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Computational Methods in Social Sciences

Binary outcomes utilizing varied strategies in familiarizing science concepts

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Abstract

This research endeavor aimed to find out the probability of obtaining a proficient performance in familiarizing science concepts using varied strategies. Also, it was directed on determining significant difference on the performance of students in science when exposed to varied strategies. One hundred eighty students from F. Bangoy National High School were chosen as respondents of the study. Descriptive- predictiveand quasi- experimental design were employed in the study. The statistical tools used were mean and standard deviation, frequency and percentage, logistic regression, univariate analysis and Eta- squared.The results revealed that Puzcellized method was the best intervention among the three strategies. Majority of the students were at the below proficiency level. Varied strategies do not significantly predict performance of students in science. There was significant difference in the performance of students in familiarizing science concepts when exposed to varied strategies. And the effect of varied strategies to the performance of students in familiarizing science concepts was large.

Introduction

Scanty instructional materials in teaching science lessons greatly affected comprehension and retention skills of the students. Certainly, manifestations by students in F. Bangoy National High School have indicated poor performance in familiarizing anatomy of certain object using the conventional method. To note, learning strategies interact with personal characteristics of students. There is no ideal strategy which generates success in all learning situations. Students should be trained to develop an understanding and skills for using appropriate strategies that satisfy their needs. This horrible fact can be remedied by using puzzle in teaching the lesson.

Extant studies revealed that the use of puzzle game was found to be effective in improving the performance of the students. In Southwestern Nigeria, CPP (Crossword -Picture Puzzle) Teaching Strategy was employed to public junior secondary schools which demonstrated significant effect on the achievement score of the students (Olagunju & Babayemi, 2014). In addition, Hmielski (2003) supported the claimed of Adeyemo et al., (2013*)* asserted that students learning styles through the use of puzzle method impact on their performance, and that students learn effectively. Due to these individual differences their performance will be based on what they have learnt in one way or the other.

Research Questions

This study aimed to find out the likelihood and effectiveness of varied strategies in obtaining a proficient performance of students in familiarizing science concepts. Specifically, it was directed to answer the following questions:

1. What is the level of performance of the respondents in terms of pretest and posttest scores when exposed to collaborative learning, puzcellized method and direct instruction?
2. What is the profile of performance of the studentsin science?
3. Which of the strategies best predicts performance in familiarizing science concepts?
4. Is there a significant difference in the performance of students in familiarizing science concepts when exposed to varied strategies?
5. What is the magnitude of effect of the varied strategies in familiarizing science concepts?

Methodology and Research Design

The study utilized two designs, one for the first phase in predicting outcomes and the other one for determining effect size of the intervention. Hence, the study carried out descriptive- predictive research design which was concerned with and designed solely to explain the present distribution of variables, without regard to causal or other hypotheses. Meanwhile, it focused on predicting decisions about individuals or to aid in various

types of selection. Also, it made use of quasi- experimental design which was a non- equivalent control group pretest- posttest design. Non- equivalent design was a good design when you have access to one group for your experimental. This design was used by the researcher because the subjects of the study were intact group of the grade seven students in integrated science class in a naturally assembled setting at F. Bangoy National High School, Sasa, Davao City.

Correspondingly, the statistical tools used in the analysis of data were Mean and standard deviation, frequency and percentage, logistic regression, univariate analysis and Eta- squared.

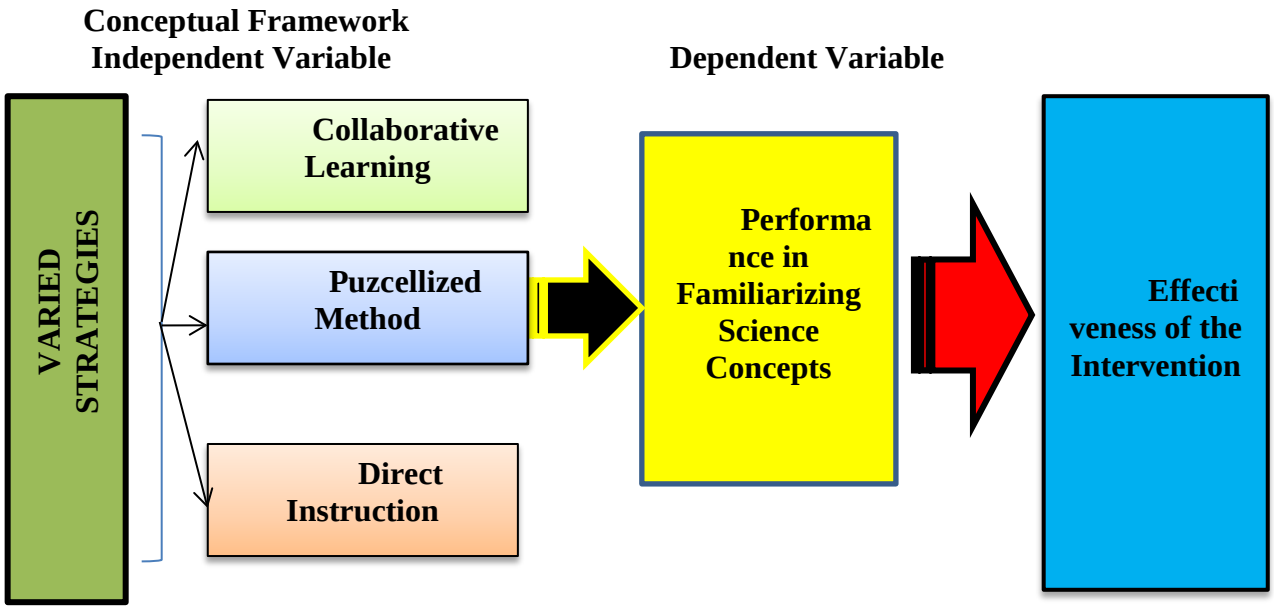

Figure 1. Conceptual Paradigm of the Study

The figure above displayed the conceptual framework of the study. The independent variable of the study was varied strategies which were made up of collaborative learning, direct instruction and puzcellized method. On the other hand, the performance of students in familiarizing science concepts acted as the dependent variable of the study. The study involved two stages or phases: it started with prediction using the three strategies that would explain performance of students in familiarizing science concepts. The next phase was to determine if there was significant difference in the performance of students when exposed to varied strategies. And the result obtained was used as basis in determining the effect size of the intervention. The variables used in the study were continuous or metric data.

Theoretical Framework

The use of puzzle is anchored on Constructivist view which posits that learning is a social process, whereby students construct new concepts based on current knowledge. Hence,effective learning takes place when science is taught through a medium of puzzle games; and it is known that information's are easier to recall when it has been presented through puzzle games.

Research Respondents

The study only considered three sections in grade seven of F. Bangoy National High School, Sasa, Davao City. This was composed of one hundred eighty students where each section has sixty students. The number of respondents used was apt to the research design in determining significant differences. The respondents belong to the heterogeneous group.

Instruments

In obtaining data for the study, this research utilized test questions that measure respondents' knowledge in the topic differentiating plant and animal cell. The scores obtained by the respondents were product of exposure to varied strategies. Each section was exposed to teaching intervention; one section for collaborative learning, second for direct instruction and third for puzcellized method. The performance of students in familiarizing science concepts was measured in terms of their grade.

Results and Discussion

Based on the data collated and analyzed, this section highlights the significant result of the study.

Table 1.Mean Scores When Exposed to Varied Strategies

Strategies	N	Pretest SD	Posttest SD	Pretest Mean	Posttest Mean	Descriptive Interpretation
Collaborative Learning	60	1.50	3.25	3.73	10.63	Very Low to Average
Puzcellized Method	60	2.11	3.53	5.50	13.18	Low to High
Direct Instruction	60	2.05	3.47	4.05	7.07	Very Low to Low

Table 1 displays the mean scores of the different groups when exposed to the designed intervention or varied strategies. It reveals that puzcellized method registered the highest mean score of 5.50 and 13.18 both in the pretest and posttest. Meanwhile, direct instruction ranks second in the pretest with a mean score of 4.05 and 3.73 for collaborative learning. The posttest score of direct instruction is 7.07 which is the lowest among the three. Overall, it generated a low to high interpretation for puzcellized method, very low to average for collaborative learning and very low to low for direct instruction. The result suggests that puzcellized method is the best intervention among the three because it increases or enhances the performance of students in familiarizing science concepts.

Table 2.Profile of Performance in Science of Grade 7 Students

Performance in Science	Frequency	Percentage	Descriptive Interpretation
0	127	70.6	Below Proficient
1	53	29.4	Proficient to Advance
Total	180	100.0	

Table 2 shows the profile of performance of grade seven students in science. It depicts that performance of students coded with 0 or 70.6% registered below proficiency while those coded with 1 or 29.4% performed in the proficient to advance level. This means that students coded with 1 demonstrated better performance in science compared to students coded with 0.

Table 3.Significant Influence of Varied Strategies on the Performance in Familiarizing Science Concepts of Grade 7 Students

Variables in the Equation				
	B	Exp (B)	p-value	Decision
DV	Performance in Science (0,1)			
Constant	4.07	58.54	.20	
Puzcellized Method	-.28	.76	.29	Not Significant
Collaborative Learning	-.33	.72	.15	Not Significant
Direct Instruction	-.21	.81	.35	Not Significant

Table 3 exposes the significant influence of varied strategies on the performance in familiarizing science concepts. The result showed that the three varied strategies are not significant predictors of performance of

students in familiarizing science concepts. Hence, this suggests that other factors should be considered in explaining performance of students in science.

Further, Salawu (1999) asserts that the method of teaching could be regarded as the vehicle through which a message is delivered. Hence, methods of teaching are one of the factors to be considered in explaining performance of the students. This proves that this study should not be limited only to varied strategies in determining students' outcomes in a subject area.

Table 4.Univariate Analysis on the Significant Difference in the Performance of Students in Familiarizing Science Concepts

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	390.025	2	195.013	46.596	.000
Within Groups	740.775	177	4.185		
Total	1130.800	179			

Table 4 depicts the univariate analysis on the significant difference on the performance of students in familiarizing science concepts. It generated an F- value of 46.60 with a p-value of .000 which is lesser than .05 level of significance. This implies that there is a significant difference on the performance of students in familiarizing science concepts. Students who are exposed to puzcellized method had an improved performance as depicted with the highest mean score in the posttest (M=13.18) compared to students who are exposed to direct instruction and collaborative learning. Significant learning is achieved once students had an actual experience in manipulating or familiarizing concepts that are seen and learned directly.

The result above agrees with findings of Adeyemo et al, (2013*)* which assert that students in four selected schools in Mushin Local Government, Lagos, Nigeria who were exposed to puzzle method performed better in science. Meanwhile, cooperative learning has also shown benefits which include academic gains across different curriculum domains (Slavin et al., 2003) as well as positive effects of cooperative learning on interpersonal attitudes, behaviors, values and skills.

Table 5. Magnitude of Effect of Varied Strategies to the Performance of Students in Familiarizing Science Concepts

Sum of Squares between Groups	Total Sum of Squares	Eta- Squared	Remarks
390.025	1130.80	.34	Large

Table 5 reveals the magnitude of effect of varied strategies to the performance of students in familiarizing science concepts. The Eta- squared value tallies .34 which signifies large effect. Thus, varied strategies in general significantly contributed a significant or huge effect to the performance of students in familiarizing science concepts. The Eta- squared was calculated by dividing sum of squares between groups over the sum of squares total. The interpretation or remarks is based on Cohen's (1988) classification: .01 as a small effect,.06 as a medium effect and.14 as a large effect.

Conclusion

Based on the findings of the study, the following conclusions were drawn:

1. The performance of the students when exposed to varied strategies was as follows: high for puzcellized method; average for collaborative learning and low for direct instruction.
2. The profile of performance of students in science was below to proficient.
3. Among the three strategies, no strategy significantly predicted performance of students in familiarizing science concepts.
4. There was significant difference in the performance of students in familiarizing science concepts when exposed to varied strategies.
5. The effect of varied strategies to the performance of students in familiarizing science concepts was large.

Recommendation

Based on the conclusions drawn, the following are offered:

1. Intensify the application of Puzcellized instruction to topics that deals with visual images.
2. It should be adopted as one of the teaching strategies in handling or teaching science lessons.
3. Curriculum planners and science teachers could make use of puzzle for effective basic science delivery in schools.
4. Use other predictors in explaining performance of students in science.
5. Conduct similar studies to validate its findings.

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Adoption and compliance with ifrs by listed firms in ghana and the extent of financial statement disclosures

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Abstract

With the differing development in similarity to enhance basic leadership, the hugeness of IFRS can't be over misrepresented. Is been 10 years since Ghana formally acknowledged International Accounting Standard(IAS)/International Financial Reporting Standard (IFRS), trading Ghana National Accounting Standard for every single recorded organization. Recorded organizations who asserted consistence have consistence hole as yet existing. Past research has upheld that. This examination, explored the degree of consistence with IFRS disclosure necessities of recorded firms on the Ghana Stock Exchange. What's more, the investigation endeavored to recognize factors, for example, firm size, use, profitability related with the level of consistence. The investigation utilized optional information which were procured from recorded firms on the Ghana Stock Exchange yearly reports. The period attempted for the investigation was from 2008 to 2016. These years were picked since less work has been done on consistence for the years under audit for recorded firms on the Ghana Stock Exchange (GSE). The populace for the examination was recorded firms on GSE with test size of twenty-six (26). In light of the example of the twenty-six (26) recorded firms for the 9 years time frame, a normal of 83.7% consistence with IFRS disclosure necessities was made, with firm size measurably connected with the level of consistence. Despite what might be expected, the level of consistence displays a negative huge relationship with use and profitability. As the powers of globalization enable nations to open their ways to remote speculation and business improvement crosswise over outskirts, the requirement for a typical reporting has come to stay and it has along these lines wind up imperative to guarantee full consistence with the utilization of the IFRS. On the off chance that there is strict standard observing by the administrative bodies, for example, (Ghana Stock Exchange, Security and Exchange commission, Bank of Ghana), at that point full consistence can be accomplished. Additionally, Institute of Chatered Accountants Ghana which is in charge of controlling the accounting profession ought to guarantee that normal preparing are sorted out for accounting, inspectors and so forth to make them side by side and refreshed with the consistence of IFRS. This would help accounting approach producers to found procedures to energize consistence with IFRS by the recorded firms.

Keywords: *Disclosure, Financial reporting, Accounting, Quality of financial reports' disclosure, Firm-specific characteristics, International Financial Reporting Standards, Mandatory disclosure, Ghana*

1. Introducation

1.1 Background of the problem

For as long as years, organizations have arranged their financial proclamation as per standards usually utilized as a part of their nation, prevalently known as Generally Accepted Accounting Practice (GAAP) (Emerging Market Weekly, 2008). The point behind that was normal accounting standards and disclosure comprehensively didn't exist (Cook, 2004). The worldwide speculation group had impediments because of the nonattendance of basic behaviors. Accounting rules that looks remote and the nonappearance of disclosure can dishearten financial specialists from putting all around in a productive way (Eitemann, S. et al, 1992). It wound up critical for the utilization of a typical worldwide reporting dialect (Flynn, 2008). All inclusiveness and equivalence of financial reports ended up basic. The thought was invited and quickly accumulated pace which have made organizations to approach the purposeful financial market and it has conveyed colossal advantages to the household monetary course of action. Generally, the presentation of a worthy international superb financial reporting standards was started in 1973 when the International Accounting Standard Committee (IASC) was shaped by sixteen (16) professional bodies from different nations, for example, United States of America, United Kingdom, France, Canada, Germany, Australia, Japan, Netherlands and Mexico (Garuba and Donwa, 2011). As of late, numerous nations overall received the International Accounting Standards (IASs) or International Financial Reporting Standards (IFRSs) with the point of influencing organizations to uncover greater quality data in their yearly

reports (FASB, 2008). IFRS is the all around connected accounting framework contributing significantly to the activities of worldwide capital markets and additionally the international financial private enterprise (Capron, 2005).The reason for The International Accounting Standards Board's (IASB) IFRS Framework expresses that; "The point of financial proclamations is to give data about the financial position, changes in financial position and execution of an element that is vital to various of clients in making monetary decisions",(IASB 2010). The acknowledgment of IFRS all around is a standout amongst the most noteworthy administrative changes ever. The expansion pace of globalization of financial markets has likewise realized the requirement for looking at financial reports deliberately. Bodies, for example, International Accounting Standards Committee (IASC) now International Accounting Standards Board (IASB) built up in April, 2001, assumed vital part through announcement of various standards that tries to control bookkeepers' internationally on financial articulation planning and introduction (Larson and Street, 2004). The majority of the nations in Asia, Europe and Africa have embraced these standards and those with association with recorded organizations in the United States not some time before must agree to International Financial Reporting Standards. Subsequently, these worldwide foundations have pushed for the selection of International Financial Reporting Standards by creating and transitional nations as a component of their rebuilding programs. This approach has seeped to boosting the certainty of financial specialists (Mir, and Rahaman, 2005). At present, near hundred (100) nations have executed IFRS with more than 12,000 firms. A more noteworthy number of such nations have household standards which are IFRS based (AICPA backgrounder, 12/11/08). Consistency of accounting standards has been famous as helpful since the utilization of stable guidelines and standards to get ready outer financial articulation has a section in accomplishing reliable and straightforward reporting at the international level. (Bader A. et al, 2002). The acknowledgment and execution of IFRSs has happened in numerous creating and created nations (Demir et al., 2013).In January, 2007, the Minister of Finance and Economic Planning – Ghana needing to advance expanding development of her economy in the private segment formally propelled the appropriation of IFRS in substitute of its old Ghana National Accounting Standards (GNAS). By December 2007, recorded organizations, banks, non-banks financial foundations, insurance agencies, government business undertakings, securities representatives, annuity, speculation banks and open utilities were relied upon to set up their financial explanations as per the IFRS. In a deliver to the members at the starting, the clergyman alluded to a Report on Observance of Standards and Codes (ROSC) on Ghana that the world bank issued in March 2007, and noticed that "the reception of IFRS would address certain shortcomings the ROSC of Ghana has distinguished" (United Nation, 2007). As of now, Ghana is one of the fifteen (15) countries in Africa to have received IFRS (Zori, 2011). There has been little study on the compliance with IFRS of Ghanaian listed firms and quality of financial statement disclosure. Research has shown that total compliance has still not been achieved among the listed firms in Ghana. Upon this background that my research studied about corporate adoption and compliance of International Financial Reporting Standards by listed firms and quality of financial statement disclosure. To accomplish this aim two specific objectives and questions were developed and stated below: a). Determine the extent to which listed institutions comply with the disclosure requirements of the adopted IFRS. b). Examine the impact of corporate characteristics on disclosure levels of listed firms. c). what is the extent of compliance of listed firms to the disclosure requirements of IFRS/IAS? d).what is the impact of corporate characteristics on disclosure levels of listed companies?

1.2 Statement of the Problem

As indicated by the Report on the recognition of standards and codes, (ROSC 2004) there existed compliance holes/resistance as for International Accounting Standards (IAS) in Ghana organizations who guaranteed compliance. A portion of the instances of resistance recognized were:

- General: None of the four organizations tended to the IAS prerequisites on hindrances of advantages, financial instruments, or worker benefits; nor did they address section reporting, related gatherings, and profit per share. What's more each of the four organizations utilized obsolete wording, two organizations did not represent conceded impose at all and inaccurately exhibited common things.
- Components of financial proclamations: Three of the organizations' financial explanations did exclude an announcement of changes in value.
- Property, plant and hardware: Companies that revaluated property, plant and gear, neglected to take after every one of the necessities of IAS.

- Prior year alteration: Two organizations had deficient and unseemly disclosures regarding earlier year modifications.

With these instances of rebelliousness with International Accounting Standards by these organizations' who guaranteed willful compliance and the formal appropriation of IFRS in Ghana, there is the requirement for an examination concerning the level of compliance with IFRS by recorded firms in Ghana.

As an aftereffects of financial emergencies in late 1990s, the international group gave extraordinary significance on the real part that the recognition of international standards and codes of best practices can play in keeping up a productive national and international financial frameworks (Amos, 2000). Accordingly, the International Monetary Fund (IMF) and the Executive Boards of the World Bank perceived a gathering of twelve zones with their related standards that are considered to be basic for the institutional principal of macroeconomic solidness and are vital to the operational work of the two establishments (World Bank, 2001). Ghana embraced the audit practice and displayed the Reports on the Observance of Standards and Codes (ROSC) which was set up by a group from the World Bank between January 2007 and December 2008 (Wiredu, 2008). Late research has given considerable proof that organizations asserting to have embraced the IASs are not agreeing to the standards (Street and Gray, 2001; Glaum and Street, 2003). Research on compliance of IFRS particularly in creating nations, in any case, stays inadequate (Lin et al., 2012). Put essentially, prove on the level and determinants of compliance of IFRS in Ghana stays sparse in spite of its appropriation ten years back. To fill the hole in the writing, this examination draws on Hossain et al. (1995), Demaria and Duffour (2012) and Agyei-Mensah (2014) system to inspect the degree of compliance with International Financial Reporting Standards by recorded firms and quality of financial articulation disclosure and to turn out with the variables that can impact IFRSs compliance and its impact on their arrival on value. The asserted that aggregate compliance with IAS/IFRS have been accomplished by every single recorded firm in Ghana is unconfirmed. The evaluating and accounting hones in Ghana has institutional difficulties in compliance, checking, direction and guaranteeing requirement of the standards (cover the Observance of Standards and Codes, 2004). Hence, looking for answers to the examination questions is essential for understanding whether compliance with IFRS is being accomplished and for recognizing factors that impacts the compliance level among the recorded organizations. The controllers: Bank of Ghana, Institute of Chartered Accountants Ghana (ICAG), Ghana Stock Exchange, Ghana Credit Reference Bureau and Securities and Exchange Commission are on the whole prone to be occupied with resistance by the recorded organizations. The recognizable proof of rebelliousness is a genuine exclusion and when distinguished by these controllers could be entirely talked against and significant issues raised on enhancing the circumstance. The findings provide existing and potential overseas and domestic investors an unbiased assessment of the extent of compliance with IFRS in Ghana for listed firms. More so, since developing countries have in a way been neglected in terms of disclosure studies, this research adds to literature on disclosure compliance studies in developing countries.

2. Literature review

2.1. The environment of Corporate Financial Reporting in Ghana

Factors, for example, legislative issues, law, economy, instructive framework and international relations impacts the financial reporting process in Ghana (Assenso-Okofo et al., 2011). A commonplace case is political insecurity as a consequences of a few military upsets, influenced both press and monetary opportunity contrarily and, in the long run, the financial reporting process in Ghana (Amankwah-Amoah and Debrah, 2010; Appiah et al., 2014). In 1990, the Ghana Stock Exchange was set up to give checking and requirement by endorsing rebellious recorded organizations. Starting here, the Securities and Exchange Commission and Ghana Stock Exchange require every recorded organization to agree to their controls the extent that financial reporting is concerned. The Ghana Stock Exchange, be that as it may, has frail institutional establishment and limit issues, recommending implementation holes. The multi-party vote based framework in 1992 required press flexibility, the right to speak freely and monetary opportunity, and, along these lines, upgraded corporate reporting. The improved corporate reporting is additionally elevated by the small scale based economy. ROSC (2005), in any case, watched various insufficiencies in the corporate

Ghana financial reporting administrative condition. These incorporate absence of quality corporate administration, compliance issues and powerless checking organizations including the Parliament, the Ghana

Stock Exchange and ICAG. To put it plainly, the current reporting system isn't just ineffectual yet in addition wasteful (Assenso-Okofo et al., 2011). The requirement for pulling in international speculators and the utilization of Ghana for full International Federation of Accountants (IFAC) enrollment, all things considered, expect Ghana to embrace and execute IFRS. Consequently, in 2007, Ghana moved from adjustment to selection of IFRS. A noteworthy improvement in reference to the more extensive reception and execution of IFRS in Ghana is the notice issued by the ICAG and in conjunction with the New Patriotic Party Government drove by Former President John Agyekum Kuffour, which commands recorded organizations, banks and insurance agencies, government business endeavors, benefits reserves, open utilities and security representatives to exhibit their financial explanations as per IFRS since the monetary year starting after January 1, 2007. Consequently, all current 28 Ghana accounting standards were supplanted with the more than 40 IAS. This, thusly, helps international comprehension of Ghanaian financial explanations and, accordingly, upgrades worldwide speculators' group trust in securities recorded on the Ghana Stock Exchange. Here, World Bank Investment Climate Surveys demonstrate that international speculators are indicating good faith on account of an enhanced political atmosphere and financial reporting (Abor, 2007). The net inflows of outside direct speculation, for instance, expanded from US$1,519m in 2000 to US $2139m in 2007 (The World Bank Annual Report, 2009). In this manner, Ghana speaks to an intriguing situation inside which to look at observationally the motivating forces for the degree of compliance with IFRS.

2.2. International Financial Reporting Standards

International Financial Reporting Standards (IFRS) are group of prescriptive principles and rules with worldwide reach and bid which give guidance and direction on how business endeavors in a globalized world could accomplish the objective of appropriate record keeping, straightforwardness, consistency, equivalence and improving open trust in financial reporting (Tendeloo and Vanstraelen, 2005). Thus, if firms neglect to agree to the necessities of IFRS would bring about irregularities, absence of responsibility and straightforwardness, contortion in financial reports, in the long run outcomes into poor financial reporting practices and flow of accounting data that is of less incentive to a specific gathering of clients. This is on the grounds that the arrangement and introduction of financial articulations will be without objectivity, dependability, believability and equivalence, and in this way brings about false business hones which accordingly prompt business disappointment and end up destroying on the national economy (Atu et al., 2014). In addition to other things, the expanding internationalization of the institutionalization of accounting rules has diminished wide judgmental instinct and carefulness, which has decreased crafted by the outer reviewer extensively (Porwal, 2006). It likewise takes into account a significant level of consistency in the use of accounting arrangements, which has fortified likeness financial reports the world over. There are 69 specific accounting standards and particular translations. This sub-part will speak to short portrayals about the substance of the most principal standards, including IAS 1, IAS 2, IAS 16, IAS 17, IAS 32, IAS 39, IFRS 7 and IFRS 10.IFRS 7 sets out disclosures of financial instruments.The introduction, acknowledgment and estimation of financial instruments are the subjects of IAS 32 Financial Instruments:Presentation, IAS 39 Financial Instruments: Recognition and Measurement, IFRS 9 Financial Instruments (being created in stages) is proposed to at last supplant IAS 39. (IFRS 7).The accounting standard IFRS 7 expects elements to give disclosures in their financial articulations that empower clients to assess the hugeness of financial instruments, the nature and degree of dangers emerging from them and how elements deal with those risks.IFRS 7, Financial Instruments: Disclosures, merges and extends various existing disclosure prerequisites and includes some critical and testing new disclosures. It is pertinent for yearly periods starting on or after 1 January 2007, with earlier year comparatives required. A portion of the necessities of IFRS 7 will be commonplace because of the way that it is, to a limited extent, a substitution of IAS 32, Financial Instruments: Presentation, while others –, for example, the prerequisite to give quantitative and subjective market hazard disclosures – are new and may speak to a huge test for some. Numerous substances have not yet centered on the degree of the extended disclosures or the frameworks and procedures required to create them. A few substances may likewise be ignorant of how they will be affected by the prerequisite to uncover inward organization administration data remotely (Mackenzie et al. 2013, 580).

2.3. Disclosure Theories

Three theories have been used to explain the disclosure of information in corporate reports. These are: Agency theory, Signaling theory and Legitimacy theory. According to agency theory (e.g., Jensen and Meckling,

1976; Fama and Jensen, 1983) disclosure of risk information is used as a means to overcome agency problem between management and owners of the company (Healy and Palepu, 2001). If shareholders and creditors do not observe companies' risk management activities directly, they will tend to institute monitoring systems to increase the flow of information about those activities, and to reduce uncertainty (Linsmeier et al., 2002). Under the signaling theory, developed by Spencer, financial reporting is said to stem from management's desire to disclose its superior performance where, good performance will enhance the management's reputation and position in the market for management services, and good reporting, which include disclosing risk information is considered as*4*reports to convey specific signals to current and potential users. Morris (1987) argued that there is consistency between both agency theory and signaling theory. He therefore, suggested that a combination of them could provide a better prediction of disclosure for more accounting reporting. Legitimacy theory is another common perspective that has been adopted to understand organizational forms and structures based on the assumption that a corporation has to maintain its legitimacy for its survival, Meyer and Rowan, (1977). Legitimacy theory is based on the notion of a contract between a firm and its stakeholders on the premise that firms signal their legitimacy by disclosing certain information in the annual report, according to Shocker and Sethi (1974).

2.4. Hypotheses Development

The primary examination directed on disclosures was finished by (Cerf 1961) when he explored 527 corporate yearly reports against a disclosure list containing thirty one data things. He found that the level of disclosure was emphatically connected with corporate size and posting status yet not with profitability. Following firmly after (Cerf 1961), (Singhvi 1967) additionally found that quality of disclosure was related with firm size, number of investors, rate of return, profit edge, stock value variances, posting status and CPA firm. Research in disclosure level and compliance with IAS started when the new century rolled over with look into led by (Tower et al. 1999), (Cairns 1999) and (El-Gazzar et al. 1999). The investigation that broke down the components impacting IAS compliance was finished by (Street and Gray 2002). Utilizing an international example of 279 firms they tried a few factors against the level of disclosure, for example, posting status, organization measure, industry, sort of inspector, profitability, notes to the records, nation, and size of home securities exchange among others. (Dumontier and Raffournier 1998) in their exploration on the utilization of IAS in Switzerland speculated that the reception of IAS would prompt expanded data disclosure. They found that there was a positive impact of size, internationality, posting status, reviewer write and possession dispersion on IAS use. What's more, (Street and Bryant 2000) found that more prominent disclosure is related with accounting approaches reference that specifically expresses that the financial proclamations are set up as per IAS and a review feeling that expresses that International Standards on Auditing (ISA) were utilized when directing the audit.(Hope et al. 2006) found that nations with poor speculator assurance frameworks are immensely liable to formally endorse IFRS, and consequently inferred that IFRS speak to a methods through which nations can upgrade financial specialist insurance and make their capital markets more justifiable to remote speculators. Authors, for example, (Choi 1973), (Cooke 1989, 1992), (Wallace, 1988), and (Zarzeski, 1996) have assessed the degree and quality of disclosure in yearly financial reports. For example, (Zarzeski, 1996) examined yearly reports from seven nations to find whether social and market powers are steady with levels of disclosure by the firms. (Latridis and Valahi 2010) inspect that the elements that seem to influence the quality and detail of accounting disclosure as being: firm size, industry part, stock proprietorship, partner premiums, international presentation, speculators' desires and other key financial factors, for example, profitability, liquidity, financial use, and development. As indicated by (Palmer 2006), there are a few hypothetical systems that help the disclosure writing. The two primary rehashing hypothetical clarifications given in the writing are organization hypothesis and political expenses. (Beattie, 2005) refered to in (Palmer, 2006) recommends that positive accounting scholars have endeavored to proceed onward from portraying accounting arrangement decisions to clarifying willful disclosure decisions, and a significant number of the hypothetical clarifications for the connection between the level of disclosure of financial data and corporate characteristics are grounded in positive accounting theory.Bushman and Smith 2011, inspected the decrease of data inconsistency following the arrangement of intentional accounting disclosures would tend to bring down the related organization and political expenses, and prompt lower costs in issuing value capital. The distinctions among firms, nonetheless, is associated with various components that impact a firm's financial articulation including modern write (Street and Bryant, 2000), profitability (Tower et al., 1999), firm size (Glaum and Street, 2003), use (Demir and Bahadir, 2014), firm age (Al-Shammari, 2008) and liquidity (Street and Gray, 2001). Drawing on the organization hypothetical focal point and with regards to the corporate Ghanaian compliance of IFRS, I built up the

speculations beneath. The asserted that aggregate compliance with IAS/IFRS has been accomplished by every recorded firm is unconfirmed. The reviewing and accounting hones in Ghana has institutional misfortunes in compliance, checking, control and guaranteeing implementation of the standards (provide details regarding the Observance of Standards and Codes, 2004). Subsequently, looking for answers to the exploration questions is vital for understanding whether compliance with IFRS is being accomplished and for recognizing factors that impacts the compliance level among the recorded organizations. The controllers: Bank of Ghana, Institute of Chartered Accountants Ghana (ICAG), Ghana Stock Exchange, Ghana Credit Reference Bureaux and Securities and Exchange Commission are largely prone to be keen on resistance by the recorded organizations. The ID of resistance is a genuine oversight and when recognized by these controllers could be entirely talked against and important issues ascended on improving the circumstance. The findings provide existing and potential overseas and domestic investors an unbiased assessment of the extent of compliance with IFRS in Ghana for listed firms. More so, since developing countries have in a way been neglected in terms of disclosure studies, this research adds to literature on disclosure compliance studies in developing countries.

3. Method

3.1. Sample Size

Qualitative research design was adopted to evaluate the level of listed firms in Ghana who have adopted IFRSs since the effective date for the adoption of IFRS, i.e. 2007. The study population consists of the 31 firms listed on the Ghana Stock Exchange. Accounting and financial data were collected from the GSE fact sheets and the firm's website I omitted five firms with incomplete data, resulting in a final sample of 26 listed firms. My sample firms comprise financial (11), agro-forestry (1), mining and oil (4), manufacturing and trading (6), pharmaceutical and beverages (2) and information technology and paper industries (2).

3.2 Compliance Index.

The dependent variable in this study is extent of IFRS compliance. The checklist prepared is compared with the disclosures made by the firm in their financial statement. Based on this comparison, a score of 1 is assigned if firm discloses item present in the prepared checklist for the respective IAS/IFRS in the financial statement report in the year under review, 0 is assigned if the firm does not disclose item in the checklist for the respective IAS/IFRS.

$$\mathrm{TI} = \frac{\mathrm{TD}}{\mathrm{M}} = \frac{\sum_1^{\mathrm{m}} \mathrm{di}}{\sum_1^{\mathrm{n}} \mathrm{di}}$$

where:

TI = Total Disclosure Index

TD = Total Disclosure Score

M = Maximum disclosure score for each company

di = Disclosure item

im = Actual number of relevant disclosure items (m≤n)

n = Number of items expected to be disclosed

The multivariate test used to test the hypotheses is the standard multiple regression analysis and the regression model is:

$$\mathrm{CRD} = \mathrm{a} + \beta 1\ \mathrm{X1} + \beta 2\ \mathrm{X2} + \beta 3\ \mathrm{X3} + \beta 4\ \mathrm{X4} + \beta 5\ \mathrm{X5} + \beta 6\ \mathrm{X6} + \beta 7\ \mathrm{X7} + \beta 8\ \mathrm{X8} + \mathrm{e}$$

a = constant (the intercept).X1 = Board size

X2 = Independent board members X3 = Auditor size X4 = Liquidity X5 = Board ownership concentration X6 = Firm size X7 = Leverage X8 = Profitability e = error term.

3.3 Independent Variables

Based on the literature reviewed, the following firm characteristics, firm size, board size, profitability, leverage, independent directors, block ownership concentration and current ratio have been used to develop the hypotheses.

Table 2. The definitions and proxies of independent variables

Variable	Definition/Proxy
Board size	Total number of directors on the board
Independent Directors	The proportion of non-executive directors to total number of board members
Board Ownership Concentration	Total shareholding of top 20 shareholders divided by the total number of shares outstanding
Firm size	The firm's total assets
Audit firm size	Dummy variable: 1=Big 4 audit firms, 0= other audit firms
Leverage	Ratio of non-current liabilities to shareholder's equity
Profitability	Return on assets / Return on Capital Employed
Liquidity	The ratio of current assets to current liabilities

3.4. Research hypotheses

Based on the literature reviewed in chapter two the following: firm characteristics, firm size, board size, profitability, liquidity, leverage, independent directors, board ownership concentration, and auditor size (type) have been used to develop the hypotheses.

3.4.1. Firm Size

Research directed by Wallace and Naser (1999), Raffournier (1995), Owusu-Ansah (1998) and Alsaeed (2005) found a significant connection between the extent of an organization and the level of disclosure. The clarifications gave by these scholars point to the way that bigger firms have more mastery and financial assets to scatter financial data when contrasted with little firms. Juhmani (2012), Demir and Bahadir (2014), Glaum and Street (2003), Street and Gray (2001) and Street and Bryant (2000) neglected to discover a relationship between corporate compliance of IFRS and firm size.From the literature reviewed the following hypothesis will be tested:

H1. Ceteris paribus, there is a positive relationship between firm size and IFRS mandatory disclosure.

3.4.2.. Liquidity

Liquidity alludes to a firm's capacity to meet its transient commitments when they fall due. Cooke (1993) contended that the soundness of the firm utilizing liquidity as the measuring stick is related with more noteworthy disclosure level. Belkaoui-Raihi (1998) dissimilar to Cooke (1993) found no connection amongst liquidity and disclosure level. In like manner, Wallace et al. (1994) found a huge negative relationship amongst liquidity and disclosure level for unlisted Spanish organizations. From the foregoing the following hypothesis can be developed:

H2: Ceteris paribus, there is a positive relationship between firm liquidity and IFRS mandatory disclosure.

3.4.3. Profitability

The impact of profitability on the level of IFRS compliance might be connected to a few observational contentions. For example, earlier investigations by (Wallace et al., 1994; Naser, 1998; Agyei-Mensah, 2014)

found a positive connection amongst profitability and the level of disclosure. These investigations found that firms with high profitability would be more inspired to send uplifting news to the market than firms with low profitability. Nonetheless, others like (Street and Gray, 2001; Hossain and Hammami, 2009) in their examination found no relationship amongst profitability and the level of firms' intentional compliance with IFRS disclosure prerequisites. Following from the above studies the following hypothesis would be tested:

H3: Ceteris paribus, Profitability is positively associated with IFRS mandatory disclosure.

3.4.4.. Leverage

To a great extent, there is a developing assemblage of writing recommending that firms diminish the investor to obligation holder struggle by consenting to IFRS/IAS prerequisites. A few examinations have inspected the relationship between the obligation value proportion and the level of disclosure (Malone et al. 1993; Hossain et al. 1994; Ahmed and Nicolls, 1994; Jaggi and Low, 2000). These investigations found a positive connection between the obligation value and the level of disclosure. Firms with high obligation value may have more impetuses to unveil that is, cumbersome financial data to suit the requirements of their leasers. It is there for important for such firms to be checked by higher financial specialists to unveil more than firms with low obligation value. From the above the following hypothesis will be tested:

H4: Ceteris paribus, Leverage is positively associated IFRS mandatory disclosure.

3.4.5. Independent Directors

Great corporate administration expects the incorporation of free (non-official) executives on corporate sheets. (Vienot report, 1995; Bouton report, 2002; Chen and Jaggi, 2000) introduce two principle contentions in help of autonomous executives: The primary point recommends that, free chiefs give counsel to corporate sheets on vital choices which may enhance the firm's monetary and financial execution. The second contention suggests that, autonomous chiefs have more motivations to screen administration choices and exercises. Fama (1980) expect that outside chiefs are a definitive interior screens of administrative basic leadership. They make sure that investor's advantages are on the most fundamental level. Fama and Jensen (1983) propose that sheets made out of a higher extent of autonomous chiefs have more prominent control and screen administrative choices. Also, it is accepted that free chiefs have motivations to practice their choice control keeping in mind the end goal to keep up reputational capital.

Following Jensen and Meckling (1983), the examination will expect that outside chiefs have motivations to create notorieties as specialists in choice control. Truth be told, most outside executives of open partnerships are either directors of different enterprises or imperative choice specialists in other complex associations. Subsequently, the estimation of their human capital depends principally on their execution as inward choice administrators in different associations. Earlier research finds a positive connection between the extent of outside executives in the board and financial articulation fakes dangers (Dechow, Sloan et Sweeney (1996), Beasley (1996)). The non-official chief guarantees that the checking of the board is compelling. Truth be told, when the board is overwhelmed by non-autonomous executives, complicity amongst supervisor and board individuals could happen. This could hurt investor's interests and firm straightforwardness. Cheng and Jaggi (2000) reported that observing the corporate sheets by INDs recommends that corporate sheets will turn out to be more receptive to financial specialists, and consideration of INDs on sheets will enhance the firm's compliance with the disclosure necessities which thusly will upgrade the completeness and quality of disclosures. Utilizing an example of 82 UK recorded organizations for the period 1988-1989, Forker (1992) demonstrates a positive relationship between financial disclosure quality and the extent of outside executives on the board. Eng and Mak (2003) coordinate measure of non-mandatory disclosure had a critical negative relationship with the extent of open executives. From the literature reviewed the following hypothesis will be tested:

H5: There is a positive association between the proportion of outside directors and IFRS mandatory disclosure.

3.4.6. Board Ownership Concentration

It is normal that possession focus will impact the compliance with IFRS prerequisites. Akhtaruddin, M. and Haron, H. (2010) contemplated the impact of proprietorship fixation on intentional disclosure and found that possession focus mirrors the impact of the dominant part investors. In their investigation led before on, Chau G.

and Gray, S.J. (2010) demonstrated that more extensive possession is emphatically identified with deliberate disclosure. From the literature reviewed the following hypothesis will be tested:

H6: There is a positive association between board ownership concentration and IFRS mandatory disclosure.

3.4.7. Board Size

As indicated by Fama and Jensen, (1983) observing and controlling administration activities are the most critical elements of top managerial staff. Likewise, expanding the quantity of board individuals enhances the ability of the board in observing and controlling administration activities therefore, upgrading straightforwardness and disclosure of more data by administration (Gandia, 2008). From the literature reviewed the following hypothesis will be tested:

H7: There is a positive association between board size and IFRS mandatory disclosure.

3.4.8. Audit firm size

A few inquires about have been done to test the connection between the extent of review firm and the level of disclosure (Wallace et al., 1994; Marston and Robson, 1997; Owusu-Ansah, 1998). (Wallace et al. 1994, 47) hypothesizes that greater accounting firms are supported by the mastery of the international firms to which they subsidiary and that a "hypothesis of affiliation" exits, recommending that the substance of yearly reports are examined as well as affected by reviewers. Be that as it may, distinctive outcomes revealed by (Marston and Robson, 1997) and (Owusu-Ansah, 1998) that review firm size isn't critical related with the level of disclosure. From the literature reviewed the following hypothesis will be tested:

H8: There is a positive association between audit firm size and IFRS mandatory disclosure.

4. Results

4.1 Descriptive Statistics

To be able to answer the first research question; to what extent do companies listed on the Ghana Stock Exchange comply with the disclosure requirement of IFRS/IAS. Information from the annual reports of the 26 companies were gathered and analyzed.

Table 4.1 reports the descriptive statistics for all the variables in the study. The dependent variable, EOD has a mean of 62%, the minimum is 49%, the maximum being 75% with a standard deviation of 8%. The results indicate that over the five years, the extent of IFRS disclosure is 62%. Auditor size recorded 25%

Average BOC (Top20 shareholding) is 84.6%, minimum is 56.5%, maximum being 97.05% with standard deviation of 10.17%. The average number of non-executive directors (PNED) is 16.33%, minimum is 2%, maximum being 32% with standard deviation of 5.83%. The average board size (BODS) is 9, maximum is 12 and minimum is 4.

Table 4.1 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
MS	150	154,505	9,381,800	1,278,257	2,011,286
ROCE	150	(8.00)	33.00	6.74	8.41
CUR	150	0.20	6.93	2.66	3.79
LEV	150	0.06	2.77	0.88	0.57
ROA	150	(8.00)	33.00	6.70	8.86
AUDITOR	150	0.00	1.00	0.93	0.25
EOD	150	49.00	75.00	61.90	8.43
BOC	150	56.55	97.05	84.62	10.17
BODS	150	4.00	12.00	8.57	1.92

4.2 Univariate analysis

To meet the requirements of the regression analysis assumptions, the correlation between the study variables and test for multicollinearity problems were examined. Table 4.2 presents the correlation results for the study variables. The correlation analysis shows that firm size (FMS) has a significant relationship with LEV at 1% level (p=0.000); with ROA at 1% (p=0.000); with ROA at 1% (0.001); with EOD at 5% level (p=0.013). These results indicate the need to pay attention to possible multi-co linearity problem in the regression analysis.

Table 4.2Spearman's rho

Correlations

		FMS	ROCE	CUR	LEV	ROA	AUDITOR	EOD	PNED	BOC	BODS
FMS	Correlation Coefficient	1.000	-.472**	-.002	.386**	-.267**	-.309**	-.203*	-.036	.014	.394**
	Sig. (2-tailed)		.000	.978	.000	.001	.000	.013	.663	.865	.000
	N	150	150	150	150	150	150	150	150	150	150
ROCE	Correlation Coefficient	-.472**	1.000	.182*	-.481**	.788**	.357**	.245**	.222**	-.021	-.183*
	Sig. (2-tailed)	.000		.025	.000	.000	.000	.002	.006	.803	.025
	N	150	150	150	150	150	150	150	150	150	150
CUR	Correlation Coefficient	-.002	.182*	1.000	-.167*	.439**	.108	.001	.043	-.047	-.429**
	Sig. (2-tailed)	.978	.025		.041	.000	.188	.993	.602	.568	.000
	N	150	150	150	150	150	150	150	150	150	150
LEV	Correlation Coefficient	.386**	-.481**	-.167*	1.000	-.279**	-.386**	.148	-.201*	-.135	-.026
	Sig. (2-tailed)	.000	.000	.041		.001	.000	.070	.014	.101	.750
	N	150	150	150	150	150	150	150	150	150	150
ROA	Correlation Coefficient	-.267**	.788**	.439**	-.279**	1.000	.341**	.155	.162*	-.061	-.354**
	Sig. (2-tailed)	.001	.000	.000	.001		.000	.059	.048	.458	.000
	N	150	150	150	150	150	150	150	150	150	150
AUDITOR	Correlation Coefficient	-.309**	.357**	.108	-.386**	.341**	1.000	.417**	.289**	-.124	.359**
	Sig. (2-tailed)	.000	.000	.188	.000	.000		.000	.000	.132	.000
	N	150	150	150	150	150	150	150	150	150	150
EOD	Correlation Coefficient	-.203*	.245**	.001	.148	.155	.417**	1.000	.259**	-.006	.179*
	Sig. (2-tailed)	.013	.002	.993	.070	.059	.000		.001	.937	.029
	N	150	150	150	150	150	150	150	150	150	150
BOC	Correlation Coefficient	.014	-.021	-.047	-.135	-.061	-.124	-.006	-.059	1.000	.044
	Sig. (2-tailed)	.865	.803	.568	.101	.458	.132	.937	.470		.596
	N	150	150	150	150	150	150	150	150	150	150
BODS	Correlation Coefficient	.394**	-.183*	-.429**	-.026	-.354**	.359**	.179*	.188*	.044	1.000
	Sig. (2-tailed)	.000	.025	.000	.750	.000	.000	.029	.021	.596	
	N	150	150	150	150	150	150	150	150	150	150

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

*. Correlation is significant at the 0.05 level (2-tailed).

4.3 Multicollinearity and autocorrelation tests (assessment of the validity of the model)

A regression analysis (Tables 3.3) was performed on the dependent and independent variables to check on the existence of the multi-co linearity and serial or autocorrelation problems. The tolerance and Variable Inflation Factor (VIF) tests revealed no harmful correlation. According to (Pallant, 2013; Field, 2009; Neter et al., 1996), if the largest VIF is greater than 10, there is cause for concern. However, the maximum VIF value in Table 5 is 1.884 and Durbin Watson value of 1.722. In addition, the tolerance is greater than 0.20 for the variables (the smallest tolerance is 0.622). Therefore, this study is not subject to high colinearity problems. Overall, there are no linearity, multicollinearity, and autocorrelation problems.Thus the model developed in the study are statistically significant for explaining financial reporting quality.

Table 4.3 Regression results

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.501[a]	.251	.209	7.5010	1.722

a. Predictors: (Constant), BODS, BOC, LEV, CUR, FMS, PNED, ROCE, ROA, AUD

b. Dependent Variable: EOD

Table 4.4 Regression results (Coefficient of determination)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	40.833	6.810		5.996	.000		
	FMS	-1.179E-6	.000	-.281	-3.324	.001	.742	1.347
	ROCE	.244	.169	.243	1.439	.152	.786	1.375
	CUR	.159	.199	.071	.796	.427	.662	1.512
	LEV	3.052	1.185	.205	2.576	.011	.835	1.197
	ROA	-.060	.168	-.063	-.355	.723	.970	1.884
	PNED	.411	.118	.289	3.477	.001	.769	1.300
	BOC	.073	.067	.089	1.093	.276	.809	1.236
	AUDITOR	-.006	.047	-.024	-.137	.892	.887	1.120
	BODS	1.099	.375	.250	2.931	.004	.732	1.365

a. Dependent Variable: EOD

4.4 Findings

With regards to the direction of relationship between the dependent variable EOD and the independent variables, the results are as follows:

The regression results show a positive relationship between FMS and EOD, (β= 0.281) and statistically significant at .01 level (p=0.001). Thus H1 is supported, hence accepted.

There is positive relationship between CUR and EOD (β= 0.071)) but statistically insignificant at 0.05 level (p=0.427). Thus H2 is not supported, hence rejected.

There is positive relationship between ROCE and EOD (β=0.243)) but statistically insignificant at 0.05 level (p=0.152). There is negative relationship between ROA and EOD (β= -0.063) but statistically insignificant at 0.05 level (p=0.723). Thus H3 is not supported, hence rejected.

There is positive relationship between LEV and EOD (β= -0.205)) and statistically significant at 0.05 level (p=0.011). Thus H4 is not supported, hence rejected.

There is positive relationship between PNED and EOD (β= 0.243)) and statistically significant at 0.01 level (p=0.001), Thus H5 is supported, hence accepted.

There is positive relationship between BOC and EOD (β= 0.089) but statistically insignificant at 0.05 level (p=0.276). Thus H6 is not supported, hence rejected.

There is positive relationship between BODS and EOD (β= 0.250)) and statistically significant at 0.01 level (p=0.004). Thus H7 is supported, hence accepted.

There is negative relationship between AUDITOR and EOD (β= -0.024) but statistically insignificant at 0.01 level (p=0.004). Thus H8 is not supported, hence rejected

4.5. Descriptive statistics for IAS/IFRS Compliance

Standard	Title	Percentage compliance
IAS 1	Presentation of financial statements	97%
IAS 2	Inventories	100%
IAS 7	Statement of cash flows	99%
IAS 8	Accounting policies, changes in accounting estimates	54%
IAS 10	Events after the reporting period	67%
IAS 12	Income Taxes	78%
IAS 14	Segment reporting	70%
IAS 16	Property plant Equipment	72%
IAS 17	Leases	83%
IAS 18	Revenue	90%
IAS 21	Employee benefits	65%
IAS 23	Effects of changes in foreign exchange	53%
IAS 24	Borrowing cost	81%
IAS 27	Related party disclosure	86%
IAS 28	Intangible assets	55%
IAS 31	Investment in associates	25%
IAS 33	Interests in Joint ventures	24%
IAS 36	Earnings per share	100%
IAS 37	Impairment of assets	80%
IAS 38	Provisions, contingent liabilities, and contingent assets	100%
IAS 40	Investment property	33%
IAS 41	Agriculture	12%
IFRS 1	First-time adoption of IFRS	15%
IFRS 2	Share-Based Payment	21%
IFRS 3	Business combinations	38%
IFRS 4	Insurance contracts	28%
IFRS 5	Non-current assets held for sale and discontinued operations	16%
IFRS 6	Exploration for and evaluation of mineral resources	21%
IFRS 7	Financial instrument : Disclosures	83.7%

4. Discussion and Recommendations

This study was performed to examine the quality of financial reports disclosure of listed firms on the Ghana Stock Exchange because little evidence existed on the level of compliance of listed firms to IFRS disclosure requirements in Ghana. My research also investigated and attempted to close this gap by determining elements that influence the level of listed firms'compliance to mandatory disclosures in Ghana with regards to firm-specific traits which include firm size, profitability, debt equity ratio, liquidity, board size, board independence and board ownership concentration on quality of financial statement disclosures.Overall, my discoveries recommended that recorded firms' compliance to mandatory disclosure has a positive noteworthy association with firm size (β= 0.281). The explanation behind this can be credited to the way that firms with bigger aggregate resources conform to the IFRS and, henceforth, uncover quality data in their financial articulation so as to disregard of arrangement disciplines of Ghana. My exploration was predictable with earlier investigations by Watts and Zimmerman (1978), Owusu-Ansah (1998) and Agyei-Mensah (2014). Regarding profitability, Contrary to my expectations, the outcome uncovers a negative affiliation (inconsequential relationship (β= - 0.063, p=0.152) amongst profitability and the firm's level of compliance with IFRS mandatory prerequisites, proposing that profitability isn't identified with the unveil quality accounting data in the Ghanaian setting. This can be as a consequences of recorded firms as of now making tremendous profit and are relunctant to agree to IFRS. Keeping in mind the end goal to check this circumstance, the legislature can build up a structure by remunerating firms that conform to mandatory IFRS. Regarding my expectation for use and presence of disclosure, the outcomes delineate that the use of recorded firms have a critical ($p<0.05$) negative (β= - 0.205) association with disclosure compliance as appeared in Table 4.4. Accordingly, the suggestion that use has positive association with the compliance level with the uncovered IFRS prerequisite of Ghanaian recorded firms is rejected. The essentialness of IFRS to financial reporting hones can't be disregarded. The worldwide group are particularly worried on financial reports that have been set up based on IAS/IFRS, in this way help in baiting outside ventures. Another significance for receiving IFRS is, change in accounting quality coming about to an internationally straightforward and reasonable firm data condition and better accounting practice. Additionally, an improved similarity of financial reports will make it less exorbitant for speculators to think about and assess firms inside and outside various nations. In light of the above discoveries, this examination reasons that IFRS has affected on the financial reporting rehearses in the Ghana Full compliance can be accomplished if there is mandatory reliable checking by the administrative bodies, for example, (Bank of Ghana, Security and Exchange commission, GSE). Additionally Institute of Chatered Accountants Ghana which is in charge of controlling the accounting profession ought to guarantee that normal preparing are sorted out for bookkeepers, evaluators and so forth to make them side by side and refreshed with the compliance of IFRS. To sum up my discoveries or something else, future research ought to think about near investigations of chose African nations. This investigation adds to the writing on corporate financial reporting and disclosure rehearses. The Ghana Stock Exchange is one of the imperative capital markets in the Africa, in which International Financial Reporting Standards (IFRSs) are mandatory. In this way an investigation on the quality of financial report disclosure is huge. It likewise adds to the writing on whether the organization characteristics that analysts have observed to be huge in organizations in created nations can be connected in a creating nation like Ghana. This has been accomplished as results are predictable with a portion of the examination directed in the created economies.

CONCLUSION

Globalization has turned into an overall marvel. The acknowledgment of this idea has allowed nations to open up to outside direct speculation and business to grow crosswise over limits. It merits realizing that both the private and open part association in different nations have perceived how the advantages a solitary monetary announcing system introduces by solid universally conceded accounting principles. The accounting administrative regulatory all through the world have looked to enhance the nature of monetary revelation and correspondence in a wide setting of financial globalization. This has brought about presentation of new changes into the accounting practice a methods for speaking with the different intrigued partners, and its ensuing appropriation of the universal money related revealing measures. These laws in addition to other things try to acquire joining the worldwide accounting practices rehearses. It has therefore been embraced by numerous nations both created and creating as a methods for bringing harmoniousness into their revealing models. Hence, the present work's objective, which sought to analyze the level of compliance of, listed firms on Ghana's stock

exchange with regards to International Financial Reporting Standards (IFRS) by analyzing their financial statements with a compliance index.

The results of the empirical analysis have shown that IFRS adoption in Ghana was positively influenced by economic the growth rate, existence of financial market, weakness of previous accounting system, and a common law based on legal systems. Other variables such as company size, liquidity, profitability, leverage, independent directors, board ownership concentration, board size and auditor size effect on the level of mandatory IFRS/IAS compliance in Ghana. These variables were examined leading me to conclude that the level of compliance with IFRS/IAS in Ghana is satisfactory. on consistence by the recorded organizations, the study uncovered that every one of the organizations overviewed are utilizing IFRS as the standard of detailing, since Ghana Institute of Chartered Accountants (ICAG) made it necessary for all organizations to change to the standard in 2007, henceforth there has been productive and compelling consistence with the benchmarks. The overall firms gathered from this study shows that, there is a high level of compliance by listed companies with regards to IFRS adoption in Ghana. This study provides two significant insights as ascertaining the compliance level of institutions listed on the Stock Market as well as the factors associated with disclosure compliance of selected firms in Ghana. Based on the cases selected for the study, it can be concluded that institutions listed on the GSE over the 9 year period have an average of 84.3% compliance with regards to IFRS/IAS standards

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Notes

Note 1. : This study identifies firm-specific characteristics that influence IFRS compliance by listed firms in Ghana. This would aid accounting policy makers to institute strategies to encourage compliance with IFRS by the listed firms.

Note 2. : The study contributes to financial reporting literature relating to developing economies and Ghana, in particular

Appendix A

Disclosure compliance checklist of IAS 1[2].

Standard	Title	
IAS 1	Presentation of Financial Statements	
IAS 2	Inventories	
IAS 7	Statement of Cash Flows	
IAS 8	Accounting Policies, Changes in Accounting Estimates and Errors	
IAS 10	Events After the Reporting Period	
IAS 12	Income Taxes	
IAS 16	Property, plant and equipment	
IAS 17	Accounting for Leases	
IAS 18	Revenue	
IAS 19	Employee Benefits	
IAS 21	The Effects of Changes in Foreign Exchange Rates	
IAS 23	Borrowing Costs	
IAS 24	Related Party Disclosures	
IAS 27	Consolidation and Separate Financial Statements	
IAS 33	Earnings Per Share	
IAS 36	Impairments of Assets	
IAS 37	Provisions, Contingent Liabilities, and Contingent Assets	
IAS 38	Intangible Assets	
IAS 40	Investment Property	
IFRS 2	Share-Based Payment	
IFRS 3	Business Combinations	
IFRS 4	Insurance Contracts	
IFRS 5	Non-current Assets Held for Sale and Discontinued Operations	
IFRS 6	Exploration for and Evaluation of Mineral Resources	.
IFRS 7	Financial Instruments: Disclosures	IAS/IFRS used in the
IFRS 8	Operating Segments	Study

The relationship between smartphone applications usage and students' academic performance

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Abstract

Since 2008, smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption. While some apps are used for entertainment and socializing purposes, others are used for reading current health information and making online purchases. However, a review of literature indicates that there are limited studies on the impact of smartphone application usage on students' grades and this motivated the conducting of this research so as to examine the role of smartphone applications usage on students' academic performance. A quantitative research approach was used and questionnaire was used to survey a sample of 200 respondents who were selected randomly. The data was analyzed using Statistical Package for Social Sciences version 20. On analyzing the data, all the hypotheses were supported indicating that there is a significant relationship between students' application usage and academic performance. This indicates that the type of smartphone applications and how they use it determine their level of knowledge and overall grade achievement. However, the impact is mediated by the amount of time spent using such as applications. This indicates that when more time is spent on using educational applications, there are more chances of enhancing level of knowledge and classroom achievement since it is used as a learning tool to search for information needed for assignments and test or examinations. However, when more time is spent on social applications, the academic competence and classroom achievement will reduce although the student may be good in social trend. The implication of this finding is that both parents and school authorities should regulate the students' use of smartphones and ensure that it is used for the right purpose so as to enhance the level of academic achievement.

Keywords: *Smartphone applications usage, students' academic performance, time spent on smartphones, types of applications.*

Introduction

The growth of smartphones use has been remarkable as Lane and Manner, (2011) indicate that over half a billion smartphones were purchased globally in 2011 with US having the highest penetration rate. Without exception, Malaysia has joined the countries who are currently riding in the wave of telecommunication evolution with an increase of 16 percent smartphone penetration rate in 2012 to 63 percent while the applications usage among people increases from 54 percent to 76 percent daily surfing the internet and using other applications by September, 2013 as reported by The Sun Daily, (2013). In a similar vein, the study of Böhmer, *et al.* (2011) opine that since 2008, the smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption. The examples of apps include; mobile application games, GPS which renders location-based services, social apps like Whatsup, WeChat, Viber and BBM, order-tracking, ticket purchase, newsfeed and mobile medical apps. This indicates that while some application are used for entertainment and socializing purposes, others are used for surfing the internet on latest research findings and making online purchases. However, there are limited studies done on the impact of smartphone application usage on students overall academic performance and this has motivated the conducting of this current study so as to better understand how time spent on smartphones applications can affect students' academic performance.

The Malaysian smartphone market has experienced a steady growth over the years and the sales of smartphones accounts for about 66 percent of consumers' electronic spending in the year 2010 (Osman, *et al.* 2011). From the total of 85% of Malaysians who are said to own mobile phones, 23% owns smartphones as reported by the Malaysia Telecommunication and Multimedia Commission. Given the growing interest and purchase of smartphones especially among young adults, many scholars have delved into the study of smartphone usage among users and its various impacts on the social and psychological development of the users

(Norris, 2007; Mothar, *et al* 2013). However, despite the high penetration rate of smartphones in Malaysia, a review academic studies indicates that there are limited studies which specifically focused on the impact of smartphone application usage on students' overall academic performance. For example, the studies of Chittaranjan, *et al.* (2011); Tossell, *et al.* (2012) opine that there are still far less empirical studies done adequate enough to understand users' behaviors on the smartphone applications usage among users and the academic effect. Driven by this, the current study intends to examine the role of smartphone applications usage on students' academic performance in terms of the classroom achievement, students' competence and the overall final grade point average.

The main purpose of this study is to determine the impact of smartphone application usage on students' academic performance in Malaysia. The study is significant for unraveling the role of smartphone applications usage on students' academic performance in terms classroom achievement, students' competence and the grade point average. This study has both practical and academic implications. Since understanding students' academic performance and the determinants is imperative given that the outcome is used as measure to predict the students' future performance, the findings of this study will help both parents and the governing bodies of higher institutions to know the role smartphone applications usage in the academic campus plays on their children and wards' final cumulative grade point average. Having known the impact of apps usage patterns on the students' academic performance, the findings of the study will help educators to implement appropriate policies that will enable the students to use the various smartphone applications to enhance their final cumulative grade point average. On the academic importance side, the findings of this study will provide some insights for future researchers who will like to extend this line of enquiry to other unit of analysis or settings. This indicates that this study will serve as a foundation for further researchers since the subject area largely remains much unexplored in the Malaysian context.

Literature review

Smartphones are mobile electronic devices that run advanced operating systems with options to install new applications, thereby providing the user with varied functionality including internet connectivity (Aviram, 2010; Oulasvirta, *et al.* 2011). However, another view defined smartphones as handheld personal computers which support the installation of new applications and equip with continuous network connectivity (Osman, *et al.* 2011; Thiraput, 2013). While the former definition is built on the premise that smartphone is an advanced form of cell phone with built-in applications that enables the use of diverse functions such as the ability to access the internet and play music and video, the latter definition considers smartphones as minicomputers designed to perform every functions modern day computers can achieve given the inclusion of additional software functions like e-mail and internet browser. However, there seems to be a consensus among the two claims and the common thread running through all the definitions is that smartphone is an advanced mobile electronic device which has a large touchscreen for direct finger input as its main *means of* interaction and an operating system capable of running downloaded applications, thereby performing most of the functions of a computer such as receiving input, processing and producing output and storage.

Smartphone applications are programs which are designed to be operated on smartphones which are installed after being downloaded from online application sales outlets (Lee, *et al.* 2012). However, another view defined smartphone applications as software applications that run on mobile phones and computers (Verkasalo, *et al.* 2010). While the former definition is built on the premise that smartphone applications are usually small specialized programs which are downloaded and installed into mobile devices, the former definition considers smartphone applications as a piece of software which can run on electronic devices such as smartphones. However, there seems to be an agreement among the two definitions and the common thread running through all the definitions is that smartphone applications are computer programmes designed to run on electronic devices such as smartphones, tablet computers and other mobile devices.

Since 2008, smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption (Böhmer, *et al.* 2011). The examples of apps include; mobile application games, GPS which renders location-based services, social apps like Whatsup, WeChat, Viber and BBM, order-tracking, ticket purchase, newsfeed and mobile medical apps. This indicates that while some apps are used for

entertainment and socializing purposes, others are used for reading current health information and making online purchases.

Differences in smartphone applications usage pattern among students

Although studies on the interaction between students' differences and app usage are scarce, there is evidence to believe that smartphone applications usage among students may vary significantly depending on their individual differences. According to this claim, personality traits may determine the type of smartphone applications used by student. In supporting this claim, the study of Lane and Manner, (2011) found that while introverted people are more likely to use texting applications when communicating with friends or family members, extroverted and more agreeable people are more likely to use call applications while placing less importance on text app. This indicates that social and psychological factors play significant role in the choice of smartphone application usage among students. In supporting this claim, the *Uses and Gratifications Theory* by Jay Blumler and Elihu Katz argues that people's differences causes smartphone users to seek out different applications and use them differently (Leung and Wei, 2000; Wei and Lo, 2006). According to this claim, the theory shows that the way smartphone users actively select and use applications depend on their social and psychological needs and gratification-seeking motives. However, another view seems to indicate otherwise. According to this latter claim, there is no clear evidence to support the claim of smartphone applications usage being influenced by the users' personality traits. This is because of the limited number of studies on the use of smartphone applications among students and concluding that individual differences is a contributing factor on app usage is yet to be established. In supporting this claim, Chittaranjan, *et al.* (2011) say the role of the smartphone in revealing a person's attitude and behavioral patterns is still unclear due to limited studies in this direction. According to this finding, it cannot be concluded that a smartphone apps usage pattern is determined by the users' socio-psychological traits since there are limited studies to support it.

Furthermore, there seems to be a further argument on the issue of smartphone application usage among students although there are limited studies available. According to one perspective, there is a gender difference in the smartphone application usage among students. Central to this claim is that while female students tend to use more social oriented applications such as WeChat and Facebook messenger for socializing purposes, male students prefer streaming contents and video games applications. This is because while female students are more communication and social oriented, male students are more assertive and competitive in nature. In supporting this claim, the study of Lenhart, *et al.*, (2010); Lee, *et al.* (2014) found that while male smartphone users tend to be more task-oriented in their application usage, female users are more people-oriented aimed at satisfying their social motives. According to this finding, female students value social functionality of the applications more than male students who often use more of applications for self-gratification. In supporting the foregoing claim, the study of Pawłowska and Potembska, (2012) found that female smartphone users use more social-oriented apps than male users for the purpose of gossiping and maintaining close personal relationships with friends and family members. However, another view seems to argue that there is no clear gender difference in the smartphone applications usage pattern among students. According to this latter perspective, a demographic characteristic such as gender is not a strong determinant of which application students may use at any point in time. In supporting this claim, the study of Economides and Grousopoulou, (2008) found that there is no statistically significant relationship between a user's gender and his or her preference for mobile phone application usage. According to this claim, gender is not a significant determining factor of which smartphone application to use by a student and for how long. Thus, it may be concluded here that there is a mixed and inconclusive findings on the relationship between gender difference and smartphone applications usage pattern among students.

Students' academic performance

Academic performance is a demonstration of competence that is measured through assessment Beckman, *et al.* (2006). However, another view defined academic performance as how well a student is accomplishing his or her tasks and studies (Amin, *et al.*, 2006). While the former definition indicates that the result of a student's performance (i.e. the grade point average) on tests reflect his or her academic performance and it is taken as an indicator of the student's competence after an educational phase, the latter definition claims that academic performance entails the extent to which a student has achieved his or her educational goals. However, Albanese, *et al.* (2008) defined academic performance as a demonstration of students' level of competence and mastery of

subjects through completion of multiple tests of competence in a particular domain of education. According to this claim, there are three essential elements of academic performance which include assessment, competence and performance. While assessment is a tool used by educators to determine student's level of knowledge, skills and learning, competence entails the possession of the necessary attributes such as knowledge, skills, abilities and attitudes. However, there seems to be a common ground on both claims and both definitions indicate that academic performance is the outcome of a student's education which is displayed through his or her level of knowledge, skills and attitudes.

Academic performance as shown in the grade point average is used by the governing bodies of higher institutions to determine which student is displaying the right level of competence as defined by the academic standards. Also, potential employers assess the final cumulative grade point average to determine which candidate is suitable for the job (Beckman, *et al.* 2006). This indicates that understanding students' academic performance and the determinants is imperative because the outcome can be used as measure to predict the students' future performance and be used as an outcome variable for educational research purposes.

The influence of smartphone applications usage pattern on students' grade point average

There are two views on the impact of smartphone applications usage on students' academic performance. On the one hand, studies portray the influence of smartphone usage on students' academic performance in a positive light. According to this optimistic view, smartphones can be used as effective learning tools which can enhance the students' grade point average. For example, map and weather applications serve as learning tools when it comes to learning subjects relating to geography. Also, students form chat groups on applications such as Whatsup and Viber to share ideas on group assignments and this can enhance the outcome of their team works and consequently the final grade point average. In supporting this claim, Krebs, (2012) reports that a recent study from North Carolina found that smartphones apps usage in the classroom can have a huge impact on students' classroom achievement. According to this study, test scores improved by 30% after smartphones were introduced to low-income students in the school. This is because the students saw the introduction of the smartphones as opportunity to learn new things by searching for latest technological innovations and new findings on various subject areas around the world and the knowledge gained helped to build mental warehouse of information required to achieve better grades. Similarly, the study of Griffith, and Liyanage, (2008); Bakon and Hassan, (2013) opine that apps such as instant messaging, wikis, discussion boards and other apps can complement what is taught in a conventional classroom setting, thereby enhancing students' competence on the subject matter. A further study on the impact of smartphone apps on students' education by Sarwar and Soomro, (2013) indicates that smartphone makes it easier for students and lecturers to collaborate for academic purposes. According to the study, smartphones can enable students to attend classes during sick leaves through their apps and keep up with their academic works rather than falling behind due to unanticipated circumstances. It can be concluded here that the right use of smartphone applications has the potency to improve students' overall grades because it makes communication easier and faster among students and lecturers which enhances effective flow of information and the sharing of ideas and knowledge among students.

However, while the above claims indicate a positive relationship between smartphone applications usage and students' grades, a competing view portrays the impact of smartphone applications usage on academic performance in a more negative light. According to this pessimistic claim, rather than improving overall grades of students, the use of smartphone applications tends to reduce their academic performance because most of the students only use social apps interacting with their friends and families. In supporting this claim, a study on the impact of Whatsapp Messenger usage on students' academic performance in tertiary institutions by Yeboah and Ewur, (2014) found that smartphone applications usage generated negative impact on the students' grades in Ghanaian universities instead of enhancing their academic performance given the instant internet connectivity. According to the study, most of the students spend much of their valuable time meant for study on social applications and this result to delay in completing their assignments, lack of reading for test and examinations, lack of concentration during lecture periods. The study further found that students' over reliance on social applications destroys their spellings and grammatical construction of sentences since many users of instant messengers tend to use abbreviations and informal expressions during chatting. This indicates that addiction to smartphone applications cause difficulties in balancing online activities (i.e. Whatsapp usage) and students' academic preparation and this reduces the overall cumulative grade point average of the students. Similarly, the

study of Simuforosa, (2013) opine that high level use of applications for social networking can cause students to lose focus on their academic tasks and this will negatively affect their academic outcomes. A further study by Ezemenaka, (2013) found that constant use of internet enabled phones in the classroom reduces students' level of concentration and consequently their academic performance. It can be concluded here that too much use of smartphone applications on non-academic related things can reduce students' academic competence and their overall grades.

Potential mediators of the relationship between application usage and academic performance

Although research on the relationship between students' smartphone application usage and academic performance is scant, there is evidence to believe that the impact of app usage on students' academic performance is determined by the particular type of application and the time spent on using such applications. Thus, this section discusses the potential mediators of the relationship between smartphone applications usage and students' academic performance.

Types of smartphone applications as a mediator

Although studies on the impact of smartphone applications usage on students' academic performance is scant especially in the Malaysian academic context, there is reason to believe that the type of app used on smartphones may determine the nature of activities the students may engage and this will in return determine the effect on their academic competence and grades.

For example, if students use more of social applications such as Facebook messenger, Viber and WeChat for socializing purposes instead, it may affect their grades negatively because much time meant for studies will be used on non-academic related things (Yeboah and Ewur, 2014). However, if students use their smartphones as learning tools to surf the internet and search for latest research findings on their area of specialization, it will enhance their level of competence in the subject and this will result to better grades. In supporting this claims, the study of Yeboah and Ewur, (2014) found that Ghanaian students' over reliance on social applications such as Whatsup does not only affect their spellings and grammatical construction of sentences since many users of instant messengers tend to use abbreviations and informal expressions during chatting, it also affects the students' grades because most of the students spend much of their valuable time meant for using academic related applications such as Google in researching for latest findings on their courses but wasting much time on socializing.

However, another view seems to offer a complicating perspective to the ongoing argument. According to this latter claim, there is no strong relationship between the type of smartphone application used and the students' academic performance. This indicates that whether a student use social applications or otherwise, it may not have significant effect on the grade point average of the students. In supporting this claim, the study of Prescott, *et al.* (2012) on the impact of smart mobile electronic devices use on the academic performance of pharmaceutical students indicates that there is no significant relationship between the type of applications used and the overall grades. According to this study, despite the high frequency of use and the perceived negative impact on learning claimed by researchers, the use of applications during class for both course-related and non-course-related purposes had no overall impact on academic performance in the study population. This claim indicates that the type of smartphone application used cannot determine the academic performance of the students but rather other intrinsic and extrinsic factors.

Time spent using smartphone applications as a mediator

Although studies on the time spent on smartphones among students are scant especially in the Malaysian academic context, there is evidence to believe that there is a notable variation in the duration of smartphone usage among students. This indicates that while some users spend less time on it, others spend considerable much more time. In supporting this claim, the study of Hingorani, *et al.* (2012) asset that access to social media sites, such as Facebook and Twitter and texting applications has captured the attention of many students and many of them spend a considerable amount of time utilizing smartphone applications. For example, a survey found that

young users of smartphone from the ages of 18 to 24 send an average of 109.5 messages daily which totals to over 3,200 texts every month. Similarly, a study found that over 60% of young adults admit to be highly addicted to their Smartphone in that they spent considerable time engaging in diverse activities (Sarwar and Soomro, 2013).

Having established earlier that some students use smartphone applications for socializing while others use it for academic purposes, time spent can determine how well students perform academically although there are limited studies to support this claim. For example, when smartphone applications are used for only socializing purposes and much time meant for studying is spent on non-academic related things, it will reduce the students' grades. But, if smartphone is used as a learning tool and much more time is spent on applications where students form chat and reading groups to exchange ideas and knowledge, it will improve their academic competence and subsequently their cumulative grade point average. Thus, it can be concluded here that time spent on smartphone applications can determine whether students' grades will improve or decline.

Theoretical framework

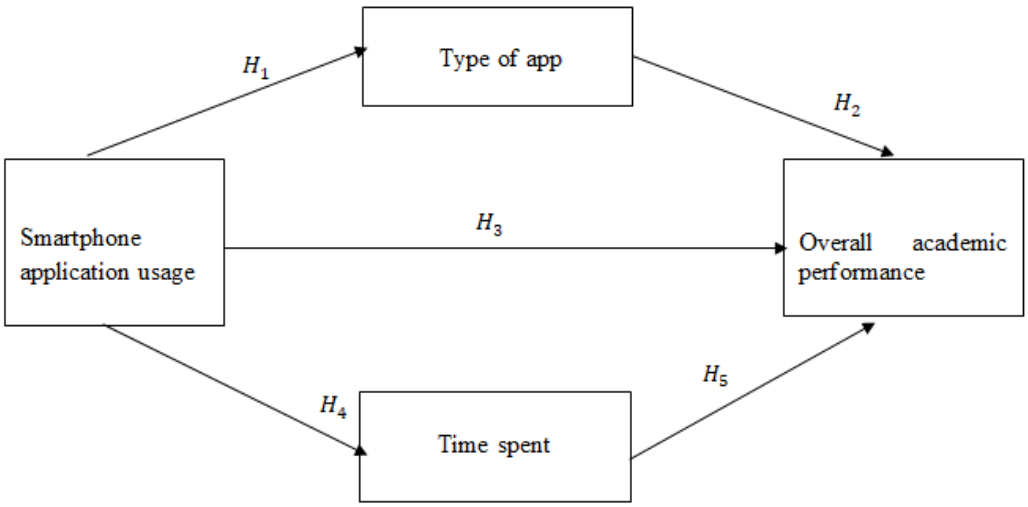
Bakon and Hassan, (2013) studied the perceived value of smartphone and its impact on deviant behaviour among Malaysian college students. The objective of the study was to determine the impact of smartphones on deviant behaviour and student's academic performance.

On the relationship between smartphone application usage and students' academic performance, the study found that the use of smartphones among students do not have a significant and positive effect on both the students' deviant behaviour and their academic performance. However, while this study provides some insights on the field of smartphone usage among in academic environment, the small sample size may affect the validity and reliability of the study because Fosgate, (2009) argues that the probability of a study yielding a statistically sound conclusion is determined by large sample size. Thus, the current study tends to address this limitation by increasing the sample size to widen the research context so as to ensure validity and the generalizability of the results.

Conceptual framework

This section highlights the conceptual framework of the current study. The structure of the framework is an extension of the study of Bakon and Hassan, (2013) and Figure 2.2 below shows the interrelationship between the variables. The framework indicates that smartphone application usage may influence students' cumulative grade point average. However, the framework shows that the level of effect will be determined by the particular type of application and the time spent on each application.

Figure 2.1: Conceptual framework of the study



Research methodology

Research approach

This study uses quantitative research approach. A quantitative research approach is known as a number-based research strategy which emphasizes the quantification in collecting and analysing data. A quantitative approach was selected for this study because it was the most feasible option given the objectives of the study. Besides, prior experienced scholars have used quantitative approach on similar topics believing that it is more objective and reliable in generating results that can be generalized beyond the sample size to the larger population. In supporting this claim, Collis and Hussey, (2009) opine that quantitative research approach studies tend to generate a more dependable results whose findings can be generalized because standardized questionnaires are used to collect objective data unlike the qualitative approach which is more exploratory.

However, while quantitative research approach study may produce a more liable results, it does not give room for detail analysis of issues given that it is a number-based study unlike qualitative studies that provides in-depth analysis and richness of data. In supporting this claim, Sukamolson, (1996) opine that qualitative studies offers more room for detail analysis of issues because it is more exploratory in nature since interview sessions are conducted which offers the chance for more probing questions to be asked unlike quantitative studies which uses standardized questionnaires.

Population and sample size analysis

The target population for this study undergraduate college students in Nilai who have smartphones or have used it before. This target population was selected based on findings on smartphone usage among Malaysians that majority of the users are young college students who use smartphones for various reasons ranging from socializing to reading local news and to surfing the internet for academic related information as suggested by The Sun Daily, (2013). Given the large population under consideration and the difficulty involved in including every subject, a sample of only 150 undergraduate students will be selected to represent the target population. The decision to select a sample of 150 respondents is based on budget and time considerations. Besides, the ease and convenience in collecting and analyzing small sample data determined the choice of the selected sample size. In supporting this claim, Bryman and Bell, (2011) opine that a manageable sample size should be selected to represent the population so as to reduce the budget and time involved in conducting large sample study.

However, considering a small sample size in a study can increase the statistical error and human bias during data collection which may compromise the findings and the generalizability of the study because a small sample

cannot provide adequate representation of the population. In supporting this claim, Fosgate, (2009) argues that the probability of a study yielding a statistically sound conclusion is determined by large sample size. To address this issue, the respondents were selected randomly so as to give every unit the chance of being included as the next section indicated.

Sampling technique

This study uses a simple random sampling technique during data collection. Simple random sampling technique was used because it gives every unit of the population an equal and independent chance of being selected and included in the study. In supporting this claim, Sekaran and Bougie, (2010) opine that simple random sampling data collection method ensures a higher generalizability of results because all elements in the population are considered and they have equal chance of being chosen and studied.

However, others argue that simple random sampling technique is not as simple as it may sound because a detail profile of the target respondents may be obtained prior to conducting the study in order to randomly select who to include in the study. Besides, others argue that simple random sampling technique is not as efficient as stratified sampling technique the population may not be divided into meaningful segments prior to selecting the subjects in proportion to their original numbers in the population (Bluman, 2001).

Data collection instrument

This study uses a questionnaire to collect the data. Questionnaire was selected because of the numerous advantages it has over interview or focus group discussion. For example, questionnaire can be used to collect a large amount of data within a short period of time and it gives the respondents the chance to answer the questions at their own convenient time. Also, the results generated from questionnaire may be more valid because it offers standardized questions for every subject. In supporting this claim, the study of White, (2005) opine that questionnaire instrument can be easily administered to collect a large data in a fast and more convenient way since respondents can answer at their convenience.

However, questionnaire has some limitations. For example, questionnaire does not provide room for the respondents to ask questions when they do not understand the issues involved. Besides, questionnaire does not make room for asking more probing and complex questions that may through more light on the issues and determinants unlike focus group discussion and interview session that may provide a better forum for detail discussion and data collection. In supporting this claim, the study of Lefever, *et al.* (2007) argues that questionnaire does not make room for clarification since standardized questions are provided for every subject.

Measurement of the variables

The questionnaire has five sections comprising of 25 questions and a multidimensional scale and ranking order are used to measure the main variables. The five-point likert scale anchors from“1” – strongly agree to “5” – strongly disagree. However, the measurement of the smartphone applications use variable was based on ranking order where subjects are asked to tick their preferred applications on the “Yes Column” while the others are indicated on the “No Column”. These measures are used because prior experienced scholars have also used similar measurements on similar studies. For example, while Pijpers, (2005) found the five-point Likert scales to be effective measures of certain constructs, Lee, *et al.* (2014) found ranking to be more feasible on certain issues.

Statistical tools used

Since the study uses quantitative approach, certain statistical tools will be used during data computation and analysis. For example, SPSS will be used to compute and analyze the data. Also, while tables and percentages will be used to analyze the responses of the data, Pearson correlation and Multi regression analysis will be used to test the hypotheses so as to determine which one is supported or rejected.

Pretest

Pretesting means determining the validity of the research instrument prior to conducting the main study. Given this, a sample of 20 respondents will be selected and given the questionnaire to know how well they may understand the questions. Based on the responses given, the questions may be modified if the need arises so as to ensure that the target respondents can easily understand and answer the questions accurately. Subsequently, the responses were computed and analyzed using Statistical Package for Social Sciences (SPSS) and the reliability of the data was tested and it was 0.87 indicating high reliability of the instrument.

Research assumptions

It is assumed in this study that the respondents will provide valid response to the questions. Also, it is assumed that the study will generate valid and reliable results whose findings can be generalized beyond the sample size to the larger population.

Data analysis and discussion

In the previous chapter, the methods and procedures used in conducting the study were discussed. However, this chapter focuses on analyzing the data collected. Thus, the following issues will be discussed: demographic profile of the respondents, smartphone application usage, type of smartphone applications, time spent using smartphone applications and overall academic performance. The chapter will conclude with a discussion of the hypotheses using Pearson correlation and Multi regression analysis.

Demographic profile of the respondents

Table 4.1 below shows the results from the respondents' demographic data. From the result, Nigerian respondents seem to dominate the sample followed by the Chinese. This is due to the growing number of Nigerian and Chinese students studying in either Nilai doing either degree or master programme. Also, the data is dominated by more male respondents because of more male undergraduate students in the study location. For example, a quick check on the undergraduate students' population in Nilai indicates that there are more males than female students and this reflects the Malaysian gender ratio which is 106 males to 100 females. However, the data from the age distribution indicates that over half of the respondents fall within the age bracket of 23-27 years old while only 21% of the respondents are within the age bracket of 28-33 years old. The reason why younger respondents dominate the sample is because there are more young students in the study location. This is because many students left high school quite early and moved straight to the university without wasting time. This indicates that many of the respondents did not bother to work and raise money after the secondary school education but they just proceed straight to start their degree programme. On the educational level, 71.5% of the respondents are degree students doing various forms of courses. The reason why degree students dominate the sample is because undergraduate students are more than master students and the reason is because more people tend to stop at the degree level and work for a while before proceeding with their post graduate programmes.

Table 4.1: Demographic profile of the respondents

Respondents' demographic variables		Number	Percentage (%)
Nationality	Nigerian	101	50.5
	Indian	17	8.5
	Chinese	34	17
	Malaysia	11	5.5
	Others	47	18.5
	Total	**200**	**100**
Gender	Female	92	46
	Male	108	54
	Total	**200**	**100**
Age range	18-22 years old	56	28
	23-27 years old	102	51
	28-33 years old	42	21
	Total	**200**	**100**
Educational level	Diploma	41	20.5
	Degree	143	71.5
	Masters	12	6
	Others	4	2
	Total	**200**	**100**

Discussion of the hypotheses results

Having done the descriptive analysis, the focus here will be discussing the results of the hypotheses using Pearson correlation and subsequently the Multi regression analysis and Table 4.2 below shows the results of the hypotheses.

Table 4.2 Results of the Pearson correlation test

		App usage	App type	Time spent	Academic performance
App usage	Pearson Correlation	1	.561**	.373**	.378**
	Sig. (2-tailed)		.000	.000	.000
	N	200	200	200	200
App type	Pearson Correlation	.561**	1	.581**	.402**
	Sig. (2-tailed)	.000		.000	.000
	N	200	200	200	200
Time spent	Pearson Correlation	.373**	.581**	1	.480**
	Sig. (2-tailed)	.000	.000		.000
	N	200	200	200	200
Academic performance	Pearson Correlation	.378**	.402**	.480**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	200	200	200	200

Hypothesis 1: Smartphone usage depends on the type of application

The aim of this hypothesis is to determine how smartphone usage depend specific applications. The null and alternate hypotheses are stated below:

H_o: Smartphone usage does not depend on specific type of application

H_a: Smartphone usage depends on specific type of application

Table 4.2 above shows that while the r value is 0.373, the p-value is 0.000 which is less than the confidence level and it shows that while the null hypothesis is rejected, while the alternate is accepted. Thus, it can be concluded here that smartphone usage among students depends on specific type of applications. This supports the

finding of Ezemenaka, (2013) that the type of app used on smartphones may determine the nature of activities the students may engage.

Hypothesis 2: Overall academic performance of students depends on the type of application used

The aim of this hypothesis is to determine how students' overall academic performance is determined by specific type of applications. The null and alternate hypotheses are stated below:

H_o: Overall academic performance of students does not depend on the type of application used

H_a: Overall academic performance of students depends on the type of application used

Table 4.2 above shows that while the r value is 0.402, the p-value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This shows that there is a significant relationship between students' overall academic performance and specific types of smartphone applications. According to this claim, the improvement of decrease of students' level of competence and grades will depend on the type of application used. This supports the findings of Ezemenaka, (2013) that the level of knowledge achieved through smartphones will depend on the specific applications. This shows that while some applications especially the educational related ones may enhance level of knowledge obtained, others especially the non-educational applications may reduce the level of it because more time is spent on nonacademic related issues.

Hypothesis 3: There is a significant relationship between smartphone applications usage and students' overall academic performance

The aim of this hypothesis is to determine the relationship between smartphone applications usage and students' overall academic performance. The null and alternate hypotheses are stated below:

H_o: There is no significant relationship between smartphone applications usage and students' overall academic performance

H_a: There is a significant relationship between smartphone applications usage and students' overall academic performance

Table 4.2 above shows that while the r value is 0.378, the p-value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This indicates there is a significant relationship between smartphone application usage and students' overall academic performance and this supports the findings of a recent study from North Carolina that smartphones apps usage in the classroom can have a huge impact on students' classroom achievement in that test scores improved by 30% after smartphones were introduced to low-income students in the school as report by Krebs, (2012).

Hypothesis 4: Time spent depends on smartphone application usage

The aim of this hypothesis is to determine how time mediates the relationship between application usage and academic performance. The null and alternate hypotheses are stated below:

H_o: Time spent does not depends smartphone application usage

H_a: Time spent depend smartphone application usage

Table 4.2 above shows that while the r value is 0.373, the p-value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This shows that how much time spent on smartphones depends on specific applications. This indicates that students may spend more time on their favorite applications while spending lesser time on some other applications and this indicates that when their favorite applications are education based, it will improve their academic performance since more time is spent but when the favorite applications are social based, it will reduce the classroom achievement and overall final grades since time meant for studies is spent chatting and socializing. This support the findings on a study on the impact of Whatsapp Messenger usage on students' academic performance in tertiary institutions by Yeboah and Ewur, (2014) found that many students spend much of their valuable time meant for study on social applications and this result to delay in completing their assignments, lack of reading for test and examinations, lack of concentration during lecture periods.

Hypothesis 5: Time spent depends on academic performance

The aim of this hypothesis is to determine how time mediates the relationship between application usage and academic performance. The null and alternate hypotheses are stated below:

H_o: Time spent does not depends on academic performance relationship

H_a: Time spent depend on academic performance relationship

Table 4.2 above shows that while the r value is 0.480, the p-value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This indicates that time spent mediates students' academic performance. According to this claim, when more time is spent on educational application, students' level of knowledge and grades will improve but when less time is spent, it will reduce the academic performance. This supports the findings of Mothar, *et al* (2013) that if smartphone is used as a learning tool and much more time is spent on applications where students form chat and reading groups to exchange ideas and knowledge, it will improve their academic competence and subsequently their cumulative grade point average. Thus, it can be concluded here that time spent on smartphone applications can determine whether students' grades will improve or decline.

Multi regression analysis

Table 4.4 below shows the results of the Multi Regression analysis and the results show that time spent on smartphone applications seem to have more impact on students' overall academic performance. This indicates that how well students' knowledge and competency as well as the classroom achievement will be determined by the time spent on using smartphone applications. This supports the findings of Mothar, *et al* (2013) that when students use smartphone as a learning tool and much more time is spent on applications where students form chat and reading groups to exchange ideas and knowledge, it will improve their academic competence and subsequently their cumulative grade point average and verse versa.

Table 4.3 Multi Regression analysis results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Overall academic performance	.968	.196		4.949	.000
Application usage	.281	.104	.198	2.698	.008
Type of application	.101	.101	.083	.997	.320
Time spent	.378	.079	.358	4.803	.000

4.7 Conclusion

Analysis of the results indicates that student's level of competence, classroom achievement and overall grades is influenced by application usage. According to this claim, when students choose educational applications and spend more time surfing the internet or sharing academic related ideas, experiences and information, it will help to build mental warehouse needed to achieve the best classroom and overall grades. However, results from the Multi Regression analysis indicates that time spent on smartphone applications has more effect on the application usage and academic performance relationship.

Overview of the main findings

On analyzing the data, it was found that there is a significant relationship between smartphone application usage and students' overall academic performance and this supports the findings of a recent study from North Carolina that smartphones apps usage in the classroom can have a huge impact on students' classroom achievement in that test scores improved by 30% after smartphones were introduced to low-income students in the school as report by Krebs, (2012). However, smartphone usage among students depends on specific type of applications and the time spent on using such applications. Thus, it was found that there is a significant relationship between students' overall academic performance and specific types of smartphone applications.

According to this claim, the improvement or decrease of students' level of competence and grades will depend on the type of application used. Also, time spent mediates students' academic performance. According to this claim, when more time is spent on educational application, students' level of knowledge and grades will improve but when less time is spent, it will reduce the academic performance. However, how much time spent on smartphones depends on specific applications. This indicates that students may spend more time on their favorite applications while spending lesser time on some other applications and this indicates that when their favorite applications are education based, it will improve their academic performance since more time is spent but when the favorite applications are social based, it will reduce the classroom achievement and overall final grades since time meant for studies is spent chatting and socializing. Furthermore, results from the Multi Regression analysis found that time spent on smartphone applications seem to have more impact on students' overall academic performance.

Managerial implications of the findings

The study found that the improvement or decrease of students' level of competence and grades will depend on the type of application used and the amount of time spent using such applications. The implication here is that both parents and school authorities should regulate the students' use of smartphones and ensure that it is used for the right purpose so as to enhance the level of academic achievement. This indicates that strict rules and regulations should be implemented on the type of applications to use and the amount of time to spend on using such applications. For example, students should be allowed to use only educational applications and strictly for the purpose of surfing the internet and finding academic related information needed for assignments, classroom preparation and tests or examinations. Also, students should only be allowed a certain amount of time using smartphone applications so as to have time for other school activities.

Recommendation for further studies

While the study offers some insights in the field of smartphone applications usage on academic performance, there are some limitations that further studies need to address. First, the study used a small sample size of only 200 in spite of the large study population and this may limit the generalizability of the findings. This is because small sample size may not guarantee enough representativeness of the population and this limit the ability of the findings to be applied beyond the sample size to the larger population. For example, the study of Fosgate, (2009) argues that the probability of a study to yield statistically sound conclusion depends on a large sample size. Secondly, the study was conducted among students from one location and this may limit the chances of applying the findings in other settings. This indicates that further studies need to be conducted using a larger sample size using students from diverse academic institutions across Malaysia.

Conclusion

Since 2008, smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption. While some apps are used for entertainment and socializing purposes, others are used for reading current health information and making online purchases. However, a review of literature indicates that there are limited studies on the impact of smartphone application usage on students' grades and this motivated the conducting of this research so as to examine the role of smartphone applications usage on students' academic performance. On analyzing the data, all the hypotheses were supported indicating that there is a significant relationship between students' application usage and academic performance. This indicates that the type of smartphone applications and how they use it determine their level of knowledge and overall grade achievement. However, the impact is mediated by the amount of time spent using such as applications. This indicates that when more time is spent on using educational applications, there are more chances of enhancing level of knowledge and classroom achievement since it is used as a learning tool to search for information needed for assignments and test or examinations. However, when more time is spent on social applications, the academic competence and classroom achievement will reduce although the student may be good in social trend. The implication of this finding indicates that the students ensure that they use smartphone for the right purpose so as to enhance the level of academic achievement.

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Beyond Accessibility – A Universal accessibility framework for blind-friendly user interfaces on smartphone

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Abstract

Smartphone has become an essential tool for visually impaired and blind people in performing their daily activities stimulating independence, productivity and social inclusion. The smartphone user interfaces are equipped with accessibility features such as talkback, voice assistant, etc. however; the blind people are still facing several challenges in performing common activities such as placing a call, sending messages etc. We have proposed universal accessibility framework for blind-friendly user interfaces by semantically enriching the existing smartphone user interaction paradigm. The framework re-organizes/regenerates user interface components, layouts, etc. extracted from common mobile application into a simplified blind-friendly user interface on the basis of user preferences, device-logging, and context-of-use. In this study, the user experience of blind people in operating smartphone interface was explored through principal component analysis. A total of 41 blind people with an average age of 33.8 (SD=1.58) participated in the study. The user experiences have been collected in performing several everyday activities. The results revealed an improved interaction experience, task completion accuracy, and user satisfaction.

Keywords: *Accessibility, Usability, Human-Computer Interaction, Blind people, Smartphone, Adaptive User Interface, UI*

1. Introduction

Information and communication technologies are adding capabilities for rapid and inexpensive solutions for people with disabilities. Smartphone-based technologies have proven its potential in the provision of accessibility-inclusive services to improve the quality of life of visually impaired and blind people [1]. Touchscreen as an input interface became a standard feature of smart devices such as smartphone, tablets, and smartwatches [2]. These devices provide an easy-to-use alternative to the traditional mobile phone device. Recent advancements in the smartphone capabilities in processing information, large screen display, availability of sensors for capturing and processing the context-aware objects are surfacing a value-addition in devising new solutions and services.

Visually impaired and blind people are using smartphones for performing several common tasks such as making calls, sending a message, taking a picture, listening to music, etc. [3, 4]. The interactions of blind people with smartphone transpire through accessibility services such as screen readers, speak screen, text to speech, larger font size, etc. in accessing information, selection of non-visual objects, etc. on smartphone interfaces [5, 6]. The device cost[7], lack of physical control[8], non-availability of screen readers in the local language, speech speed adjustment [9], text entry on traditional keypads with small keys[10] and limitation in the existing accessibility features[11] are few problems of smartphone user interfaces.

The provision of user-centric personalized and simplified user interface design will significantly overcome the issues of accessibility [12]. The usability of existing user interface paradigm can be markedly improved through the re-organization and personalization of user interfaces to reduce the cognitive overload, inconsistency in navigational structure, and real-time adaptation of user interface in response to changing user requirements. Adaptive user interfaces leverage flexibility in the user interface elements to customize/personalized according to the user needs thus reducing the burden of accessing over-crowded non-visual items on the screen. However, Kane et al. [4] contended the need for an alternative accessible interface to use smartphone potential.

We proposed a Universal Accessibility Framework (UAF) for blind-friendly user interfaces on smartphone. The framework incorporates the potentials of adaptation mechanism, users profiling, context of use and semantically enriched user interfaces. The outcome of this design will be an improved accessibility service, which will generate an optimal user interface for blind people. The interface will improve the user experience of blind people in performing common activities on a smartphone; institute a sense of quick learning, quick memorization and initiative learning experience.

2. General problems in the literature

Through a series of studies, researchers have analyzed and identified recommendation for usability, adaptive interface and how efficiently using a smartphone for blind people. Recently, touch-based interfaces have a significant impact on the mobile communication market, due to non-availability of tactical clues; researchers has contributed in making these devices more accessible for blind people. Large display surface with the ability to create visual interaction components has gained the opportunity for interaction with touchscreen interfaces. For instance screen reading applications including JAWS[1], NVIDIA[2], Narrator[3] of windows, Metal mouth[4], Windows Eyem Desktop, Talkback, Sound back[5], Mobile Speak[6] and voice over[7] read the contents of screen on desktop as well as mobile/smartphone, assisting blind people to interpret the non-visual objects on touch screen, besides the users can also read and understand the contents of screen through refreshable Braille display [13-19]. The use of Automatic Speech Recognizer(ASR) enables the blind people to convert the speech into text [20]. Krajnc et al. [21] suggested talking touch for interacting blind people to communicate with a smartphone by reducing the interface complexity. The "talking touch" and "talking touch list" composed of a list of pages deployed on a number of screen sizes of a smartphone device, thus providing ease in faster input with audio feedbacks. Aaron [22] designed dialer for blind people, they have made a fixed position's digit keys on the screen. The first impression of the key represents the center represented by digit 5, while the rest of digits occupied the relative places. The top center represents the digit 2; top left represent digit 1, top right represents digit 3, left side from center represent digit 4, right side form center represents digit 6, bottom left represent digit 7. The bottom center represents digit 8; bottom right represents digit 9 and bottom of these three digits are represented by the symbol of start 0 and hush from left to right sequence. Young [23] proposed typing Braille letter and sending message developed their Braille typing application. They proposed the "self-adhesive" plastic, which has a hole for identifying the keys positions on the screen according to their application.

Borodin et al. [24] have developed the "HearSay" a non-visual web browser for blind people using voice XML. The browser reads the web page contents in two navigational modes, which continuously reading the contents while skipping extra information such banner, menus, and ads. The HearSay non-visual web browser uses a geometrical clustering algorithm [25]. However, there is no unique function of reading the content of an email. Similarly, Borodin et al. [26] introduced a Tele web services; they have integrated the traditional and usable phone incorporated with the features such as context-oriented browsing. This helps blind users to access the web from the phone, search on web, check their email and other web activities by speaking and using phone keys. This system had initially developed for desktop users, and there is no difference in using email activities with other content surfing mechanism. Chu. [27] proposed two dimensional interactive voice browsers whereas they have integrated voice functions. IBM voice to Chinese text-to-speech synthesizer was embedded to speak loud all web contents. The browser is based on IE running engine on windows platform; at startup, browsers read all structure of web page elements including frame, table, links, menus, and forms. A coding numbers are assigned to the section of the page in increasing order, which usually starts from one side to the other end for reducing time in speaking commands. However, the solution confronts issues in punctuations. Ghose et al. [28] proposed open source browser architecture, allowing blind people to navigate web sites through voice commands. This design supports text-to-speech and text-to-Braille, all keyboard operation have voice feedback.

1http://www.freedomscientific.com/products/fs/jaws-product-page.asp
2http://www.nvda-project.org
3https://marinersoftware.deskpro.com/kb/articles/281-what-is-narrator
4https://code.google.com/p/metalmouth/
5https://play.google.com/store/apps/details?id=com.google.android.marvin.talkback&hl=en
6http://webcache.googleusercontent.com/search?q=cache:mhUrXg4ZEWYJ:www.itu.int/ITU-D/sis/PwDs/Documents/Mobile_Report.pdf+&cd=1&hl=en&ct=clnk&gl=pk
7http://www.apple.com/accessibility/osx/voiceover/

Enhancing accessibility is a demanding experience for blind people. Screen reading applications are facilitating blind people in translating contents, labels and rendering non-visual items. Text to Speech such as Talkback and Soundback[8] are the accessibility service used to operate the smartphone, read the content and provide directions to respond. Mobile Speak[9] is a screen reading application generates all displays contents of the screen to speech-to-text and text-to-Braille. Voice Over[10] is screen reading application for blind people based on gestures; by dragging the finger reads the contents of the screen, voice-over reads the text in the textbox and converting screen contents to Braille display if Braille display is connected to Smartphone.

A number of gesture-based interaction techniques have been introduced on touch-enabled devices. Some of the operations include flicking, rotating, flipping, flat hand; the horizontal hand is few single and multi-finger gesture available[29]. Slide rule[4] uses multi-touch interaction to make touchscreen accessible for blind users. They have designed a set of multi-touch interaction associated with other functionalities. Similarly, touch player[30] provides directional gestures and non-speech feedback to the blind people for interaction purpose. McGookin et al. [31] designed the raised paper embedded solution for making smartphone accessible to blind users by delivering tactical sense through raised paper control fixed on the object of the screen. MessagEase [32] uses the slide and tap model for touchscreen-based entry. Selection of primary characters in the layout is performed via tapping while secondary layout menu can be operated by sliding in certain directions. NavTouch [33] is a gesture-based interface where the user can use gesture anywhere on the screen providing benefit of extended interface and layouts. Gesture to left and right navigate alphabetically horizontally and vertically; vowels are used as intended letter whereas speech feedback assists a user in navigating the alphabets. Egoki System [34] outline a framework for automatic generation of a user interface for people with disability to have universal access to several ubiquitous services. The structure suggests a suitable multimedia interaction pattern for each function duly mapped with the user requirements and expectations. An empirical study was conducted to check the viability of the system, resulting in a better response. Similarly, Supple System [35] generates user interfaces adapted on the basis of user preferences, device feature and disability profiles. The system provided a successful adaptation in less than 20 minutes from abstract UI to final UI.

Interpersonal communication through electronic aids like mobile or smartphone is possible. However, several changes in interaction mechanism need to be in place. Interaction through audio and touch-based interfaces are already available in commercial products. However, the significant disadvantage of touch-based interfaces is the lack of tactical sense [31], Identifying a widget or control button with the same interface is quite a complicated job. While, Interaction through voice mechanism are suffered from the inherited issues of poor performance, noisy environment, and change of ascent thus may lead to increase cognitive overload in memorizing voice instruction [36, 37]. Moreover, the gesture performance of a user is dependent on his experience and understanding of the application[38]. Potential of touch-based interfaces can be achieved up to a great extent while addressing the eight rules of Shniderman [39]. This includes consistency in design and controls, immediate feedback (tactical or auditory), error handling and error prevention in a manageable way, reduce cognitive overload, and always provide a home back in case of the user deviate from their path.

In summary, the usability of touchscreen user interface merits further investigation and revamping of existing user interfaces into the demands and expectations of the blind people. Few studies have proposed a usable and accessibility-inclusive user interface; however, the results need further improvement. The results should also consider the improvement in the accessibility, usability, the technical and operational effectiveness of the smartphone user interfaces for blind people. From the findings of literature review in the area of human-computer interaction, usability, accessibility and diversified requirements, we come up with a universal accessibility framework on smartphone user interfaces for blind people.

3. Universal Accessibility Framework (UAF) for blind-friendly user interfaces

We have proposed a universal framework to automatically generate a simplified user interface from the existing mobile application based on user preferences, device history, and context awareness. The logical description of user interface components of existing common mobile applications is extracted through reverse

8https://play.google.com/store/apps/details?id=com.google.android.marvin.talkback&hl=en
9http://en.wikipedia.org/wiki/Mobile_Speak
10http://www.apple.com/accessibility/ios/voiceover/

engineering methodology [40]. The UAF framework is implemented as part of the accessibility services installed on a smartphone device. We have implemented the framework on the Android operating system. The accessibility service first scans and check the availability of mobile applications in the smartphone. We have initially personalized four common applications including Call, Message, WhatsApp and Email applications. However, further applications can be added into the customize application utility. Our UAF accessibility service scans the corresponding Android Application Package (APK) file of the application needs to be personalized for the blind people. The UAF framework analyzes an application user interfaces, activities, and resources used in an application in real time. A mobile application consisting of one or many activities. The activity provides basic user Interface structure of a process or application. The framework also extracts Service, Broadcast Receiver and Content Provider of the application. The Android system loads a resource file automatically once an activity is a call to action. Figure 1 shows the UI decomposition of the Email application.

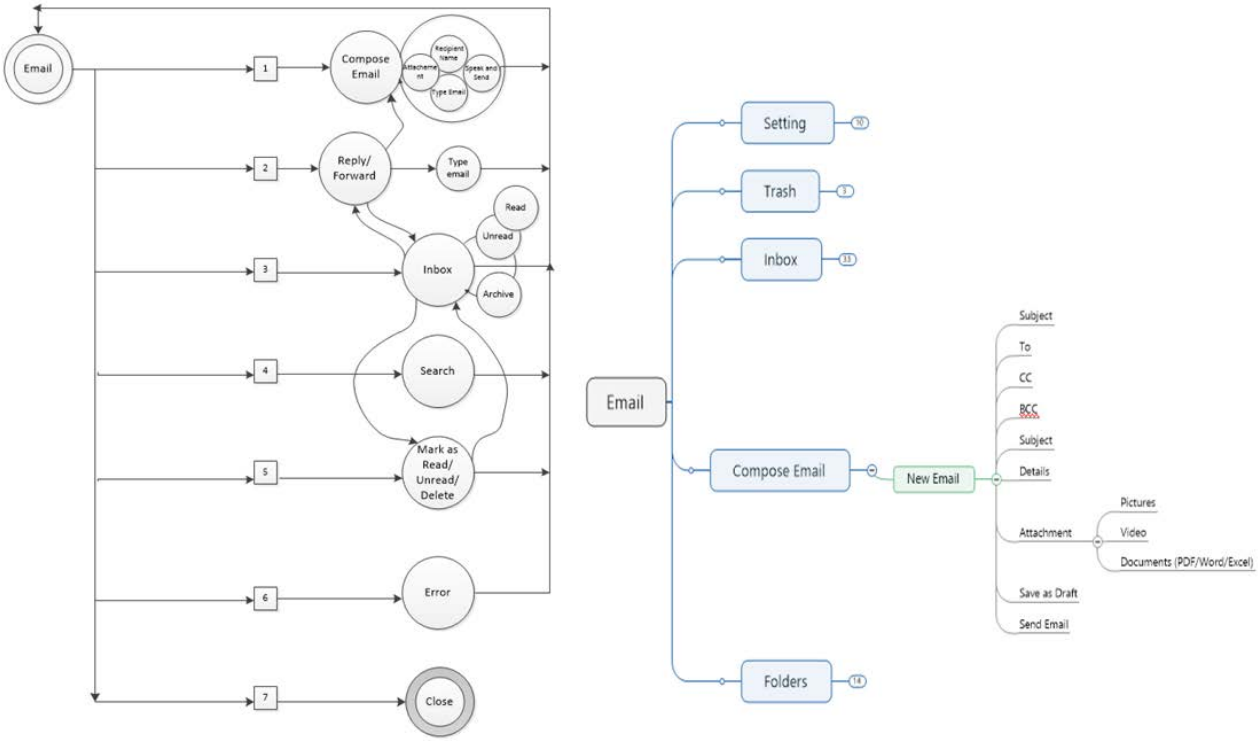

Figure 1: State Transition Diagram and Mind Map of an Email Application

The UAF accessibility service iterates activities in different phases including UI decomposition, analysis of UI and annotation of user preferences, device history and context-aware information on the interface component framework. The UAF framework is illustrated in Figure 2. The UAF used UI parameterization technique in which the elimination, substitution, and realignment of user interface widgets are fine-tuned into a final user interface. The UAF first extract the activities, UI resource, layouts and draw-able form the application. On the user end, the blind people provide preferences about layout partitioning, Input/output preference, interaction type and mode of accessibility feature (haptic, voice). The user requirements are collected through the direct input, device history, and context feature. These features are stored in the UI adaptation ontology for reasoning and further inferencing. The user preference, device capabilities, decomposition of user interface elements are processed in transformation layer of the framework. Through specific adaptation rules, the UAF delivered a simplified user interface on the smartphone. The simplified interface can be enriched with a number of available templates of screen design and screen partitions etc. In addition, context layer consistently annotating context data into the framework and mapped accordingly with the user preference. For instance, specific user applications are be made available to users in specific contexts such as news reading or book reading application can be surfaced to the main grid in the indoor environment and will be moved to the outside grid in case of the outdoor environment.

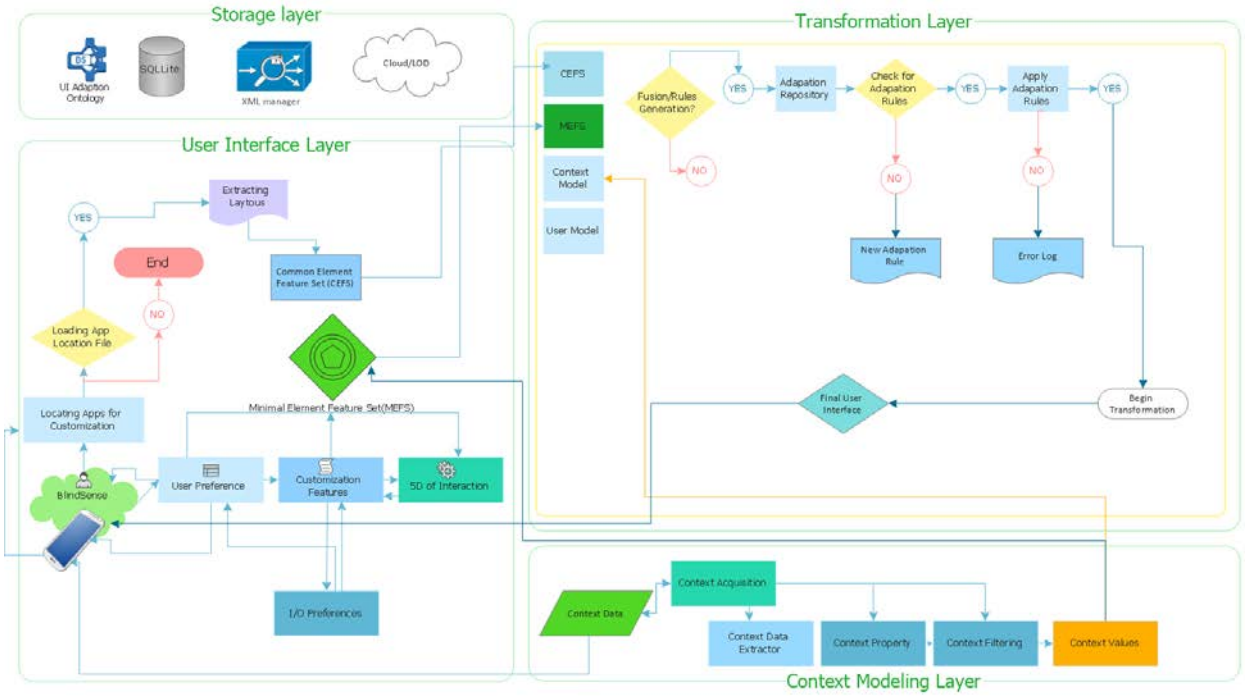

Figure 2 Universal Accessibility Framework for User Interfaces for blind people

4. Methods

The study investigated the user experience of the blind people in the personalization of automatically generated user interfaces from existing mobile application thus providing universal access to blind people in using any mobile app in a standardized and simplified manner. The user experience is the degree of perception of the user interaction with an application, device or an interface[41]. We have collected the responses from the blind people on several parameters of usability and accessibility during the study.

4.1. Participants

A total of 41 blind people participated with an average age of 33.8 years having one year of experience using smartphones. These people were recruited from the National School of Blind, Peshawar- Pakistan. University of Peshawar Institutional Review Board (IRB) has approved the study procedure for the study. Written consent was obtained from the caregiver of the blind people.

4.2. Apparatus and Stimuli

The experimental material includes a smartphone, UAF accessibility service, and 5-point Likert scale questionnaire. The UAF accessibility service was developed in Android 5.1.1 and was the primary stimuli of the entire study. A set of interactive tasks were designed through which the blind people have recorded their experience in operating the smartphone, accessing several features and performing common activities. The experimental stimuli were presented on Android smartphone with a 5.7-inch touchscreen, a maximum resolution of 1440 x 2560 pixels and weight of 171g. Table 1 describes the factor item collected on the Likert scale. These items are collected from related user interface research found in the journal, books, conference proceeding of Human-computer interactions [42-44].

Table 1 Usability of Smartphone Factors Items

Factor	Sub Factors
System Usability Scale	Placement of non-visual item on screen, effect of Vibrotactile and sensitivity of screen in response to user action
Consistency	Information Sequence, Logical order of menu items, Screen sequence, flow of information
Flexibility	Adaptation of new interfaces, layouts, and item of interests
Learnability	Screen exploration, identification of button, links, images and videos, learning curve, Touch clue, gesture shape, edges
User Experience	User attitude, mood, and pleasure

4.3. Procedure

All participant were brief about the purpose and scope of the study. These participants were asked to perform 21 tasks on a smartphone, composing of basic, intermediate and advanced tasks. They were informed to complete the task in particular time so that the efficiency and effectiveness of the tasks can be calculated accordingly. An except of the workflow of tasks are illustrated in Figure 3, 4 and 5 respectively. The facilitators have recorded the response of the participants in 5-point Likert scale questionnaire along with the observation notes taken by the facilitators. The quality metrics are describes in table 2. The experiment was implemented in implemented in ICT Accessibility Center of Department of Computer Science, University of Peshawar. Each participant completed the study in 35 minutes. The trial establishes the basis of how blind people use smartphone using UAF to accomplish specific tasks. The trial collected the quantitative and qualitative information about blind people and user expectation about the system in performing advanced and straightforward tasks. Several usability test techniques are used in the study. The usability method applied is a modification of established usability technique called Think-aloud reflection method [45]. Reflection method is composed of multi-dimensional analysis including short interview, questionnaire, and user observation. The subjective information is collected through a structured survey where responses related task performance, satisfaction, and user experience were articulated in the Likert scale. The verbal comments, emotions, and expression of the user regarding the execution of several tasks are recorded accordingly. A summary of quality metrics and necessary parameters are provided in table 2.

Table 2: Quality measurement metrics

Evaluation Parameter	Metrics	Mechanism
Temporal	Time to accomplish each task	Smartphone built-in watch
Level of Cognitive load	Level of ease of working while performing a task	After identifying the interaction pattern in specific tasks.
Effectiveness	Number of tasks completed	Through Observation
User experience	Level of satisfaction with own performance of each task Level of satisfaction with the time spent for each task	Subjective Evaluation

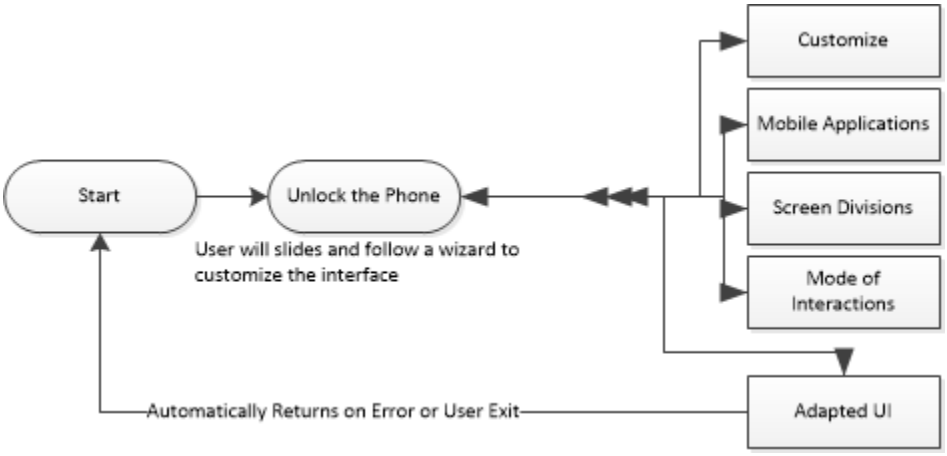

Figure 3 UAF Task Scenario 1

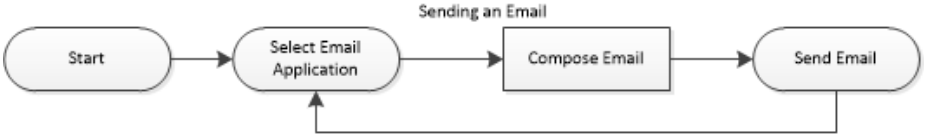

Figure 4 UAF Task Scenario II - Composing Email

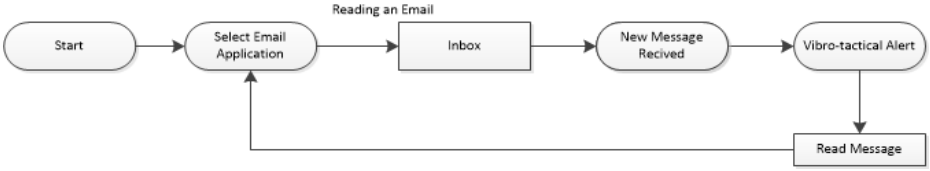

Figure 5 UAF Task Scenario III - Checking Email

The following usability parameters used to assess the effectiveness of the overall study, this includes. **Efficiency** of the user tasks was determined through temporal and mental workload analysis (human-centric ability) [46]. The time requires in completing a particular task completed.

Effectiveness The difficulty faced by the blind people in performing the activities are observed through the observation stage, and a number of queries were asked after completion of the task such as which kind of difficulty you have faced? Either they difficult was related to interface selection, response, or input. **User experience**: The level of satisfaction, performance with time is recorded in performing the individual task. The overall user experience of the blind people in performing the overall activities.

4.4. Data Analysis

We run analyses of statistical correlation to analyze the data using SPSS 21 as a primary statistical tool. Principal component analysis, reliability analysis, independent t-test and variance analysis was performed.

5. Results and Discussion

The section illustrates the finding of the data collected from the blind people on the usage of UAF. The findings were collected after the task interview and observation carried out in the task scenario. This study uses the Cronbach's α reliability coefficient to determine the reliability of the factors and items listed in the responses. The result publicized that the questionnaire item has high reliability (Cronbach's $\alpha = 0.84$) thus demonstrating the five Likert scale is well appropriate for the participants. Besides, the Chi-Square value for Barlett test was (178.17 ($p<0.01$) and Kaiser-Meyer-Olkin value was 0.752 demonstrating efficient factor analysis.

5.1. Factor influencing blind-friend user interface

Principal Component Analysis (PCA) was used to extract and analyze the factors affecting blind-friendly user interfaces on a smartphone for blind people. The factor loading metric was created using Varimax orthogonal

rotation method and number of factors having an Eigenvalue of greater than 1 was determined using Kaiser's rule [47]. The results of factor loading and variation are explained in Table 3.

Table 3 Factor analysis of UAF for blind People

Factor	Item	Factor Loading	Cronbach's Alpha	Cumulative %age	Eigenvalues
System Usability Scale	Placement of non-visual item on screen	0.85	0.82	72.61	1.45
	Effect of Vibrotactile and sensitivity of screen in response to user action	0.89			
Consistency	Information Sequence	0.95	0.90	79.43	3.17
	Logical order of non-visual items	0.81			
	Sequence of information	0.91			
	Flow of user interface components	0.87			
Flexibility	Adaptation of new interfaces	0.84	0.88	82.20	1.64
	Layouts and item of interests	0.58			
Learnability	Screen exploration	0.78	0.80	74.20	1.56
	Identification of button, links, images, and videos	0.60			
	Learning curve	0.77			
	Touch clues	0.82			
	Gesture shapes and recognition	0.82			
	Edges detection	0.88			
User Experience	User attitude	0.89	0.92	86.60	2.59
	User mood	0.97			
	User pleasure	0.92			

The previous studies have illustrated that an explicit interface is an essential and critical feature in Human-Computer Interaction[48]. Thus, this critical factor is considered in the usability paradigm of smartphone user interfaces. The first factor influencing the universal accessibility framework for blind people is the System Scale Usability (SUS)[49]. This includes the usability of the system in response the usability and accessibility of the framework. The SUS is a reliable usability scale for global benchmarking of any system's usability to determine the level of the user experience of a particular application or service. This includes placement of the non-visual item on the screen, the effect of Vibrotactile and sensitivity of display in response to user action, level of complexity, inconsistencies, and confidence in the system. Perceiving and identifying the object of interest on smartphone user interfaces is a challenge for blind people because the screen surface does not carry any tactical or physical touching. Therefore, the blind people perceive the object nearby on the screen through haptic feedback or touch perception and establish a pattern of the surrounding non-visual item on the screen [50]. To determine the reliability of the SUS questionnaire, we have used the Cronbach's Alpha. The Cronbach's Alpha coefficient for SUS factor achieved 0.82 score which is acceptably good score whereas the score higher than 0.80 represents good internal consistency among the co-related items. The results showed that all users have found the system usable and easy to use by performing several tasks of interacting with application UIs.

The second factor is the consistency, which provides a unified access to the smartphone UI components. This includes the sequence of information presented on the screen, logical order of non-visual item on the screen, sequence of information spread over the screen, flow of user interface components in the form or text-entry forms. Blind people receive less information as compare to sighted people. Thus, a highly consistent and productive user interface layout should be presented to the blind people to follow the right sequence of commands. During the experiments, the participants have reported that the consistency in the ongoing screen of an application helps them in memorization of the commands without exploring the entire screen repeatedly.

The third factor that influences the accessibility of smartphone interfaces is a UI flexibility. The user interface flexibility is the degree to which the user interface is adaptable to the requirements of the blind people. The user can customize their user experience irrespective of their impairment, technical abilities, and capabilities. [51]. This factor includes an adaptation of new user interface, layouts, an item of interest, user interface component and templates for re-arranging and organization of smartphone user interfaces based on the user requirements, device capabilities and context-sensitivity.

The fourth factor is the learnability which entrails screen exploration, identification of buttons, links, the effect of prospecting on the learning curve, touch clue, gesture shape and size and edge detection. Blind people through their finger positioning on smartphone interface can recognize with form or the object. Thus the screen partition and screen division in flexible portion help him in quick identification and learning of interface dynamics. In the study, the participants reported the difficulty in accessing/selecting/picking the region and suggested that if a haptic feedback will inevitably reduce the chances of wrong touches. For example, if a blind people click on the screen item they item should speak out the name of the function such as Home button or Compose New Email, Next or Previous, etc.

The last factor is user experience entrails information about user attitude, user mood and user pleasure/displeasure over using our accessibility service. The user experience includes all those factors which directly or indirectly affect the user interaction with an application or system [52]. In our experiment, the participants have felt a pleasured experience in performing common activities on a smartphone using UAF.

Table 4 Items wise ranking (descriptive statistics)

Item	N	Mean	Std. Deviation
User attitude	41	2.59	1.04
User mood	41	2.29	1.07
User pleasure	41	2.29	0.90
Placement of non-visual item on screen	41	2.76	0.79
Effect of Vibrotactile and sensitivity of screen in response to user action	41	2.76	0.79
Information Sequence	41	2.63	0.73
Logical order of menu items	41	2.95	0.83
Sequence of information	41	2.93	0.87
Flow of information	41	2.71	0.75
Adaptation of new interfaces	41	2.85	0.85
Layouts and item of interests	41	2.83	0.86
Screen exploration	41	2.93	0.87
Identification of button, links, images, and videos	41	2.93	0.81
Learning curve	41	2.71	1.00
Touch clue	41	3.20	0.90
Gesture shape	41	2.51	1.00
Edges Detection	41	2.80	1.00

In addition, the importance of these factor items has evidenced from the descriptive statistics reported in table 4. Blind people considered user attitude, mood and pleasure most critical item in influencing their interaction with smartphone applications. Besides, placement of non-visual item, the effect of Vibrotactile and sensitive of user action, and information sequence has considered a second level of priority. The gesture shape and touch clues have given a less essential score. This is mainly due to an inbuilt feature of screen division covered cater

the needs for gesture shape and touch clues. Smartphone provides an interaction paradigm for blind people in performing common activities. However, the non-tactical and smooth surface contributes some issues in identifying, selecting and responding to non-visual items on the screen [53]. The physical tracking behavior of smartphone interface such as feeling bumps to identify the regions and edges of the screen. However, the accessible interface should provide more clues, touch perceptions and haptic response to perform several activities on a smartphone effectively. The study presents a universal accessibility framework for blind people enabling them to access and operate mobile application efficiently, with greater control and improved user experience. We have identified from the study that the accessibility demands are more concerned about the place and location of a non-visual item on the screen rather exploring the entire screen item one by one through direct exploration.

All participates have experience smartphone user interfaces on the Android operating system. The user has performed 121 tasks in specific order. The tasks were having basic to advance level of difficulty. Besides, they have also experienced the operating of these task on using one hand and two hand exploration techniques. Blind people have indicated that the home button in the middle of the screen is very useful in going back to the main screen or knowing about the current name of the screen. Also, it assists in finding out the exact location in a provided navigational path. However, it is not ideally possible to perform all activities without wrong selection, wrong touches and making errors. Even such erroneous touches are common for all smartphone users. We have incorporated the user disability, and impairment features into the design ensure accessibility-inclusive design for blind people based on their preferences.

Conclusion and Future Work

In this study, the proposed accessibility-inclusive framework is validated the user experience of bind people in using universal accessibility interactions. The study investigates the benefits of adaptive user interfaces for blind people in performing several daily life tasks. Currently, blind people are facing issues in interacting with a diversified mobile application having multiple layouts, interfaces, and interactions paradigms. Our results are consistent with earlier studies on improving the user experience of people with visual impairment [38, 54, 55]. Thus to improve the accessibility-inclusive interface, the interface should provide positioning layers supported by haptic feedback layers. The finding of the result can be applied to facilitate in developing adaptive user interface promoting user interface flexibility. The major contribution of this work lies on the improvement in the user experience, and satisfaction of blind people in performing common applications such as call, SMS, email, massagers, calendars, etc. a number of tasks were performed by blind people and these responses were recorded in the questioner and interview session. The statistical results relived that the internal reliability of item reflects acceptable scores. The Future research work should include the optimization of user interface adaptation, integration of wearable user interface, and interactive adaptation of cross devices corporation.

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Testing the validity of the export-led growth hypothesis in Nigeria: Evidence from non-oil and oil exports

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Abstract

Nigeria is a developing economy and leading oil exporter in Africa. This study tests for the validity of the export-led growth hypothesis in Nigeria between 1981 and 2014 by disaggregating export trade into non-oil export and oil export trade. It examines the causal effect of non-oil export, oil export and import trade on economic growth. The Toda-Yamamoto augmented Granger non-causality test reveals that there is unidirectional causality from non-oil export, oil export and import trade to economic growth, thus implying that Nigeria is non-oil export-led, oil export-led and import-led. Also, it shows that non-oil export trade leads economic growth more than oil export trade. On the whole, the study finds evidence to validate the export-led growth hypothesis in Nigeria.

Keywords: *export-led growth hypothesis, export, non-oil export, oil export, Granger non-causality*

JEL Codes: F1, F14

1. Introduction

Export is a source of foreign exchange earning which increases the rate of capital formation in an economy. It helps to alleviate balance of payment deficits and generates employment opportunities. Feder (1982) argues that export may influence total factor productivity through its externalities on the rest of the economy. A country's international competitiveness and relevance is heavily dependent on its export. The endogenous growth theory postulates that export promotes economic growth by allowing an increase in technological innovation and 'learning by doing'. The relationship between export and growth is often linked to the possible positive externalities for the domestic economy as a result of participation in the global market (Medina-Smith, 2000).

The export-led growth hypothesis (ELGH) postulates that export is a crucial determinant of economic growth and that causality runs from export to economic growth. The proponents of the ELGH are the neo-classical economists. They are of the view that export expansion would drive growth. Awokuse (2003) states that export expansion can be an indirect catalyst of growth in an economy through efficient allocation of resources, greater capacity utilisation, exploitation of economies of scale, and stimulation of technological improvement as a result of competition in the world market.

Policy makers and academic believe that export is a key factor in promoting economic growth in developing economies (Dreger & Herzer, 2011). Sannasse, Seetanah and Jugessur (2014) observe that countries with low levels of economic development gain less from exports as a driver of economic growth. Nigeria is a developing economy and an active player in the world market through its oil exports. Prior to the discovery of oil in Nigeria, agricultural products were the major export commodities of the country. The period of oil boom in the 1970s caused a neglect of agricultural exports and oil became the main export commodity. In 1986, Nigeria adopted the International Monetary Fund (IMF) Structural Adjustment Programme (SAP). The SAP recommended the outward-oriented trade (export expansion) strategy as a means to promote economic growth in developing countries. However, over the last three decades, oil export annually accounts for more than 90% of total export in Nigeria. It is against this statistical observation that this study separately determines the causal effect of non-oil export and oil export on economic growth and in attempt to provide evidence to validate the ELGH in Nigeria.

In testing for causal effect of non-oil and oil exports, import would be included. Studies like Riezman, Summers and Whiteman (1996), Thangavelu and Gulasekaran (2004) among others have shown that inclusion of import is important because failure to control while testing the ELGH may produce misleading outcome. The

exclusion of import creates the problem of omitted variable bias because significant export growth is usually associated with rapid import growth (Awokuse, 2008; Mishra, Sharma & Smyth, 2010). Nigeria is a leading oil exporter in Africa and heavily relies on proceeds from oil exports. The decline in global oil prices coupled with the fall in crude oil production as a result of militancy activities in the Niger Delta region led to a shortfall in oil revenue and this subsequently led to retrogression in economic performance. Therefore, it is imperative to examine whether oil exports drive economic growth more than non-oil exports in Nigeria.

An augmented Granger causality test proposed by Toda and Yamamoto (1995) has been widely used to test for the export-led growth hypothesis, however, its application is new to Nigeria. The Toda-Yamamoto Granger causality testing approach works in Vector Autoregressive (VAR) system. Toda and Yamamoto (1995) note that the method is inefficient and suffers some loss of power due to intentionally over-fitting the VAR model, but the relative inefficiency is dependent on the VAR model. However, Toda-Yamamoto approach's is better than the traditional Granger causality tests because it produces valid estimates irrespective of the order of integration of the series and cointegration (Wolde-Rufael, 2005). The results from the Toda-Yamamoto Granger causality test showed that non-oil export trade drives the Nigerian economic growth more than oil export trade. Overall, it showed that the export-led hypothesis is valid for Nigeria. The outcome of this study informs the government that export promotion strategy should be adopted with more emphasis on non-oil exports. The rest of the paper is sectioned as follows. Section 2 provides the literature review and Section 3 discusses the data issues and preliminary analyses. Section 4 and Section 5 present the estimation and conclusion respectively.

2. Literature Review

The export-led growth hypothesis argues that a unidirectional causality moves from exports to economic growth with no feedback. The direct opposite of the export-led growth hypothesis is the growth-led export hypothesis which argues that economic growth drives exports. Contrary to these hypotheses is the feedback effect hypothesis which states that exports and economic growth cause each other.

Evidence supporting the export-led growth hypothesis: Tang, Lai and Ozturk (2015), employing the Toda-Yamamoto Granger causality approach with a rolling window analysis, showed that the export-led growth is valid for the Four Little Dragon countries (Hong Kong, South Korea, Singapore and Taiwan), but not stable over time. Employing the Vector Error Correction Model (VECM) Granger causality test, Tsegaye (2015) showed that no feedback effect occurred in the unidirectional causal link moving from exports to economic growth in South Korea. Gossel and Biekpe (2014) used the Toda-Yamamoto Granger causality testing procedure to show that growth is export-led in South Africa after liberalisation.

Azeez, Dada and Aluko (2014) discovered that exports predict economic growth in Nigeria using the Ordinary Least Squares (OLS) regression analysis. The VECM estimated by Shahbaz (2012) revealed that there is a long-run unidirectional causality from exports to economic growth in Pakistan. Hye and Siddiqui (2011) discovered that exports drive economic growth in Pakistan using the Autoregressive Distributed Lag (ARDL) modelling approach and rolling window regression method.

Ozturk and Acaravci (2010) utilised the Toda-Yamamoto Granger causality test to show a unidirectional causal flow from exports to economic growth in Turkey. In a sample consisting of Argentina, Colombia and Peru, Awokuse (2008), based on the VECM Granger causality test, found evidence to validate the export-led growth for Peru. Utilising the VECM Granger causality test, Narayan, Narayan, Prasad and Prasad (2007) showed that the export-led growth hypothesis is valid for Fiji in the long-run but upheld for Papua New Guinea in the short-run.

Parida and Sahoo (2007) showed evidence to uphold the export-led growth hypothesis in four South Asian countries using the Pedroni panel cointegration method. Using Luktkepohl and Wolters weak exogeneity test, Herzer, Nowak-Lehman and Siliverstovs (2006) found that manufactured exports cause economic growth in Chile. Love and Chandra (2005) applied the VECM Granger causality test and found that only India, Maldives and Nepal is export-led in the South Asian region.

Abual-Foul (2004) revealed one-way causality from exports to output in Jordan employing three bivariate models namely VAR in levels, VAR in first differences, and Error Correction Model (ECM). Awokuse (2003), in a study on Canada, found that exports lead economic growth using the VECM and Toda-Yamamoto Granger

causality tests. Following the Toda-Yamamoto Granger causality test procedure, Hatemi-J and Irandoust (2000) showed a unidirectional causal link moving from exports to economic growth exists in Ireland and Portugal.

Evidence against the export-led growth hypothesis: Balcilar and Ozdemir (2013), employing the Toda-Yamamoto Granger causality test based on bootstrapping, found evidence of feedback effect between exports and output in Japan. Alimi and Muse (2012) revealed a unidirectional causality running from economic growth to exports in Nigeria using the VAR Granger causality/exogeneity wald tests. Husein (2010) provided strong evidence of bidirectional causal relation between exports and economic growth in the MENA region using the VECM Granger causality test.

In a panel of Pacific island countries (Fiji, Papua New Guinea, Solomon Islands, Tonga, and Vanuatu), Mishra, Sharma and Smyth (2010) showed that the causality between exports and economic growth is bidirectional using the panel Granger causality test. Awokuse (2006) found bidirectional causal relationship between exports and economic growth in Japan with the aid of the Toda-Yamamoto Granger causality test and directed acyclic graphs. Awokuse (2005), applying VECM and Toda-Yamamoto Granger causality tests, showed that there is a two-way causality between exports and Korean economic growth.

Al Mamun and Nath (2005) showed that economic growth predicts exports in Bangladesh employing Granger causality test based on ECM. Panas and Vamvoukas (2002) utilised the VECM Granger causality test and found that economic growth drives exports in Greece. Based on VECM Granger causality test, Dhawan and Biswal (1999) found that causality flows from economic growth to exports in India in the short and long-run but causality runs from exports to economic growth in the short-run.

Shan and Sun (1998a) employed the Toda-Yamamoto Granger causality testing approach and revealed that exports is growth-driven in Australia. Biswal and Dhawan (1998) showed that bidirectional causality is evident between exports and economic growth in Taiwan using the ECM based Granger causality test. Utilising the Toda-Yamamoto Granger causality test, Shan and Sun (1998b) also found bidirectional causality between exports and economic growth in China.

3. Data Issues and Preliminary Analyses

This study tests for the export-led growth hypothesis by examining the causality between economic growth and export (oil and non-oil) in Nigeria between 1981 and 2014. Economic growth is measured with gross domestic product (GDP) at constant basic prices usually known as Real GDP (RGDP). Annual time series data on real GDP, non-oil export value (NOILEXP), oil export value (OILEXP) and all import value (IMP) were sourced from the 2014 Annual Issue of the Central Bank of Nigeria (CBN) *Statistical Bulletin.* The preliminary analyses consist of descriptive statistics, graphical representations, unit root test and co-integration test. The logarithm form of the series was used, thus RGDP, NOILEXP, OILEXP and IMP are presented as LRGDP, LNOILEXP, LOILEXP and LIMP respectively in the analysis.

Table 1: Descriptive Statistics

Statistic	LRGDP	LNOILEXP	LOILEXP	LIMP
Mean	6.042885	2.990760	6.330676	5.969070
Maximum	6.923209	7.030124	9.569633	9.305274
Minimum	5.426051	-1.593565	1.974248	1.789022
Skewness	0.4539876	-0.118817	-0.382172	-0.335386
Kurtosis	2.085069	1.897116	1.732192	1.701286
Jarque-Bera (p-value)	0.308239	0.405926	0.211749	0.220156
Observations	34	34	34	34

Source: Author's Computation

From Table 1, LRGDP has a positively skewed distribution while LNOILEXP, LOILEXP and LIMP have a negatively skewed distribution. The Kurtosis statistics indicates that all the series have a platykurtic (thin and low-peaked) distribution. The Jarque-Bera statistics indicates that the null hypothesis of normal distribution is accepted for all the series.

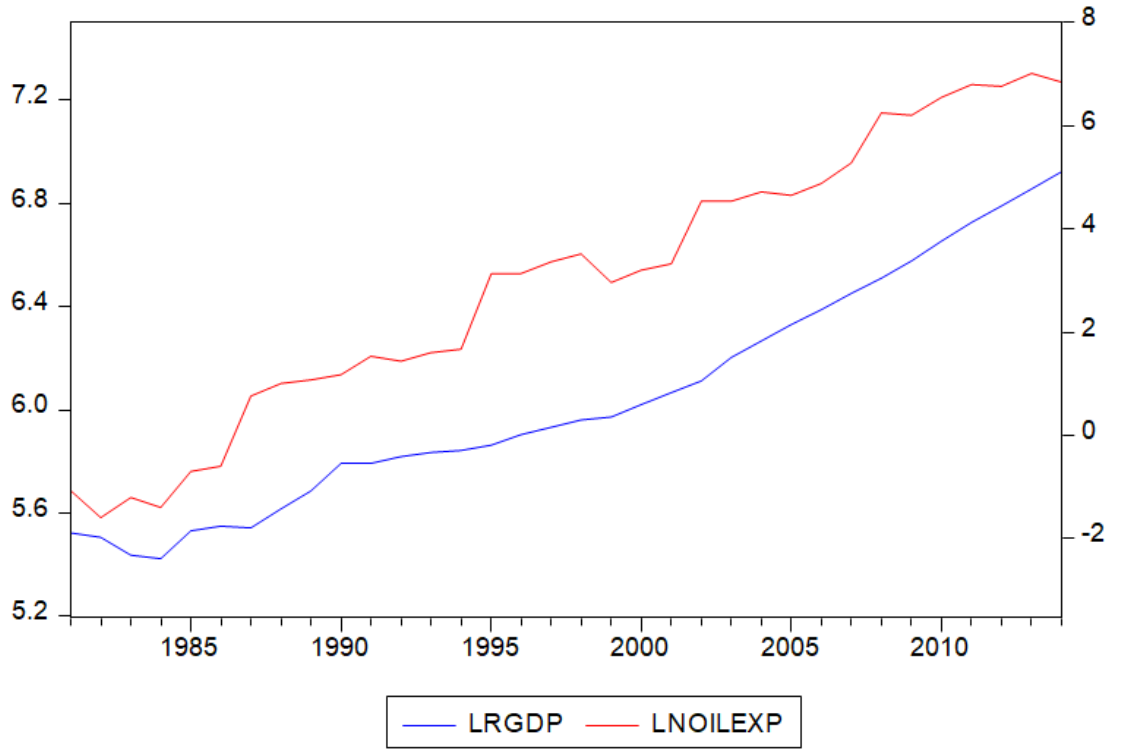

Fig. 1: Combined Graph of LRGDP and LNOILEXP

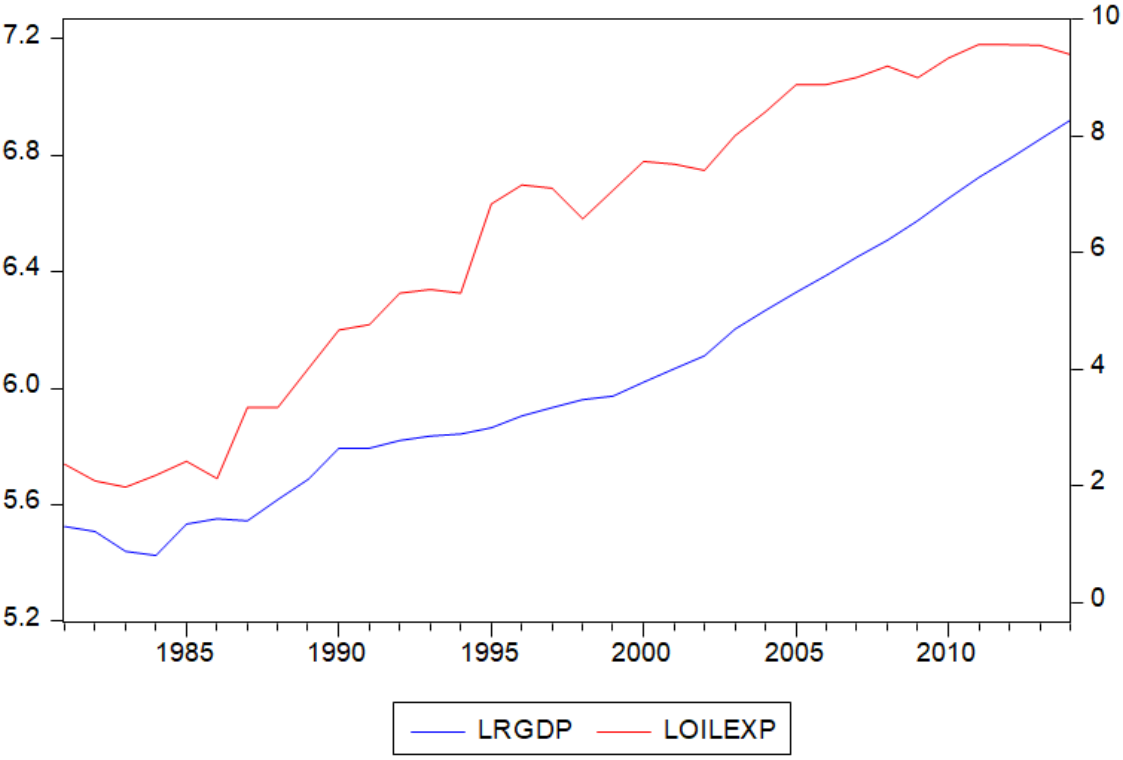

Fig. 2: Combined Graph of LRGDP and LOILEXP

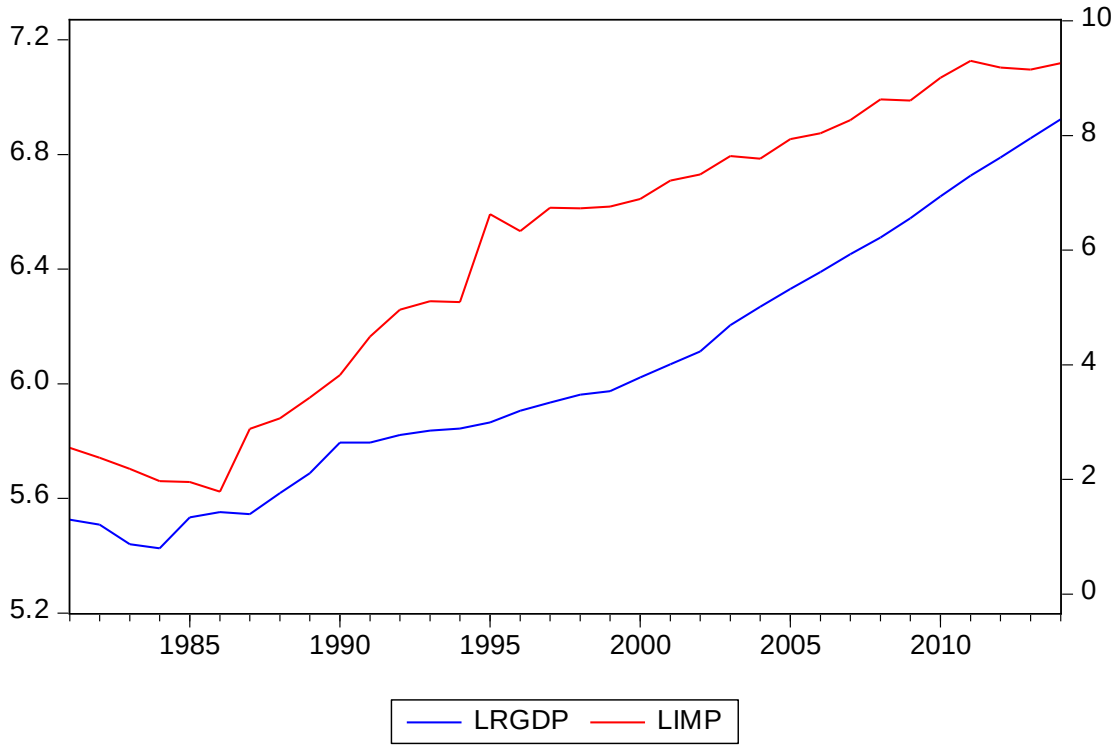

Fig. 3: Combined Graph of LRGDP and LIMP

Fig. 1 shows that LRGDP and LNOILEXP move in the same direction and Fig. 2 shows that LRGDP and LOILEXP also move in the same direction. Also, Fig. 3 shows that LRGDP and LIMP move in similar direction.

Unit Root Test

The Ng-Perron (NP) modified unit root test and Augmented Dickey Fuller (ADF) breakpoint unit root test were employed to check for the presence of unit root in the series and to determine the order of integration – I(*d*) in the absence or presence of structural break in the series respectively. The NP unit root test consists of MZa, MZt, MSB and MPT statistics but this study utilises only MZa and MZt. The ADF breakpoint unit root test was performed in an Innovative Outlier (IO) model. The null hypothesis for the test is that the series has a unit root. Table 2 presents the summary results of the unit root tests on the series and the order of integration.

Table 2: Unit Root Test Results

Ng-Perron Test			
Series	**MZa statistic**	**MZt statistic**	**I(*d*)**
LRGDP	-15.1920***[b]	-2.75106***[b]	I(1)
LNOILEXP	-167.748*[b]	-9.14507*[b]	I(0)
LOILEXP	-15.6325*[a]	-2.78835*[a]	I(1)
LIMP	-15.7769*[a]	-2.80828*[a]	I(1)
ADF Breakpoint Test			
Series	**ADF statistic**	**Break Date**	**I(*d*)**
LRGDP	-7.287193‡[b]	1990	I(1)
LNOILEXP	-5.336499‡[b]	1989	I(0)
LOILEXP	-4.931804†[b]	1994	I(0)
LIMP	-4.997209•[b]	1998	I(0)

* and *** denote 1% and 10% asymptotic critical value respectively and [a] and [b] indicates intercept only and intercept and trend in test equation, respectively. Also, ‡,† and • denotes p-value less than 1%, 5%, and 10% respectively.

Source: Author's Computation

The results in Table 2 show that LRGDP, LOILEXP and LIMP are non-stationary series while LNOILEXP is a stationary series. Therefore, there is a mix of I(0) and I(1), thus indicating that the series are integrated in different order.

4. Estimation

The augmented Granger non-causality test developed by Toda and Yamamoto (1995) was utilised. The existence of co-integration and stationarity of series are not pre-requisites for the test. However, utilising the Toda-Yamamoto (T-Y) test, the maximum order of integration (d_{max}) is required, hence the need to perform unit root test on the series. From the unit root test, d_{max} is 1. The test is performed in a Vector Autoregressive (VAR) framework which treats all variables as endogenous. The T-Y VAR models for this study are stated as follows:

$$LRGDP_t = \omega + \sum_{j=1}^{k} \beta\, LRGDP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LRGDP_{t-p} + \sum_{j=1}^{k} \rho\, LNOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, LNOIL_{t-p} + \sum_{j=1}^{k} \partial\, LOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LOIL_{t-p} + \sum_{j=1}^{k} \emptyset\, LIMP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, LIMP_{t-p} + \varepsilon_t \quad \ldots.(1)$$

$$LNOIL_t = \omega + \sum_{j=1}^{k} \rho\, LNOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, LNOIL_{t-p} + \sum_{j=1}^{k} \beta\, LRGDP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LRGDP_{t-p} + \sum_{j=1}^{k} \partial\, LOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LOIL_{t-p} + \sum_{j=1}^{k} \emptyset\, LIMP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, LIMP_{t-p} + \varepsilon_t \quad \ldots.(2)$$

$$LOIL_t = \omega + \sum_{j=1}^{k} \partial\, LOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LOIL_{t-p} + \sum_{j=1}^{k} \rho\, LNOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, LNOIL_{t-p} + \sum_{j=1}^{k} \beta\, LRGDP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LRGDP_{t-p} + \sum_{j=1}^{k} \emptyset\, LIMP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, LIMP_{t-p} + \varepsilon_t \quad \ldots.(3)$$

$$LIMP_t = \omega + \sum_{j=1}^{k} \emptyset\, LIMP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \theta\, LIMP_{t-p} + \sum_{j=1}^{k} \partial\, LOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LOIL_{t-p} + \sum_{j=1}^{k} \rho\, LNOIL_{t-j} + \sum_{p=k+1}^{k+d_{max}} \sigma\, LNOIL_{t-p} + \sum_{j=1}^{k} \beta\, LRGDP_{t-j} + \sum_{p=k+1}^{k+d_{max}} \alpha\, LRGDP_{t-p} + \varepsilon_t \quad \ldots.(4)$$

An optimal lag length (k) of 1 was chosen for the VAR model based on the sequential modified LR test, Final Prediction Error (FPE), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ). Table 3 reports the VAR optimal lag length selection by the different criteria.

Table 3: VAR Optimal Lag Length Selection Result

Lag	LR	FPE	AIC	SC	HQ
0	NA	0.001127	4.563003	4.749829	4.622770
1	200.2998*	1.10e-06*	-2.382322	-1.448190*	-2.083485*
2	12.85635	1.84e-06	-1.927862	-0.246425	-1.389956
3	25.89504	1.38e-06	-2.384433*	0.044309	-1.607457
4	7.886983	3.15e-06	-1.924457	1.251590	-0.908412

* denotes lag order selected by each criterion at 5% significance level.

Source: Author's Computation

The validity of the lag length of 1 is further validated by the VAR residual serial correlation test. The test accepts the null hypothesis of no serial correlation at lag 1. Table 4 presents the result of the serial correlation test.

Table 4: VAR Residual Serial Correlation Test Result

Lag	LM statistic	p-value
1	22.37872	0.131
2	22.20307	0.137
3	14.08642	0.592
4	18.99582	0.269

Source: Author's Computation

The null hypothesis for the T-Y Granger non-causality test is that there is no causality. The T-Y test uses $k + d_{max}$ as its optimal length; hence the optimal lag length for the T-Y VAR models is 2. Table 5 reports the result of the T-Y Granger non-causality test based on a modified Wald (MWALD) statistic.

Table 5: T-Y Granger non-Causality Test Result

Dependent Variable	Independent Variables				All
	LRGDP	LNOILEXP	LOILEXP	LIMP	
LRGDP	DV	{6.017959} [0.0142]**	{2.702048} [0.100]***	{3.296863} [0.069]***	{9.098757} [0.028]**
LNOILEXP	{0.016435} [0.898]	DV	{0.418344} [0.518]	{0.160905} [0.688]	{0.59361} [0.898]
LOILEXP	{0.933209} [0.334]	{0.611588} [0.434]	DV	{0.099197} [0.753]	{1.387694} [0.708]
LIMP	{0.988182} [0.3202]	{0.195765} [0.658]	{0.679249} [0.410]	DV	{1.242301} [0.743]

** and *** denote rejection of null hypothesis at 5% and 10% significance level respectively. DV indicates Dependent Variable, MWALD statistic in { } and p-value in [ ].

Source: Author's Computation

The result of the T-Y Granger non-causality test reveals that there is unidirectional causality from LNOILEXP, LOILEXP and LIMP to LRGDP and no reverse causality from LRGDP to LNOILEXP, LOILEXP and LIMP in Nigeria. This suggests that non-oil export, oil export and import trade drive economic growth with no feedback effect from Nigerian economic growth. It also shows that there is absence of causality between LNOILEXP and LOILEXP. This implies that non-oil and oil export trade do not predict each other. Furthermore, LNOILEXP and LOILEXP do not have causal effect on LIMP and *vice versa*. This indicates that non-oil export and oil export trade do not cause import trade and are not led by import trade. Overall, the result from the Granger causality test suggests that the export-led growth hypothesis can be upheld for Nigeria and this is in tandem with evidence from other developing countries such as Tsegaye (2015) for South Korea, Shahbaz (2012) for Pakistan, and Ozturk and Acaravci (2010) for Turkey among others. However, in an attempt to use ARDL as a result of different order of integration of series in line with condition for estimating T-Y, it only considers a univariate form of estimation without taking into consideration the nature of the relationship of the series under consideration.

5. Conclusion

This study tested the validity of the export-led growth hypothesis in Nigeria by determining the causal effect of non-oil export, oil export and import on the economic growth of the country. It finds that there is a long-run relationship among economic growth, non-oil export, oil export and import. Also, it observes that economic growth is led by non-oil export, oil export and import trade. It was further revealed that economic growth does not lead non-oil export, oil export and import trade. This study discovered that non-oil export trade is more relevant to the growth of Nigeria than oil export trade. Overall, there is strong evidence to support the export-led growth hypothesis in Nigeria. The policy implication of this study is that government should intensify efforts to

increase the country's export by adopting the export promotion strategy. There is also need for the government to prioritise the non-oil sectors, especially the agricultural sector which tends to be the viable source for the country to generate foreign revenue as it was the mainstay of the economy before the discovery of oil.

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