ISSN 2047-3338

Internet Banking User Interface Design: A Comparative Trend Analysis of Nigeria Perspective

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***Abstract*—User Interface is an important component of every computing system. This is particularly true in Internet Banking, where the users are customers, who access the banking services online, from different locations of the world. These customers when dissatisfied with the banking services could take drastic actions, such as spreading service failure related rumours, withdrawal of patronage, and so on. Since customers access Internet Banking services through the user interfaces via the websites, it means that such interface designs should follow best practices and highest standards. Though no singular Internet Banking System may be termed as superior over the rest of the others in the world, it is necessary that system designers should be contemporary, innovative and customer-centric. One way to achieve this is by studying what is obtainable in the industry with the view of improving on the existing expertise. This work is a computational analysis of the current trends in Internet Banking user interface designs, with cases studies drawn from some selected Nigerian banks. Some of the outcomes of this research are the User Interface Functionality (UIFA) Chart, and the User Interface Similarity Analysis (UISA) Chart.**

***Index Terms*—Internet Banking, User Interface, Trend Analysis and Virtual Keyboard**

I. INTRODUCTION

THE role of Information Technology in banking is such a strategic one. Thus, an article [1] described Information Technology as the heart of banking, while [2] called it a radical innovation in banking. The Internet, as a field of Information Technology plays a leading role in banking, as it enables financial institutions to handle their transactions online, real time. A research by [3], which was corroborated by [4] reiterated that Internet has an exponential influence on the ability of banks to transact businesses online. It is therefore not out of place to devote this research to the study of the user interfaces through which Internet Banking transactions take place.

A number of researches have revealed the importance of user interface in computing. For instance, [5] described user interface as a major factor that determines software acceptability and marketability. A research by [6] has linked the concept of '*software non-usability*' with complexity arising from wrong interface design. We will describe the methodology of this research.

II. MATERIALS AND METHODS

This research is a trend analysis study, involving some selected banks in Nigeria. The five banks used as case studies are, UBA [7], First Bank [8], GT Bank [9], Zenith Bank [10], and Stanbic IBTC Bank [11] as shown in Fig. 1. The strategy adopted in this work is to focus our critical analysis on the '*pro-Internet Banking functionalities*' designed into the websites of the selected banks. This follows from the fact that the bank customers access the Internet Banking services via the websites.

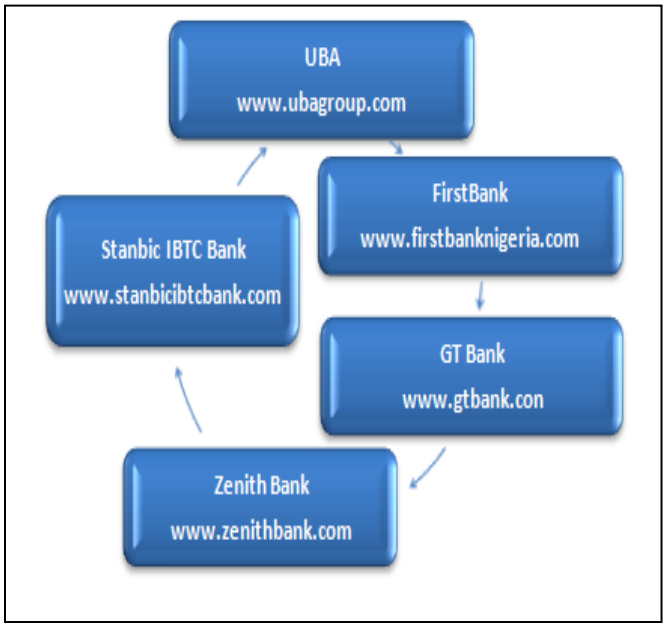

Fig. 1: Five Nigerian Banks Studied

The term *pro-Internet Banking functionalities* refers to the visual language elements designed into the Internet Banking interface, in order to enrich the customer's experience, and facilitate the banking operations. Examples of such operations are, supply of data to the banking system, retrieval of important information from the banking system, and so on. A

number of research articles like [12] and [13] have summarized the common elements of visual language interface design into a four-letter acronym WIMP, that is "*windows, icons, menus and pointers*".

The functionalities identified and studied by this research can be grouped into seven design categories. These are the user convenience design, security design, trust related design, bank and product (BAP) information design, communication design, social network design, and internationalization design, as listed in the functionalities pyramid in Fig. 2. Each of the five Internet Banking systems studied, were considered in terms of these design categories.

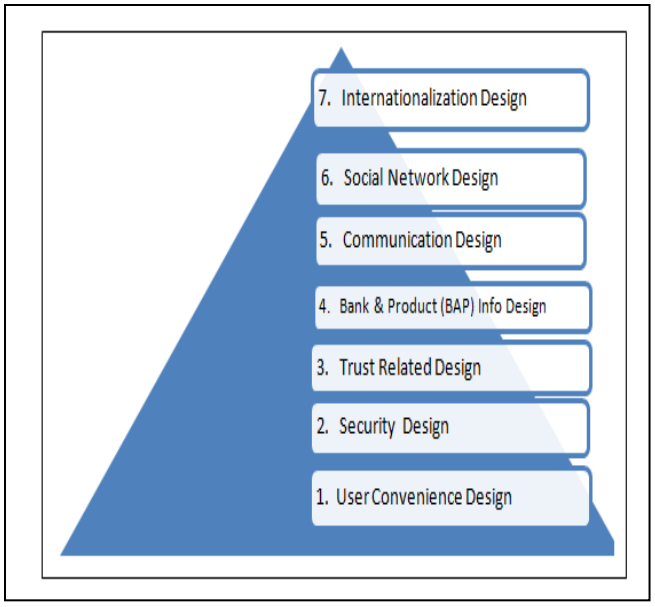

Fig. 2: Functionalities Pyramid

A. *User Convenience Design*

One of the benefits of Internet Banking, over the traditional offline banking is user convenience [14]. Four major functionalities have been identified, which can be designed into the Internet Banking website, to enhance user convenience. These are '*Forms Download', 'Search Engine', 'System Clock Display',* and *'Back to the Top'* functionalities, as shown in Fig. 3.

Customers make services requests to banks through a number of means, such as phone calls, formal letters, sms, e-mails, and so on. Most times, the customers initiate such requests by the completion and submission of important forms. In the traditional offline banking, the customers are required to visit the banking halls in order to achieve this - a process which is time consuming. In Internet Banking however, the system designers articulate all the necessary forms, and build them into the websites. Thus, a customer simply locates the form objects in the website, completes and submits the form online for further processing. In more complex cases where the customers' signatures are required, the system designer builds forms repositories into the Internet Banking System. These forms are stored in common file formats such as Microsoft Word and PDF. Consequently, File Download functionality is designed into the website, so that the customer can easily download these forms by a click of the button.

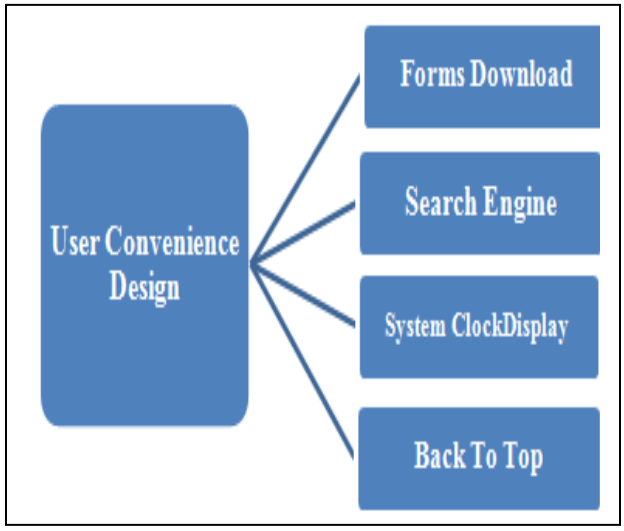

Fig. 3: User Convenience Design Options

Another design trend that enhances customers' convenience is to incorporate the '*Search Engine'* functionality into the Internet Banking website. For instance, the search engine could answer such service related questions like, '*where in a city XYZ do we have a branch of the bank?*', '*which of the bank's ATMs can handle cash deposits?*', '*which of the bank branches handle Western Union Money Transfer?'*, and so on. Another design trend that enhances customer convenience is the '*System Clock/Calendar*' display. For instance, designing a system calendar into the Internet Banking website saves the customer the pains of looking out for a physical diary, or trying to figure out dates. This is especially important while trying to supply date related data into the banking system. The '*Back To Top*' design refers to a functionality which makes it possible for users to simply move to the top of a page by click of a button. For instance, imagine a customer viewing a bank information web page that is fairly long. It could be very irritating and time wasting, if the only way to move to the top of the page is by pressing the '*Top Arrow*' key or by clicking the vertical bar several times. The design strategies so far enumerated are by no means an exhaustive listing of how to achieve user convenience. In fact, system design for user convenience is an area of active scientific research.

B. *Security Related Design*

Rather than delving into full discussions on the internal security of Internet Banking, this research will focus on the security related designs at the user interface level. Three of the important functionalities of interest are idle time expiry, keyboard design, and password recovery design, as shown in Fig. 4.

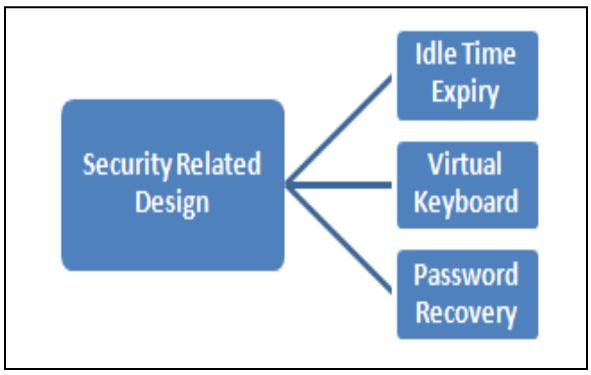

Fig. 4: Security Functionalities Diagram

Idle Time Expiry is designed into the Internet Banking system for security reasons. Leaving a computer system idle for a long time is a security lapse, because it gives room for unauthorized access into the system. The rule of thumb is that, no form of security lapses should be underrated or ignored in Internet Banking, since a singular financial fraud over the internet could lead to loss of huge amount of money. Moreover, it is usually a very difficult task to recover such funds. The trend is therefore, to build idle time expiry into the Internet Banking usage, such that if the user leaves the system idle longer than necessary, the system automatically logs out the user.

The virtual keyboard functionality is another security related design. A number of scientific researches such as [15], [16] and [17] recommend the virtual keyboard implementation as a more secure user authentication data entry medium, than the traditional physical 'QWERTY' keyboard. The trend in Internet Banking design is to achieve user ID/Password data entry through the virtual keyboard by simple mouse clicks. The two common implementations are, the numeric keypad, and the full ASCII keyboard as shown in Fig. 5. Based on our research findings, GT Bank uses the former, while UBA uses the latter option.

The third security related design is to build '*Password Recovery*' functionality into the Internet Banking user interface. The trend is to tie the user login account to the e-mail address of the customer, such that if the password is forgotten, the same user can prompt the system to send a password recovery e-mail to the designated mail box. Through this strategy, the user can conveniently recover the forgotten password by logging into the designated e-mail box. This gives a measure of convenience to the user, and also preserves the security of the banking system.

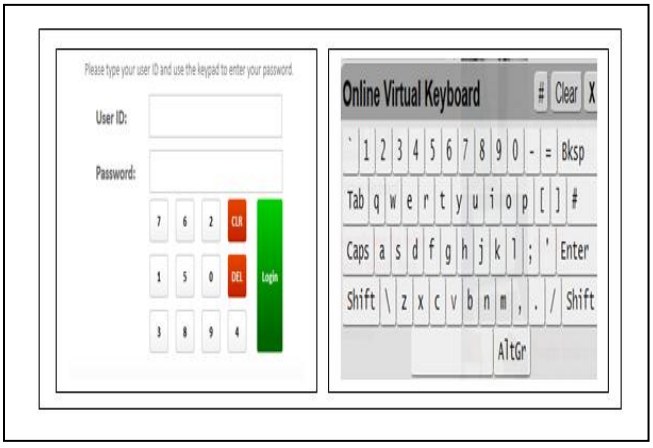

Fig. 5: Virtual Keyboards Options

Part of our findings is that different Internet Banking systems achieve password recovery through a variety of methods, combined with the use of e-mail addresses. Examples of such variations are, the use of account number, secret question, user id, contact with the account officer, and so on.

C. *Trust Related Design*

Three functionalities have been identified, as capable of either boosting, or diminishing customers' trusts in the Internet Banking system. These have been shown in Fig. 6 as '*Terms and Conditions (T&C)*', '*Privacy Statement*', and '*Last Update Date*'. Customers would prefer to have a prior knowledge of the terms and conditions attached to an Internet Banking service, than to discover some hidden conditions later. A research by [18] shows that the absence of clearly defined T&C is not a good practice in Internet Banking. A well articulated T&C could clearly spell out the cost of some special services, so as to allow the customer to subscribe to them willingly, rather than being forced to pay for such services without prior notice. Incorporating the T&C into the Internet Banking user interface, is one way to educate a customer about the prevailing terms and conditions attached to the banking services. The existence of T&C information helps to strengthen the customers' trusts towards the Internet Banking system.

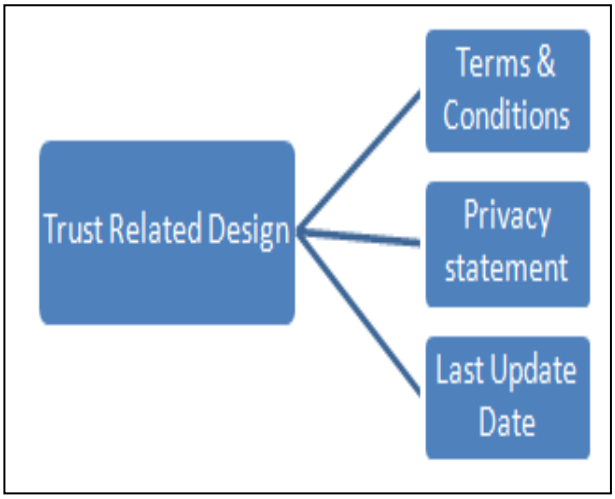

Fig. 6: Trust Related Design Options

The next trust-related design functionality is the '*Privacy Statement*'. Incorporating a well articulated '*Privacy Statement*' into the interface design boosts the customers'

morale. A scientific research [19] involving over 2,500 participants, reported that about 50% of the respondents believe that '*design and look'* is a key parameter for evaluating website credibility, followed by the information structure and the focus of the privacy statement. The privacy statement should always follow a standardized industry format [20], which is understandable to the users.

Another trust-related functionality is the '*Last Update Date*'. It is a well known fact that customers are fast becoming information technology savvy. Many technologically literate persons now review the date of last update as they visit important websites. The aim is to find out if the information content is current, or outdated. Thus when an Internet Banking website is bearing a '*Last Update Date*' that is quite old, it could be an indication that the website is not routinely maintained, or that the technology used to build it is already obsolete. According to the University of California Visual Standard [21], web designers should always indicate the '*Last Update Date*', especially in official websites.

D. BAP Information Design

The acronym BAP in this research stands for '*Bank and Product*'. Thus, BAP Information design refers to the incorporation of bank and product related information in the Internet Banking website.

The constituents of BAP information design are shown in Fig. 7. The FAQ (frequently asked questions) is a proactive answer to some common services related questions. By incorporating the FAQ into user interface design, customers are spared the pains of making phone calls, writing e-mails, or walking into the banking halls in order to get such answers. The '*Company*' or '*About Us'* is an important design option. The aim is to educate the online customers on the bank itself, the products and the services offered. The rule of thumb is that system designers should take time to review such sensitive contents as the bank and product information. This is to avoid propagating wrong information about the bank or its services, over the net.

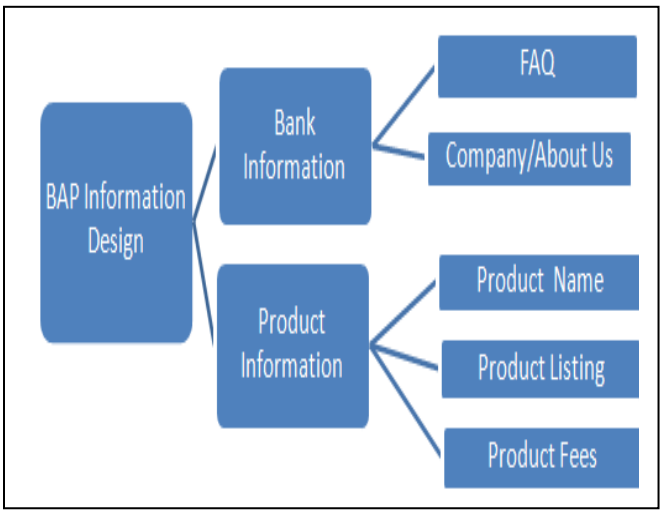

Fig. 7: BAP Information Design Options

The product name, product listing, and product fees are three important product related items in the BAP Information Design. The product name is an optional global name assigned to the entire Internet Banking products by a financial institution. The current trend is to use a strategically visible title or caption to show the Internet Banking product name in the website, the same way a company logo could be boldly advertised online. An example of a Nigerian Internet banking product name is *FirstOnline* for the First Bank PLC.

Another common practice in Internet Banking user interface design is to incorporate a listing of the products and services that are offered online. It is also usual to display the fees payable, especially for such services with fixed charges

E. Communication Design

The need for customer feedbacks in Internet Banking cannot be over emphasized. Feedbacks are crucial to understanding new technologies [22]. In a business research aimed at ascertaining the importance of feedbacks, Kampyle Company reported that 45% of the visitors who give feedbacks also converted to sales [23]. As indicated in Fig. 8, the two common captions used to represent feedback functionality in Internet Banking are, '*Feedback*' and '*Contact Us*'. One way to implement feedback is to list the contact phone numbers, e-mail addresses, Facebook accounts, and other communication media in the Internet Banking website, so as to enable the customers send their complaints and observations with ease. A second design option is to incorporate a word-processing enabled window, where customers can type in their messages and send online. The third option is to incorporate an online chat tool, which facilitates a 2-way real time communication between the customers and the support staff. Providing for customer feedback in Internet Banking is a good design practice.

F. Social Network Design

There is a growing interest in social networks. The current design trend is to incorporate social networking in the Internet Banking websites. Examples of the common social networking platforms are, FaceBook, Twitter, UTube, and Google Plus, as shown in Fig. 8.

G. Internationalization Design

As shown in Fig. 8, one important internationalization design trend is to incorporate a multilingual translator into the Internet Banking user interface. This is necessary, since Internet Banking is not a localized type of service. Thus, a bank whose head office is located in an English speaking nation, could have a large percentage of its customers speaking other non-English languages, like Chinese, Russia, Japanese, and so on. The work of a translator is therefore to translate the user interface contents, from one language to another, in line with customers' preferences.

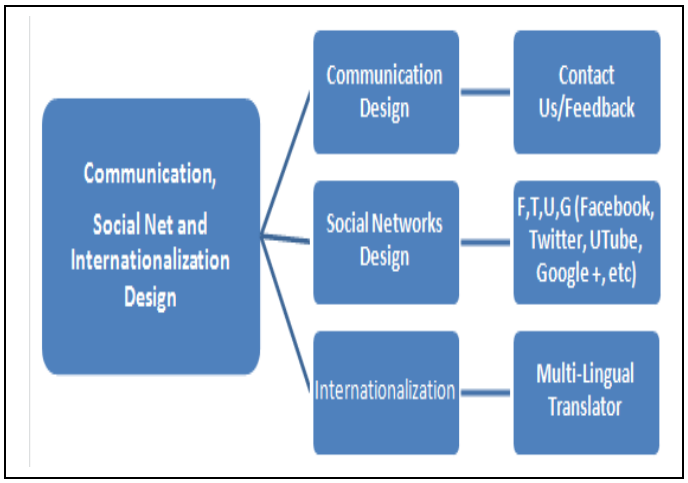

Fig. 8: Communication, Social Net & Internationalization

III. TREND ANALYSIS AND RESULTS

This research performs a critical review and analysis of the Internet Banking websites of selected institutions. The workflow in Fig. 9 summarizes the overall steps. It is made up of three compartments, labeled A, B and C. The 'A' compartment involves critical studies and data gathering from the Internet Banking user interfaces. The 'B' compartment involves the construction of pre-analysis tables. These are the Interface Design Functionality (IDF) and Binary User Interface (BUI) tables respectively. The 'C' compartment handles the computational analysis, and the output of important results. The workflow will be explained in more details.

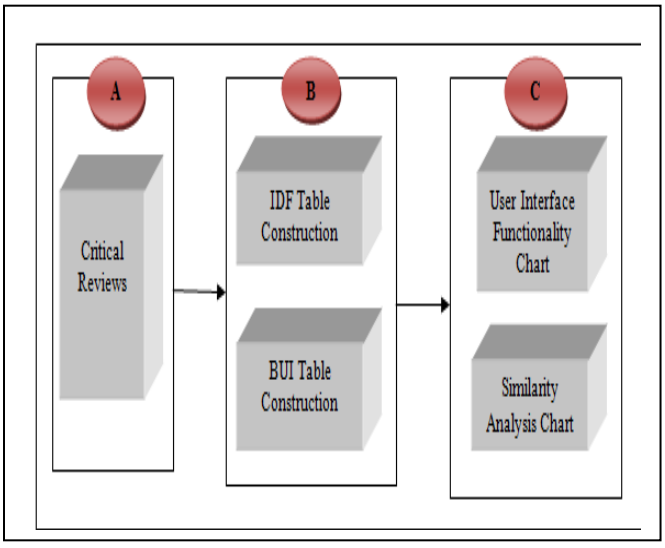

Fig. 9: Trend Analysis Workflow

A. IDF Table Construction

After system reviews, the Interface Design Functionality (IDF) table is created. The IDF table is a summary table, which collates the raw observations gathered in this research. It is shown as Table I in the appendix section of this paper. Within the table, a '*YES*' tag is an indication that a particular functionality was observed to be part of the user interface, while the '*None*' tag shows that the functionality is not incorporated. For instance, it can be deduced from the table that the '*Back To Top'* functionality exists in the GT Internet Banking, but not in that of UBA.

Apart from the use of '*YES*' and '*None*' tags, other details are also presented, with the view of further clarifying the dataset used in this study. For instance, the positions of the search engine within the Internet Banking websites are described using the three self-explanatory codes - 'Top Left', 'Top Right', and 'Mid Right' respectively. Furthermore, a definition key at the base of the IDF table is used to clarify some important abbreviations or acronyms used in the table. For instance, the code set {'T','U','F' and 'G'} represents the list of social network platforms {'Twitter', 'UTube', 'Facebook' and 'Google Plus'}.

B. Binary Table Construction

The Binary User Interface (BUI) table is constructed from the contents of the IDF table. A binary object is one that has two possible values, example '*YES'/'NO'*, *'0'/'1'*, and so on. The IDF table is transformed into binary format to enable computational analysis to be performed on it. Each cell of the binary table is assigned the value '1' wherever the original IDF table has 'YES' indicated in it, and '0' if otherwise. The binary conversion process is shown in equation (1).

$$BUI\ Table\ (x,y) = \begin{cases} 1 \ \ if \ \ IDF\ table\ (x,y)\ has\ \ 'YES' \\ 0 \ \ if \ \ IDF\ table\ (x,y)\ has\ \ 'None' \end{cases} \quad (1)$$

where x, y are the row and column indices respectively for the two tables. The resulting binary interface table is shown in Table II. The last column of this table keeps the cumulative sum, for each of the rows.

Table II: Binary User Interface Table

S/N	System Functionalities	UB	FB	GT	ZB	SB	Row Sum
1.	E-Forms Download	1	0	1	1	0	3
2.	Search Engine	1	1	1	1	1	5
3.	Today's Date	1	1	1	1	0	4
4.	Back to Top	0	0	1	1	0	2
5.	Idle time Expiry	1	0	1	0	0	2
6.	Keyboard Design	1	0	1	0	0	2
7.	Password Recovery	1	1	1	1	1	5
8.	T&C	1	1	1	1	1	5
9.	Privacy Statement	1	1	0	1	1	4
10.	Last Updated Date	0	1	0	0	0	1
11.	FAQ	1	1	1	1	1	5
12.	About Us	1	1	1	1	1	5
13.	Product Name	1	1	1	1	0	4
14.	E-Products Listing	1	1	1	1	1	5
15.	Product Fees Listing	1	1	1	1	1	5
16.	Contact Us /Feedback	1	1	1	1	1	5
17.	SocialNET	1	1	1	0	1	4
18.	Lang. Translator	0	1	1	0	0	2

Key: UB = UBA, FB = First Bank, GT=GT Bank ZB= Zenith Bank, and SB=Stanbic IBTC Bank

The BUI table is used for further computational analysis, as will be discussed in the relevant section of this paper.

C. The User Interface Functionality Chart

The user interface functionality (UIFA) chart is a graph that shows the distribution of the financial institutions, vis-à-vis the design functionalities. In other words, it is a simple way of visualizing the compliance level of the banks in terms of the Internet Banking user interface functionalities studied. The x-axis therefore represents the functionalities, while the y-axis represents the number of banks whose Internet Banking websites incorporate such functionalities. Thus, the y-axis is equivalent to the '*RowSum*' column of Table II. The resulting chart is shown in Fig. 10.

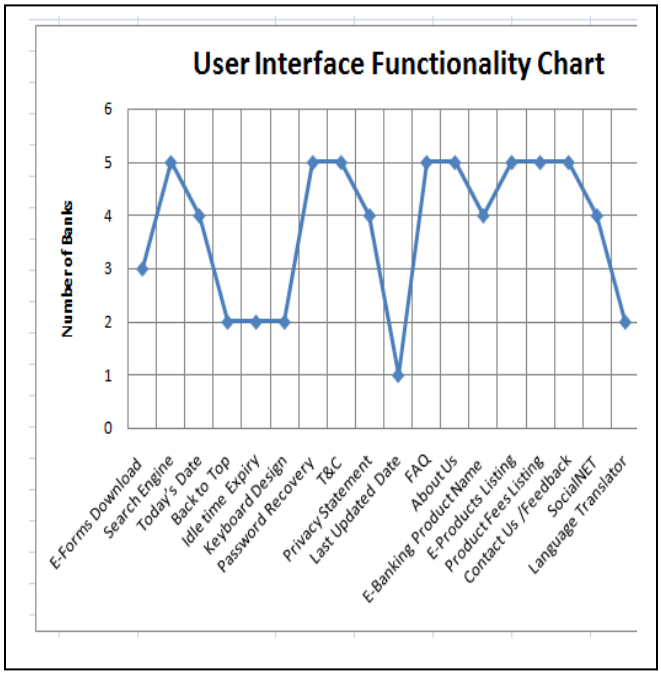

Fig. 10: User Interface Functionality Chart

It can be deduced from the graph that, all the banks have 100% compliance level, for eight of the functionalities – 'Search Engine', 'Password Recovery', 'T & C', 'FAQ', 'About Us', 'Internet Product Listing', 'E-Product Fees Listing', and 'Feedback'. However, our study shows that the least compliance level among the studied institutions is in the implementation of 'Last Update Date'. Only one of the institutions complied in this respect.

D. User Interface Similarity Analysis Chart

The User Interface Similarity Analysis (UISA) in this research is based on Jaccard Coefficient [24] for measuring similarity between binary objects. Since the Internet Banking interface functionalities are represented as binary values in the BUI table, it is possible to use the table as the input data for similarity analysis. The formula for Jaccard Similarity Coefficient is given by equation (2).

$$JACCARD(A,B) = \left[\frac{A \cap B}{A \cup B}\right] \qquad (2)$$

where A and B are banks, represented as binary columns in the BUI table, $\cap$ is binary 'AND' operator, and $\cup$ is the binary 'OR' operator.

The resulting similarity coefficient (or index) is a real number, usually in the range of [0 , 1], which represents the measure of similarity between the two binary objects being analyzed. Table III gives a breakdown of the similarity computation between UBA and First Bank. Thus, from the table, $JACCARD(UBA, FirstBank) = \left[\frac{UBA \cap FirstBank}{UBA \cup FirstBank}\right] = \frac{12}{17} = 0.706$.

Table III: Interbank Similarity Analysis Table

S/N	System Functionalities	UB	FB	UB ∩ FB	UB U FB
1.	E-Forms Download	1	0	0	1
2.	Search Engine	1	1	1	1
3.	Today's Date	1	1	1	1
4.	Back to Top	0	0	0	0
5.	Idle time Expiry	1	0	0	1
6.	Keyboard Design	1	0	0	1
7.	Password Recovery	1	1	1	1
8.	T&C	1	1	1	1
9.	Privacy Statement	1	1	1	1
10.	Last Updated Date	0	1	0	1
11.	FAQ	1	1	1	1
12.	About Us	1	1	1	1
13.	E-Banking Product Name	1	1	1	1
14.	E-Products Listing	1	1	1	1
15.	Product Fees Listing	1	1	1	1
16.	Contact Us /Feedback	1	1	1	1
17.	SocialNET	1	1	1	1
18.	Language Translator	0	1	0	1
TOTAL				12	17

Key: UB stand for UBA, FB stand for First Bank

The summary of the similarity coefficients for the entire bank is as follows.

JACCARD (UBA, FirstBank) = 12/17 = 0.706,
JACCARD (UBA, GT) = 14/17 = 0.823,
JACCARD (UBA, Zenith) =12/16 = 0.750,
JACCARD (UBA, Stanbic)= 10/15=0.667,
JACCARD (FirstBank, GT) =12/18= 0.667,
JACCARD (FirstBank, Zenith) =11/16= 0.688,
JACCARD (FirstBank, Stanbic)=10/14= 0.714,
JACCARD (GT, Zenith)=12/17 = 0.706,
JACCARD (GT,Stanbic) = 9/17= 0.529,
JACCARD (Zenith, Stanbic)=9/14= 0.634.

The similarity chart in Fig. 11 is generated from the above similarities coefficients.

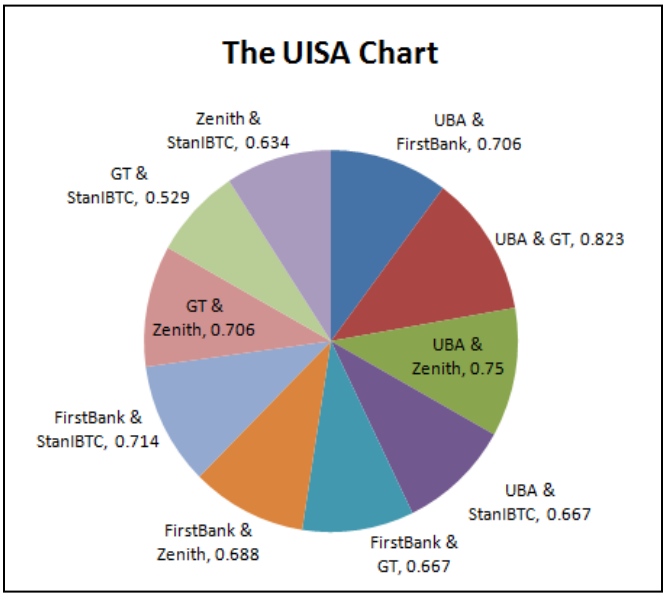

Fig. 11: User Interface Similarity Analysis (UISA) Chart

IV. DISCUSSIONS AND CONCLUSION

This research is a trend analysis of the user interface designs in Internet Banking, using five financial institutions in Nigeria as case studies.

In performing the trend analysis, eighteen (18) important functionalities, grouped into seven categories shown in Fig. 1, were studied.

The data gathered from the initial studies were collated into a special table, termed the Interface Design Functionality (IDF) table. This was later transformed into the Binary User Interface (BUI) table used for computational analysis.

Two important analyses done in this work are the user interface functionality (UIFA) analysis, and the user interface similarity analysis (UISA) analysis. Their respective outputs have been discussed. The first output can be used to make compliance related deductions. For instance, it was deduced that only two out of the eighteen banks have a multi-lingual translation enabled Internet Banking. The UISA chart is a comparison, of the Internet Banking user interfaces, of one bank with another. This output, which is based on the Jaccard's binary similarity model, can be used to make some important deductions. For instance, the bank pairs with the highest level of user interface similarities are UBA and GT banks, with a similarity index of 0.823. On the other hands, the two with the least similarity measure are GT and Stanbic IBTC, with binary similarity index of 0.529.

In conclusion, it is important to mention that the functionalities studied in this research are by no means exhaustive, and neither did this study cover all the banks in the research locality. However, the methodology applied can easily be expanded to cover an increased number of user interface functionalities. The study can also be expanded to cover many other banking institutions within the current locality, and in other regions of the world.

APPENDIX

Table I: Interface Design Functionality (IDF) Table

S/N	Functions	UBA	First Bank	GT	Zenith Bank	Stanbic IBTC
1.	E-Forms Download	YES	None.	YES (18 Forms downloadable)	YES (49 Forms downloadable)	None
2.	Search Engine	YES (Top Left)	YES (Top Right)	YES (Mid Right)	YES (Top Right)	YES (Top Right)
3.	Today's Date	YES	YES	YES	YES	None
4.	Back to Top	None	None.	YES	YES	None
5.	Idle time Expiry	YES	None	YES	None	None
6.	Keyboard Design	YES (Full Virtual Keyboard ASCI Characters)	None	YES (Virtual Numeric Keypad)	None	None
7.	Password Recovery	YES (through user ID and secret question)	YES (through secret question)	YES (through e-mail ID)	YES (through the account officer)	YES (through User ID & Nuban Acct No)
8.	T&C	YES	YES	YES	YES (18 issues raised)	YES (20 issues raised)
9.	Privacy Statement	YES	YES	None	YES (Tagged Privacy Policy)	YES (Tagged Privacy & Security Statement)
10.	Last Updated Date	None	YES (May, 2012)	None	None	None
11.	FAQ	YES (15 questions)	YES (6 question)	YES (Top Questions)	YES (17 questions)	YES
12.	About Us	YES	YES	YES	YES	YES
13.	Product Name	YES - UBA Direct	YES -FirstOnline	YES- IBank	YES- Zenith Internet Banking	None
14.	E-Products Listing	YES (Drop Down Menus)	YES (Screen wide Listing)	YES (Drop Down)	YES (Menus)	YES (Screen wide Listing)
15.	Product Fees Listing	YES	YES (eg. Current Accounts)	YES (eg. COT charges)	YES (eg. Card charges)	YES (Comprehensive)
16.	Contact Us /Feedback	YES- Phone & E-Mail +234 1 6319822, etc CFC@ubagroup.com	YES- Live Form Live Chart.	YES – Phpne : +234 700 48266 6328, E-Mail & Plus Live Chart	YES – Phone: 234-1-2787000, E-Mail & Plus Live Chart	YES – Phone: +234 1 2709676 E-Mail & Plus Live Chart
17.	SocialNET	YES (T,U,F,G)	YES (T,F,G)	YES (F, T, U, G)	None	YES (F,T,U)
18.	Language Translator	None	YES (Could not be tested)	YES (Ten languages)	None.	None

Table Definition Keys: - Twitter (T), UTube (U) FaceBook (F), google + (G)

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