of plan managers within different functional units can set goals giving the possibility to outline a budget in line with set plan that specifies how resources will be allocated to carry out organisation's goals. Though some barriers were identified that could mar the process of a dashboard. These barriers can be both external and internal challenges. One noticeable external factor demanding an improved system is the competitive business market. The market place expert's pressure on the organisation to be better at forecasting. It punishes organisations that cannot act timely and effective forecast to react faster to dynamic business conditions (Frolick and Ariyachandra, 2006).

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Resnick explained that at the highest level, executive dashboards must be customizable for the variety of situations in which they are used. Executive dashboards are often used by internal officers on a regular basis to conduct their strategic and tactical decision making. They can also be used by outsiders such as directors, venture capitalists or bankers to analyse the company for auditing, investment and loan decisions. Maintaining fundamentally different system interfaces for these groups is critical both because they have different information needs and the company has the need to protect proprietary information. Ecological interface design (EID) methods should be used to identify the information requirements for each supported user group (Resnick, 2003). He continued that the most frequent users of executive dashboards are company executives and upper-level managers. Executives from different domains will require different kinds of information at different times. Domains from which data may be needed include financial, customer, and operations. Within each of these domains, there are several types of data, including resources, system status and warnings. Resource data represent a measure of the amount of a particular resource that can be attributed to the company as a whole or a discrete subunit. System status data represent the current or historical states of a resource or process. Data can also be simplified and presented only as warnings. In this case, the actual data is not shown, but an indication that the measures have reached a noteworthy level is provided. This is helpful to reduce the complexity of the decision when precise figures are not needed.

Bennett & Flach (1992) provide an overview of several display types. The most basic is the single sensor, single indictor (SSSI) display that provides individual units of data directly from a source. For example, total daily sales of a particular product line could be displayed using a SSSI as a digital display that would be updated each day. The limitation of SSSI displays is that they provide data rather than information; it is left to the user to interpret the data. Other advantages and limitations are found with separable, configural and integral formats for integrating data sources together. Selecting the appropriate display type is critical to support effective use of the data (Bennett and Flach, 1992).

Tyrychtr, Ulman, & Vostrovsk (2015), posits that, Business Intelligence (BI) tools have the necessary technology that can help the agricultural sector to be more profitable as it gives basic support to managerial, analytical, planning, and decision-making activities of managers and specialists. Business dashboards are well designed business intelligence systems that can be said to have the requirements that give the need information that can support the decision-making and economic processes in an agricultural enterprise. Precision agriculture requires the research models such as the complex solutions and specialized software tools (Janová 2014). Studies show that there is an alarming rate of diary food waste at consumption. This list of diary food comprising milk, cream, yogurts, and cheese, are primarily lost at the consumption phase. Several studies pointed out that food waste mainly occurs in the consumption supply chain stage (Caldeira et al., 2019). This supply chain can be addressed adequately with a Enterprise Resource Planning System, that can be built in form of a business information dashboard showing key metrics that will lead to a more efficient decisions making.

III. RESEARCH METHOD / DESIGNS

This research uses a explanatory cross-sectional design. Context diagram, use case diagrams and data flow diagrams are designed to show clarity on the study content. Structured questionnaires are designed and distributed to the study population as instruments used for testing the stated hypotheses in this study and also descriptive analyses of data gathered. The total population of this study is 150 farmers in Bayelsa State, Nigeria. This research uses SPSS as its statistical tool for analyses. Hypotheses tested with spearman correlation. The section B of the questionnaire used as a survey tool to gather data is written in likert scale format with options ranging from Strongly Agree to Strongly Disagree.

- *Research Hypotheses*

The hypotheses of this study are specifically focused on testing the acceptability of a dashboard system in Bayelsa State, Nigeria. The null and alternate hypotheses in this study are stated as;

Hypothesis 1: There is no statistically significant relationship between dashboard acceptability and age of farmers in Bayelsa State, Nigeria.

Hypothesis 2: There is no statistically significant relationship between dashboard acceptability and annual income of farmers in Bayelsa State, Nigeria.

- *Context Diagram*

The context diagram below shows the relationship the dashboard system has with other external entities. The system receives inputs of users into the system for processing. This information can be stored in the database and the system can process the information give into simple metrics. The dashboard system would give output relating to key performance indicators (KPIs).

The Administrator receives all order request and processes the order based on the client's specification and requirements. Every other input necessary to the development of the personalized dashboard is collated and integrated into the system by the administrator.

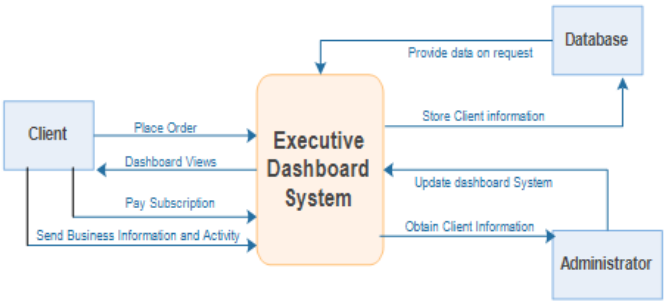

Fig 1: Context diagram

- *Use Case Diagram*

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Administrators and client are the two main external entities that interact and make use of the system's functionalities. The use case diagram in fig 2 below, shows what the client can input into the system and what administrators can also input into the system.

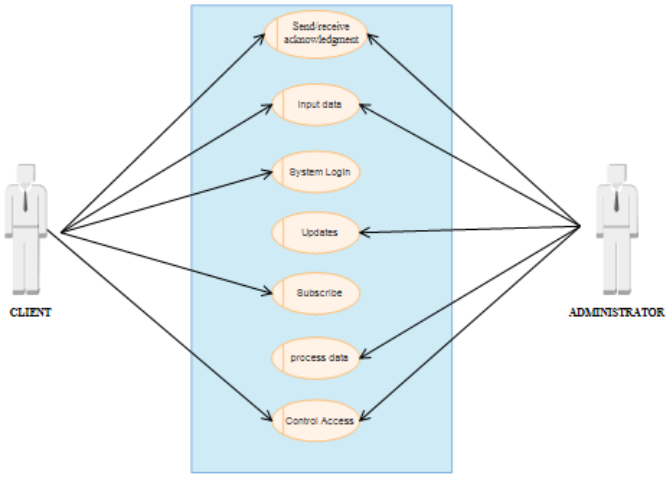

Fig 2: Use Case Diagram

➢ *DATA FLOW DIAGRAM*

The data flow diagram shows a flow of information from the client to the administrator back and forth. The client is expected to sign in as a member in order to use the dashboard service. It is only when a sign in has been done the client can place an order. He order needs to be processed by the administrator to enable the client view the personalised dashboard.

The process of making the dashboard ready for view takes time after an order has been placed. All necessary documents and information would be presented by the client and then collated and integrated into a p1ersonalized dashboard for the user.

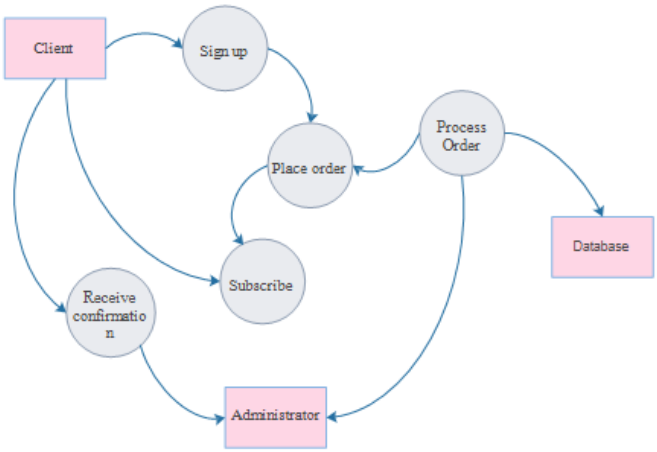

FIG 3 DATA FLOW DIAGRAM

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IV. DESCRIPTIVE STATISTICS

THE TABLE BELOW DESCRIBES THE RESPONDS GOTTEN FROM THE POPULATION OF THIS STUDY. USING THE MEAN SCORE AND STANDARD DEVIATION.

TABLE 1: LIKERT SCALE ANALYSIS

TABLE 1: UNIVARIATE ANALYSIS

ITEMS	N	MEAN	STD. DEVIATION
EVERYONE CAN EASILY OPERATE ANDROID PHONES NOWADAYS	150	3.18	.748
EVERY FARMER CAN AFFORD ANDROID PHONE AND INTERNET SUBSCRIPTION	150	2.78	.708
COMPUTER SYSTEMS HAVE MADE INFORMATION EASILY ACCESSIBLE	149	3.14	.612
THE USE OF CHARTS AND GRAPHS SIMPLIFIES INFORMATION THAT ANYONE CAN INTERPRET	150	2.74	.751
KNOWLEDGE IN CURRENT BUSINESS SITUATIONS CAN HELP BUSINESSES MAKE GOOD DECISIONS	150	3.22	.465
BUSINESSES WOULD BE INTERESTED IN APPLICATIONS THAT PROVIDES PROFESSIONAL SUPPORT	150	2.94	.740
AN APPLICATION THAT CAN HELP A BUSINESS FORECAST THE FUTURE WOULD LIMIT BUSINESS FAILURE RATE	150	2.94	.682
FARMERS WOULD BE WILLING TO SUBSCRIBE TO THIRD-PARTY APPLICATIONS TO HELP ORGANIZE THEIR BUSINESS	150	2.88	.659
VALID N (LISTWISE)	149		

From the table above, the mean score shows that majority of the respondents agree to the statement presented in each of the research item.

Table 2:Age of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Above 150	51	34.0	34.0	34.0
	36 – 150	30	20.0	20.0	54.0
	26 – 35	45	30.0	30.0	84.0
	18 – 25	24	16.0	16.0	100.0
	Total	150	100.0	100.0	

34% of the respondents are above the age of 150, 30% of the respondents are between the ages of 26 – 35 years, 20% of the respondents are between the ages of 36 – 150 years and the remaining 8% of the respondents are between the ages of 18 – 25 years.

Table 3:Annual Income of Respondents

Income in Naira		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1500,000 - 900,000	33	22.0	22.0	22.0
	1 million - 2.5 million	51	34.0	34.0	56.0
	2.5 million - 5 million	42	28.0	28.0	84.0
	Above 5 million	24	16.0	16.0	100.0
	Total	150	100.0	100.0	

The highest percentage o respondents in this study earns an annually income to falls within the range of 1 million to 2.5 million naira. It was also gathered that 16% of the respondents earns an average annual income above 5 million naira.

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Table 4: Educational Level of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SSCE	60	40.0	40.0	40.0
	OND	30	20.0	20.0	60.0
	BACHELORS	57	38.0	38.0	98.0
	POSTGRADUATE	3	2.0	2.0	100.0
	Total	150	100.0	100.0	

The table above shows that 20 of the respondents are school certificate holders. Followed by bachelors, with a total of 19 persons, and ordinary national diploma holders. Only one respondent has a postgraduate degree.

Table 5: Correlations between dashboard acceptability and age of respondents

			Dashboard Acceptability	Age of Respondents
Spearman's rho	Dashboard Acceptability	Correlation Coefficient	1.000	.622**
		Sig. (2-tailed)	.	.000
		N	150	150
	Age of Respondents	Correlation Coefficient	.622**	1.000
		Sig. (2-tailed)	.000	.
		N	150	150

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

The result of the spearman rank correlation in the tables above shows that there is a strong positive statistically significant relationship between dashboard acceptability and the age of respondents, r = 0.622, n = 150, p < 0.01. The null hypothesis is rejected. The alternative hypothesis that there is a significant relationship between dashboard acceptability and age of respondents is accepted.

Table 6:Correlations between dashboard acceptability and educational level of respondents

			Dashboard Acceptability	Educational Level of respondents
Spearman's rho	Dashboard Acceptability	Correlation Coefficient	1.000	.546**
		Sig. (2-tailed)	.	.000
		N	150	150
	Educational Level of respondents	Correlation Coefficient	.546**	1.000
		Sig. (2-tailed)	.000	.
		N	150	150

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

The result of the spearman rank correlation in the tables above shows that there is a strong positive statistically significant relationship between dashboard acceptability and the education level of respondents, r = 0.546, n = 150, p < 0.01. The null hypothesis is rejected. The alternative hypothesis that there is a significant relationship between dashboard acceptability and the education level of respondents is accepted

V. CONCLUSION

This research work is focused on viewing the relationship between dashboard acceptability for farmers in Bayelsa State, Nigeria. It is important to note that the descriptive statistics analysed in this study shows that on an average respondents responded positive to the questions asked which indicates that they agree to all the items stated in the questionnaire. The minimum computed mean is 2.74 and it is above 2.150. Though, From the analyses it can be deduced that several factors can influence the use of dashboards by farmers. Among the factors are; level of education, age, and income. These stated factors have shown to significantly affect the responds of farmers to the use of a business dashboard. Farmers with low educational background seem not to see the need to rely on a computer system for guidance. It was also observed that persons within the age bracket of 18 – 25 seem to be very interested in an information system that can help simplify activities in their operations. Reasons could be that they are already familiar with the use of devices and various applications than those within the age bracket of 150 years and above. Persons with a lower income are also less likely to desire to subscribe to a third party application than persons with a higher income. This study is aimed at developing an interactive interface for

the client but inputs needs to be done by an admin to make this process complete. The context diagram, use case diagram, and data flow diagram gives a diagram explanation on the basic functionality of a Business Intelligence dashboard.

RECOMMENDATIONS

From the findings in this research, the following recommendations are made;

- Third party dashboards should be available for Android users as mobile phones is the closest computer infrastructure to most farmers in Bayelsa State. This is to bring about ease in the process of accessing information. The statement that everyone can easily have access to mobile phone on table 1, has a mean of 3.18. This means respondents agree that android phones are available for most farmers to use.
- Training and Sensitization of farmers with low educational level. This study rejected the hypothesis which states that there is no significant relationship between dashboard acceptability and the education level of respondents. Results show that there exists relationship between dashboard acceptability and the education level of respondents. Therefore proper sensitization should be done for low educational level respondents to widen their understanding on the importance of exploring professional help to improve their business processes.
- Dashboards should provide accounting Analytics that ease complexities. Accounting is a profession of it's own and requires professionals in managing it. Most farmers do not have good knowledge in accounting. The use of professional dashboard service will help such farmers become more proficient as complex accounting information would be simplified using graphs and simple text explanations.
- Dashboard service providers should have a office in Bayelsa State. This would enable professionals such as cost and analytical accounting handlers provide a more effective and efficient service to the clients of the dashboard service providers. Also it will create easy access for the farmers to have interactions for professional advice in person whenever they so choose.

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