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Articles

The amelioration of teachers' subject and pedagogical content knowledge in mathematics

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Abstract

This article reports the efficacy of the *Multidimensional Content-Based Mathematics Professional Development Project*. This protocol is characterized as an intensive professional development program delivered during a two-week all day summer session plus six all day Saturday sessions during the succeeding fall semester. All activities were endorsed by state and national standards as well as documented by evidence-based practice to advance student achievement. Project participants were a cohort of 28 mathematics teachers randomly selected from middle and high schools identified as low-performing. Results on a pre/post examination indicated over a 27% improvement in mathematics and pedagogical knowledge.

Key Words: Mathematics Education, Pedagogy, Professional Development

Introduction

A major educational concern for middle and high schools is the amelioration of teachers' subject and pedagogical content knowledge in mathematics (Ball, Hill, & Bass, 2005). A review of the research literature documents that many teachers lack a fundamental understanding of mathematics which leads to inferior instruction (Hill & Lubienski, 2007). Compounding the issue is the ineffectiveness of past reform movements aimed at improving teachers' mathematical concepts and instruction skills (Schilling & Hill, 2007).

In an effort to enhance the teachers' learning and teaching of mathematics, some regional postsecondary institutions form partnerships and deliver professional development programs. One such professional development program is the *Multidimensional Content-Based Mathematics Professional Development Project.* The activities of this program are devised to advance conceptual understanding and critical thinking in mathematics education for both new and veteran teachers. This program delivers in-depth learning on specific math content as well as effective research-based teaching strategies and assessment techniques (Marzano, Pickering, & Pollock, 2001).

While current research supports the overall successes of these partnership programs in general (Ball, Thames, & Phelps, 2008), the purpose of this study was to investigate specifically the efficacy of the pedagogical and mathematics content knowledge of participants in the *Multidimensional Content-Based Mathematics Professional Development Program.*

Method

Participants and Procedure

The cohort of 28 mathematics teachers was randomly selected from middle and high schools identified as low-performing. The teacher-participants enrolled in a six-hour graduate course scheduled all day for two-weeks in the summer and concluded with six all day Saturday sessions the following fall semester. The morning sessions focused on mathematics content while the afternoon sessions addressed pedagogical content. All activities were endorsed by national standards (NCTM, 2000) as well as documented by evidence-based practice to advance student achievement (Marzano, Norford, Paynter, Pickering, Pollock, & Gaddy, 2001) Such activities included (a) cooperative learning groups, (b) concept maps, and (c) inquiry-based hands-on activities. The participant first observed the activity from the program mentor then performed the activity to the cohort allowing for meaningful dialogue concerning the strategies and how to effectively implement them in their classrooms. Participants were also assigned to develop a number of individual projects as required for graduate credit. For example, a literature search was assigned to review two current research articles on any topic within the domain of mathematics teaching and then present a synopsis to the cohort.

The second project involved evaluating the legitimacy of Websites for mathematics teaching. The participants created a rubric to assess such criteria as (a) type of domain, (b) author's credentials, (c) well-documented sources, and (d) how others critiqued the page (Barker, 2004). This evaluation of the websites led to the identification of ten useful, reliable sites which were then summarized and presented to the cohort. These websites provided a solid resource in developing their lesson plan project.

The literature research activities and the website evaluations provided the foundations for the lesson plan project. The lesson plan project required participants to select and develop a five-day mathematics unit of their choice that incorporated research-based strategies and addressed appropriate state and national mathematics standards. The fourth and final required project was the development of a performance-based assessment that included an appropriate rubric to assess the five-day lesson plan objectives.

Instrumentation

A 20 item examination was developed to assess the participants' (a) knowledge of reform-based instructional strategies (concept mapping, cooperative learning, problem solving), (b) performance-based assessment, and (c) ability to identify the Standards by activity. Possible scores ranged from 0 to 100. Assessments were recorded at baseline and at post intervention.

Statistical Analyses

Statistical tests for this study included, a one-way repeated measure of analysis of variance (ANOVA), polynomial regression, and Welch's t-test. Alpha was set at $p < 0.05$.

Results

Results of the repeated measure ANOVA indicated a statistically significant increase in mathematical and pedagogical knowledge, $F(1, 27) = 139.98$, p < .001, $\eta^2 = 0.84$, an extremely large effect. The means and standard deviations for the pre and posttest scores are presented in Table 1. A polynomial regression analysis was conducted to determine the relationship between pre and post scores with results detecting a quadratic relationship. In other words, greater gains appeared to occur with those who had lower pre scores, while smaller gains were observed for those with higher pre-scores. Table 2 displays the linear and quadratic relationships between pre and post scores. To test the hypothesis that those participants who initially scored at lower levels would demonstrate statistically significantly greater gains than those participants who initially scored at higher levels, the sample was dichotomized. Those participants scoring less than 80% were coded as "1" while those students scoring 80% or greater were coded as "2". This 80% benchmark was adopted from the postsecondary institution's grading policy. Results of the *Welch's t* test (assuming unequal variances) supported the hypothesis that lower-scoring participants increasing at a greater rate, $t(25.99) = 5.18$, p < .001, $\eta^2 = 0.29$, a large effect than higher-scoring participants. The means and standard deviations of the increase scores for the two groups are presented in Table 3.

Conclusion

The results strongly support the efficacy of this reform-based mathematics education professional development program. Not only did the results of the post-test indicate overall knowledge gains by the participants, but the participants who scored the lowest on the pre-test actually "caught up" with their peers who scored higher on the pre-test. Thus, at the completion of the intervention, the majority of the participants were at approximately the same level of understanding of reform-based mathematical instructional strategies regardless of their knowledge prior to the course. These results provide evidence of the effectiveness of the daily structure of this professional development initiative. The results of this study add to existing findings in which this structure has been shown to facilitate positive results in attempts to improve teacher education (Rosenstein & DeBellis, 1997). Moreover, this professional development

program can be considered "effective" in that it was characterized by a focus on content, a strong connection to practice, active learners and its duration went beyond the summer experience by providing classroom support to the participants during the following school year (Heck, Banilower, Weiss & Rosenberg, 2008).

The success of the program has been well documented through the pre- and post-test of pedagogical content knowledge, as well as through observations of the participants by the project staff during implementation of project content. Additionally, when asked about the impact of this program during follow-up visits to participants' classrooms, the participants had very positive comments. One middle school teacher participant said, "The program helped me to vary my instructional strategies....and helps to increase content knowledge and improve instructional practices. I have learned to adapt activities into more student-centered activities. " Another middle school teacher participant reported that "professionally I have learned to reflect on my teaching practices. I now provide more problem solving experiences and alternative assessments. I have made professional friendships with other math teachers. Networking was great!"

The success of the *Multidimensional Content-Based Mathematics Professional Development Project* indicates that teachers learn and implement standards-based instructional strategies regardless of their previous experiences when professional development experiences are meaningful and relevant to teachers' current classroom needs. The results of this study provide evidence that effective professional development can directly impact teachers' instructional practices and subsequently impact student learning.

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Table 1. The means and standard deviations for the pre and post test scores

	M	SD	n
pre	69.36	11.886	28
post	88.68	7.454	28

Table 2. Linear and quadratic relationships between pre and post scores

Equation	Model Summary					Parameter Estimates		
	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	.47	23.55	1	26	.000	58.69	.43	
Quadratic	.52	13.79	2	25	.000	1.81	2.20	-.013

Table 3. The means and standard deviations of the increase scores for the two groups

Group	M	SD	n
1	.36	.17	21
2	.13	.05	7
Total	.30	.18	28

An Assessment of Government Support Programs in the Development of SMEs in Malaysia: Issues and Challenges

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Abstract

Purpose The purpose of this study is to assess the issues and challenges faced by Malaysian SMEs in relation to the government support programs (GSP).

Methodology. The empirical part consists of an extensive search and analysis of academic articles and government publications related to government assistance programs in SMEs.

Findings. The results of this study highlight the issues and challenges that are significantly important to the implementation and effectiveness of government support programs for Malaysia's SMEs.

Practical Implications. This study clarifies the different issues and challenges faced by SMEs in seeking assistance programs provided by public agencies.

Originality/Value. This research will add to the existing literature reviews of government assistance programs in the development of SMEs in Malaysia.

Keywords: Government support assistance, SMEs, issues, challenges, Malaysia

Introduction and the purpose of the study

Small and medium enterprises (SMEs) are playing significant contribution in the economic development, social uplifting and political stability of every country. SMEs are diverse in nature and can be established for any kind of business activities in urban or rural areas. More importantly, SMEs can be considered as a back bone of national economy (Peters and Waterman, 1982; Amini, 2004; Radam et al., 2008). Due to significant contributions of SMEs towards the development of the economy, various agencies, particularly that of government, have given a lot of commitments in the development of SMEs in the form of programs and facilities to enhance their performances and competitiveness. In relation to this, the Malaysian government has persistently allocated resource for the development of SMEs and the allocation has been increased from RM 1,561.6 million in the Eighth Malaysia Plan to RM 2,160.2 million in the Ninth Malaysia Plan (Economic Planning Unit, 2006). Despite the huge financial support, the government has also established various support programs, institutions and agencies such as SME Bank and SMECORP to provide guidance, promotion, production efficiency, R& D activities and product development (Central Bank of Malaysia, 2006).

Definition of SMEs in Malaysia

Generally, there is no accepted worldwide definition of SMEs (Hooi, 2006; Omar and Ismail, 2009). However, in Malaysia, the definition of SMEs is mainly based on annual sales turnover and total number of full time employees (Hashim and Abdullah, 2000). In the local context, according to Small and Medium Enterprises Corporation Malaysia (SMECORP), enterprises that employ between 50 to150 full time employees are considered as medium while those that employ between 5 to 50 are called small, and less than five (5) belong to micro enterprises. These SMEs are further categorised as medium-sized companies, small enterprises and micro-enterprises (refer to *Table 1*).

Table 1: Definition of Small and Medium Enterprises in Malaysia

Size	Manufacturing, Manufacturing-Related Services and Agro-based industries	Services, Primary Agriculture and Information & Communication Technology (ICT)
Micro	Sales turnover of less than RM250,000 OR full time employees less than 5	Sales turnover of less than RM200,000 OR full time employees less than 5
Small	Sales turnover between RM250,000 and less than RM10 million OR full time employees between 5 and 50	Sales turnover between RM200,000 and less than RM1 million OR full time employees between 5 and 19
Medium	Sales turnover between RM10 million and RM25 million OR full time employees between 51 and 150	Sales turnover between RM1 million and RM5 million OR full time employees between 20 and 50

Source: www.smecorp.gov.my

Roles of SMEs in Economy

Malaysian economy has undoubtedly passed through a considerable transformation over the last few decades from agricultural based to industrial based. Now, the economy is shifting from industrial based to a knowledge-based economy to achieve the vision 2020 and to become a developed economy (Ong et al., 2010). In the Malaysian economy, the role of SMEs is considered as the backbone of the economy (Radam et al., 2008). Malaysian SMEs, particularly the manufacturing sectors, are playing a very important role in the development of economy. In 2009, SMEs comprised of 99 percent of the business establishment in Malaysia and their contribution was 31 percent of the GDP (SME Annual report 2009/10). In relation to job creation, the role of SMEs is vital. Remarkably, in 2006, SMEs employed 65.3 percent of the national workforce in Malaysia (Thurasamy et al., 2009). Based on the Census on Establishment and Enterprises 2005 conducted by the Department of Statistics Malaysia (DOSM), SMEs in Malaysia are mainly in the services sector, accounting for 87 percent or 474,706 of total business establishments. Most of these businesses are involved in the distributive trade, which includes wholesale and retail, as well as hotels and restaurants. The manufacturing sector, meanwhile accounts for 7 percent of total SMEs or a total of 39,373 businesses, of which more than half are in the three key subsectors, namely textiles and apparels, metal products as well as food and beverages (F&B). This is followed by the agricultural sector, which constitutes another 6 percent of SMEs or representing 34,188 businesses. Most SMEs in the agriculture sector are involved in crop plantation, horticulture and fishing. According to the Malaysian Ministry of International Trade and Industry (MITI) and Kassim and Sulaiman (2011) the figures indicated that the SMEs contribution to manufacturing amounted to 20 percent of the GDP, in 1991. Currently, the contribution of total employment in the manufacturing sector is 31.2 percent, and it is expected to rise significantly in the future (Kassim and Sulaiman, 2011).

The significant roles of SMEs operating in manufacturing sector is significantly acknowledged. The manufacturing sector of SMEs are mainly involved in activities such as processing and production of raw materials, textiles, food, beverages, wood, rubber, petroleum and the assembling and manufacturing of electrical and electronics appliance (Mustapha et al., 2011). Geographically, most of the manufacturing units are operating in West Coast of Malaysia, particularly in Selangor, Johor, Perak and Pulau Pinang. Two states namely Selangor and Pulau Pinang are the epicentres of SMEs, which focus on electrical and electronics (Mustapha et al., 2011). In these two states 154 SMEs are operating in electrical and electronics manufacturing sector (FMM, 2009; TEAM, 2009). More importantly, the role of electrical and electronics manufacturing SMEs is a significantly positive in Malaysian economy and becomes a valued added that provides a high knowledge intensive among SMEs. According to Ministry of Industrial Development Authority (MIDA), in 2008, the total gross output of electrical and electronics industries in economy was US$ 53.9 billion and export amounted to US$75.4 billion (www.mida.gov.my).

Government Support Programs (GSP)

Under the Ninth Malaysia Plan (9MP: 2006-2010), the government has allocated an extensive funding for SMEs of RM3.8 billion in 2008 and RM11.9 billion 2010 with the aim of improving and developing efficient SMEs. Given that SMEs need to compete,

sustain and succeed in today's challenging business environment, the government realises that it is vital to provide SMEs with the necessary management skills and know-how, given that SMEs have been identified as the main growth engines under 9MP.

In line with the SME working group theme for 2009 "Helping SMEs Access Global Markets and Overcome Trade Barriers", the Malaysia government has provided numerous support programs aim at preparing a sustainable growth for SMEs. These assistance programs include extension and advisory services, financial and credit assistance, infrastructure supports, technical and training assistance, as well as marketing and market research. A total of 202 programs valued at RM3 billion in 2008 have been implemented involving a total of 598,000 SMEs, representing a two-fold increase from the number of beneficiaries in 2007 (SME Annual Report, 2008). In 2009, a total of 174 programs valued at RM3.04 billion were implemented to enhance the capacity and capability of SMEs. The government has introduced many policies including those in the stimulus packages, to ensure that SMEs continue to have access to financing and to cope with current challenging economic years. Apart from the additional funds in the form of micro financing, the new funds and schemes have also been introduced, including guaranteed facilities to ensure viable companies including SMEs, which experiencing a temporary cash flow problem to continue to have access to financing.

Surprisingly, even though strong government supports exist, it is noted that there are certain issues and challenges faced by Malaysia's SMEs in relation to seeking assistance from these programs.

Related Issues Faced By SMEs – Literature Review

The winners of SME 100 2011 have confirmed that the key challenges facing SMEs in Malaysia are many and varied. (SME Magazine, 2010) These challenges faced by Malaysian SMEs are grouped into four broad categories. They are:

a. Access to Finance
b. Access to Human Capital
c. Access to Technology
d. Access to Market

A. Access to Finance

For many SMEs, whilst banks and the Government alike are making available funds for business expansion, they are facing problems to secure their financing. The global financial crisis has caused financial institutions to be more cautious as credit processing has become so complex, that very often SMEs find it difficult understand both the procedures and decisions when it comes to loan processing.

Study shows that for Malaysian firms, especially small businesses, capital funds remain one of the most challenging problems. Chronic shortage of capital has been an accustomed problem in considering business expansion into international markets. (Julian et al, 2012) It is interesting to find that the complicated procedure of financing application is ranked as the top reason by the 20 top winners of Malaysia Enterprise Award 2004-2008 for not receiving the full range of assistance. (Hung et al, 2011)

Research reveals that due to the limited allocation of resources, complicated application procedures involved, and some activities are meant for new enterprises are main reasons that most of the assistance programs provided by government are not fully utilised (Hung et al, 2011). This is also supported by study by Abdullah et al (2001) who

reported that the ineffectiveness of assistance programs is due to inefficient allocation of resources, and the programs focusing on developing only new enterprises and limited numbers of SMEs receive the full range of assistance.

Malaysian SMEs are still facing many issues and challenges, domestic and external, which could prevent them from being resilient and competitive despite various governmental support programs offered. Obtaining funding from financial institutions and the government is one of the ongoing difficulties where the interest charges by financial institutions on loans borrowed by SMEs are high, and this is compounded by a lack of financial transparency by SMEs. (Salleh, 2006) Study also reveals that it seems among the managerial problems in SMEs are high product cost, high overhead cost and undedicated employees. (Abd Hamid 2006)

B. Access to Human Capital

The most significant challenge facing Malaysian SMEs is a lack of human capital as it is often too expensive for SMEs to employ a competent and professional workforce. (Saleh, 2006) Whilst the government has realized the severity of the brain drain, especially among professionals and skilled workers, little is being done to help SMEs attract and retain world class talents.

To attract work talents, many SMEs have put in place numerous practices to attract and retain talents – including paying above market average salary, annual bonuses, continuous training and a conducive and supportive working environment. However, if given a choice, candidates would prefer to work for larger companies. This is where the government could step in and offer incentives to returning talents to work with SMEs and provide more incentives to SMEs to provide greater staff benefits (SME Magazine, 2010).

The interviews with SMEs' CEOs conducted by SME Magazine in 2010 also revealed that working in MNCs appeared to be more promising and glamorous for most capable young adults, making smaller organizations like SME difficult to find suitable candidates. This is supported by empirical evidence, which shows that among managerial problems faced by SMEs in Malaysia are undedicated employees and the difficulty of finding good workers (Abd Hamid, 2006).

The biggest business challenge for SMEs is the availability of talents joining their team to fuel expansion plan, and the supply of manpower for production. For some manufacturers, due to the complex nature of their business, the biggest challenge faced is the technical knowledge of their staff. Many young engineers are lacked of industry experience either due to their youth or training. Being a technology-based business, manufacturers need to keep abreast with the development of the fuel cell technology. Thus, more knowledge- based human resource to support innovation and development of the technology is needed. (SME Magazine, 2010)

C. Access to Technology

Study shows that government support has a significant and strong positive relation to ICT adoption (Alam, 2009). At a time when the country is preparing to move into high technology industries aggressively, not only as a consumer but also as developers of technology – many SMEs still find it a challenge to acquire or develop new technology. This has become a critical point as the rapidly evolving market demands cutting edge

technology in almost every aspect of business, and the new mantra of the 2010s is 'latest, best and most advanced'.

While local SMEs strives to move forward to become a global hub for biotechnology among others, many of the leading research and technological developments are coming out of Europe and North America. Finding partners and vendors who are willing to transfer these technologies to Malaysia is tough enough let alone transferring these technologies to SMEs. Hence, this is an area that many SMEs hope the government will play a facilitating role. (SME Magazine, 2010)

Lack of access to better technology and ICT have been identified as factors which hinders more efficient and productive business operations (Saleh, 2006). In addition, business or product life cycle has become shorter due to market competition. The amount of development work required has increased and it demands the company to carry out more R&D seeding to secure future businesses. Therefore, local SMEs need to realize that technology is moving fast and other SMEs in countries like South Korea and Brazil - another fast mover in the world economy - are leading the way. Local SMEs need to be more innovative to survive (SME Magazine, 2010).

D. Access to Market

Although Malaysia's entry into the WTO and AFTA has promised to open up new markets for our SMEs, many of our SMEs are instead facing such intense challenge that many have even considered folding up.

The biggest challenge is the increase of market uncertainty. In general, businesses have to reduce costs and improve productivity in the midst of adapting to changing market conditions. As customer expectations continue to change as well, SMEs compete in an industry where success is dependent on their ability to increase market share and market presence. Future performance will substantially depend on market acceptance of the products and services provided (SME Magazine, 2010).

Lack of knowledge regarding branding, customer loyalty, marketing techniques and also lack of good contacts with other local and international enterprises are identified as main problems faced by SMEs in Malaysia (Hashim and Wafa, 2002; Muhammad et al., 2010). Alam et al., (2011) observed that SMEs in Malaysia had social barriers to achieve the competitive advantage and as a result, many SMEs in Malaysia lost out in terms of opportunities. Apart from that, price competition has also been identified as the most common problem faced by the SMEs, followed by low profits and brand competition. SMEs are having less difficulty in exporting their products as their main focus is on the local markets. However, an extensive orientation towards domestic rather than the international market place is recognised as deterrence for SMEs resilience and competitiveness (Saleh, 2006).

Conclusion

Based on the literature review, it can be concluded here that the interest of the Malaysian government in developing and expanding the growth of small and medium enterprises (SMEs) has been flourishing for many years. However, despite the existence of numerous Government assistance programs, SMEs is still encountering various issues and challenges in their operations. GSP is seen as insufficient and not delivering enough towards developing and strengthening local SMEs. Thus, this study provides some insights into SMEs supporting agencies for exploiting their potential and consequently for

improving the effectiveness of the relevant GSP. In short, this study is to provide the overview of the challenges faced by Malaysian SMEs. Although this study is not empirical in nature, it provides additional information related to SMEs in Malaysia. A better understanding of the issues faced by SMEs and accessibility of GSP could be achieved if future research could be performed. Therefore, future empirical studies in this area are strongly recommended.

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A Small Open Economy Business Cycles Model for Nigeria: a Dynamic Stochastic General Equilibrium Approach

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Abstract

The study is set to fill gaps in three important areas: in-depth study of business cycles in Nigeria; application of dynamic stochastic general equilibrium (DSGE) model using Bayesian technique of solution, this complements the existing system-of-equations and the computable general equilibrium (CGE) models; and the investigation of the role of productivity, money supply, and external trade play in business cycle. Thus, three objectives are associated with this study namely establish and characterize the existence of business cycle in Nigeria, analyze the sources of business cycle fluctuations, and measure the impact of shocks. The DSGE model developed in this study to capture business cycle facts is perturbed by three exogenous shocks namely technology, monetary and export supply in line with the New-Keynesian analysis. The Bayesian method of estimation is applied on the hybrid DSGE-VAR model and the results are presented and discussed and its empirical performance evaluated. The impulse response functions and the variance decomposition are also discussed. The solution of the model is facilitated by the use of DYNARE codes MATLAB version 7.9.0.529, R2009b 32-bit (win32): a software package designed to solve DSGE models. From the DSGE-VAR approach, the results show that productivity shock, money supply growth shock and export supply growth shock contributed in the statistical sense in explaining that the Nigerian business cycle is driven by both real and nominal shocks. Finally, a major finding of the study is the fact that the export sector which is supposed to be the engine of growth of the economy is exhibiting not so strong linkages with the rest of the economy. This suggests a major challenge of policy.

Key Words: DSGE modeling, Business cycle, real shock, nominal shock, Dutch disease, dynare coding

1 Introduction

Recent convergence in the use of Dynamic Stochastic General Equilibrium models in the analysis and estimation of economic phenomena and business cycles for various economies around the world has systematically gained reputation. This is not undue to the fact that these models have to a large extent corrected for the shortcomings of previously ubiquitous real business cycle models. This new bearing in modeling has to a large extent traversed the deficiency of previous macro-economic models in that although is adopts the foundations of the real business cycle model, it also adapts, incorporating the ability of the Real Business Cycle (RBCs) models to imitate occurrences in the real economy, while in addition, (i) integrating various imperfections such as nominal ridgities in the form of monopolistic competition, tacky/sticky prices and wages, and short-run non-neutrality of monetary policy (ii) developing its framework around the optimizing behavior of microeconomic agents and the rest of the world hence incorporating forward looking behavior, (iii) provisioning a discuss of how random shocks affect the economy-hence being stochastic in nature, and (iv) building of structural equations which have economic interpretations.

Though most of these models where initially built for industrialized economies, the past few years have found developing/ low-income economies adopting this pool of knowledge in prediction, explanation, estimation and analysis of own idiosyncratic economic phenomenon. Senbeta (2011) argues that this is justified and useful, if only the, models are adjusted such that its components capture the salient specificities of these economies.

Consequently, the ensuing section provides a succinct overview of the Nigerian economic environment and historical antecedent to enable feasible evaluation of the model and its results within the stated milieu.

Presently Nigeria is said to be plagued by the Dutch disease syndrome, a condition it has been struggling to recover from. Some would refer to it specifically as, the Crude oil-curse hypothesis. Proceeding the dawn of crude-oil discovery, the Nigerian economy was majorly driven by agriculture which made up the bulk share of total employment, source of government revenue and contribution to the Gross Domestic Product (GDP). However, with the discovery of crude oil in the 1970's, the structure of the economy took a significant turn and became heavily dependent on revenue from petroleum sales, given the then growing importance of the product in the world market. Consequently, the economy became largely dependent on the external sector, with increased public sector role (Edun; *2012*). By the early '80s revenue from crude oil sale accounted for about 97% of total export earnings. Although in recent years, attempts have been made to restore some balance with commendable progress, much work still need to be done. The sudden structural change of the early 1980's opened the economy to a multiplicity of shocks, both endogenous and exogenous, which invariably resulted in cycles of booms and recessions, attributable to changing prices of crude oil in the world market, and its consequent impact on the now heavily crude-oil-dependent economy, evident in the sharp fluctuations in the gross domestic product(GDP) and inflation rate, decline in domestic production, increased fiscal deficit, rural-urban shift, among others.

Alege (2009) identifies some of these shocks as; crude-oil price shock in the early 1970's which precipitated other shocks; low-crude oil demand shock after the hike in oil prices in 1979, which set in motion the world recession of the '80s; foreign liability shock generating gaps in the execution of socio-economic development programs; stochastic

shocks from inapt policy response to observed negative developments in the economy; terms of trade shock; institutional shocks, amongst others.

An important consideration in the analysis of a developing economy like Nigeria is that it is a 'Small open economy in that it cannot influence world prices and output', Alege (2009). Hence macroeconomic policies aimed at addressing domestic phenomenon are augmented by external shocks which inadvertently distort the path of sustainable socio-economic development. Alas, the unpredictable nature of these shocks and hence, measures to curtail them necessitates investigating these shocks in a bid to understand how they interact with and affect the nitty-gritties of macroeconomic occurrences and fluctuations in the economy and hence the sources business cycle phenomenon in Nigeria.

In the ensuing section, we introduce the theoretical framework and methodology employed in this study.

2 Theoretical Framework and Methodology

The framework of this study is built around the New Keynesian blueprint of DSGE modeling which incorporates the real business cycle approach. It is based largely on the Open-economy type DSGE model, fully built on micro economic foundations and incorporates both real and nominal ridgities. While characteristically neoclassical in the long run, the short run features are basically Keynesian in nature and hence provides latitude for monetary policy to affect the real economy over the short to medium term. The distinguishing feature of this approach from previous schools of thoughts is that it is methodological in its analysis of the business cycle phenomenon. While assuming the existence of involuntary unemployment, non-neutrality of monetary policy and short-run ridgity of wages and prices, it relies on the latter (price and wage stickiness) to explain the existence of the former two.

The New Keynesian DSGE models are often summarized in three equations which encapsulate the behavior of optimizing economic agents. These are

- The aggregate demand/ IS curve
- The aggregate supply curve (basically summarizes money demand relationships)
- A forward looking version of the Phillips curve.

Hence structurally, the model assumes the existence of households and firms which maximize their utility or profit subject to some constraint and a financial intermediary. The model differs from those of Schorfheide and Nason and Cogley in that it introduced the following: (a) foreign trade sector and (b) export shock using the volatility of terms of trade. Hence, our model has four agents namely the representative household, representative firm, the financial intermediary, external trade sector and a monetary authority who has a secondary role. This model makes it possible to determine the steady state of the economy vis-a-vis the permanent shocks that change the steady state. It focuses on the dynamics of the economy and how the economy returns to the steady state following macroeconomic disturbances. Quarterly data between 1991Q1 and 2012Q2 used for this study were sourced from official sources like IMF International Financial Statistics.

3 Modeling of Business Cycles in Nigeria

3.1 The Households

According to Nason and Cogley (1994), the main objective of the households is utility maximization which depends on consumption and labour at time t; C_t and H_t respectively. However, the amount of cash to hold and deposit with the bank, which comes with interest; M_{t+1} and $R_{H,t}D_t$ are also determined by the households. Consequently, the households will want to solve the objective function that characterized the following optimization problem:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma}}{1-\sigma} + \frac{M_t^{1-\nu}}{1-\nu} + \frac{H_t^{1+\gamma}}{1+\gamma} \right] \tag{1}$$

Subject to equation 2

where β^t is the discount factor; σ, disutility of labour; C_t, Current level of consumption; H_t, Hours worked; BF is is the combined dividends from both firm and financial institutions, M_t money to be held in the next period;, Υ, household deposit with banks and E_0, expectation operator of information available at time 0.

$$P_t C_t + R_{H,t} \gamma_{t+1} + \left(1 - R_{H,t}\right) M_t \leq \gamma_t + W_t H_t + BF_t \tag{2}$$

$$\lim_{T \to \infty} E_t(\gamma_T) \geq 0$$

The constraint demonstrates that households consume, make deposits with financial intermediary and purchase cash against future with their resources. Summarily, the households get resources from labour income, dividend income, current cash holding and interest on deposit.

Deriving the ad-hoc money demand;

$$\frac{M_t}{P_t} = Y_t + \frac{1}{\sigma} R_t \tag{3}$$

Log linearizing this equation;

$$m_t - p_t = y_t - \eta i_t \tag{4}$$

3.2 The Firms

According to Nason and Cogley (1994) and Schorfheide (2000), the firm will solve the optimization problem below by choosing dividends, next period capital, labour demand and loans (F_t, K_{t+1}, N_t and L_t) respectively. This is because household value a unit of dividend in terms of future consumption, also the financial intermediary and the firms are owned by the households. Hence, period t dividends are discounted by $t+1$ marginal utility of consumption.

$$\max_{\{F_t, K_{t+1}, N_t, L_t\}} E_0 \left[\sum_{t=0}^{\infty} \beta^{t+1} \frac{F_t}{C_{t+1} P_{t+1}} \right] \ldots\ldots\ldots \ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$$

where C_{t+1} is the next period consumption; P_{t+1}, next period price level; Ht, labour demand; β^{t+1}, expected discount factor in time $t+1$; L_t, Loans; K_{t+1}, next period capital stock and F_t is dividends. The firms constraint is of Cobb-Douglass

production function of the form, $Y_t = K_t^\alpha (Z_t N_t)^{1-\alpha}$ with gross market equilibrium where $C_t + I_t = Y_t$ and $I_t = K_{t+1} - (1-\delta) K_t$, such that the constraint is written as:

$$F_t \le L_t + P_t \left[K_t^\alpha (Z_t N_t)^{1-\alpha} - K_{t+1} + (1-\delta) K_t - W_t N_t - L_t R_{F,t} \right] \dots\dots\dots(ii)$$

In a simplified version

The firm maximizes

$$P_t Y_t - W_t H_t \tag{5}$$

Subject to

$$Y_t = A_t H_t^{1-\alpha} \tag{6}$$

The FOC becomes;

$$\frac{W_t}{P_t} = (1 - \alpha) A_t H_t^{-\alpha} \tag{7}$$

By log linearizing, the labor demand schedule becomes;

$$w_t - p_t = a_t - \alpha h_t + \log(1 - \alpha) \tag{8}$$

Log linearizing equation 14, we get the production function consisting of technology and labor.

$$y_t = a_t + (1 - \alpha)h_t \tag{9}$$

The Taylor monetary policy rule shows that the central bank conducts monetary policy by changing nominal interest rate. Thus, the central bank interest rate rule is given as

$$i_t = \rho + \phi^p i\pi_t + \phi^y y_t + \varepsilon_t^i \tag{10}$$

Technology shock is assumed to follow an AR(1) process as;

$$a_t = \rho^a a_{t+1} + \varepsilon_t^a \tag{11}$$

Given that, $\qquad \hat{r} = r_t - \rho$ (12)

Substituting equation 29 int0 24

$$\hat{r}_t = \sigma \psi^{ya} E_t[a_{t+1} - a_t] \tag{13}$$

$$\hat{r}_t = \sigma \psi^{ya} E_t[\rho^a a_t - a_t] \tag{14}$$

$$r_t = \rho + \sigma \psi^{ya} (p^a - 1)a_t \tag{15}$$

The step by step derivation and loglinearization of the model are reported in Appendix 1a and 1b

3.3 The Financial Intermediary

The financial intermediary FI, which receives cash injection (X_t) from the central bank and cash deposits from the households [which equals the net change in money balances, (M_{t+1} - M_t)] represents the bank and disburses loans to firms using these funds with a return, $R_{F,t} - 1$. The problem below is solved by the FI (See Scorfheide, 2000):

$$\max_{\{B_t, L_t, D_t\}} E_0 \left[\sum_{t=1}^{\infty} \beta^{t+1} \frac{B_t}{C_{t+1} P_{t+1}} \right] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots$$
$$\dots\dots\dots\dots\dots(iii)$$

The above function is subject to the constraint below which demonstrates that the level of bonds at any period t is equal to monetary injection, interest earning on loans, money deposit by households, and less interest paid on deposits and total loans:

$$B_t = D_t + R_{F,t}L_t - R_{H,t}D_t - L_t + X_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \text{(iv)}$$

where $X_t = M_{t+1} - M_t$ is the monetary injection; B_t, bonds; D_t, deposits; L_t, loans; $R_{F,t}$, nominal interest return on loans and $R_{H,t}$, nominal interest on deposits by households

3.4 The Export Sector

An export sector EP in DSGE models is introduced (Duncan, 2002), by assuming that the economy produces two goods. The imported goods, which is the first goods could be produced domestically and the exportable, which is meant for export only is the second good.

There is need to optimize the behavior of the EP by characterizing the different goods in the economy with the assumption that there is homogenous goods in both markets at all discrete period t = 0, 1, 2, 3,… Therefore, aggregate output in the economy is either characterized as local consumption or export. This suggests that the EP is to maximize the expected discounted future stream of income subject to production function given in equation 8.

Thus, equation 7 is expressed as:

$$\textbf{Max } E_t \left[\sum_{t=0}^{\infty} \beta^{t+1} (PD_t XD_t + PX_t EX_t) \right] \dots \dots \dots \dots \dots \dots \dots \text{(v)}$$

s.t. $\quad Y_t = A_t \left[\mu EX_t^{\phi} + (1-\mu)XD_t^{\phi} \right]^{\frac{1}{\phi}} \quad \dots \dots \dots \dots \dots \dots \dots \dots \text{(vi)}$

where β^{t+1} is the discount factor; Y_t is output; XD_t is locally consumed good; EX_t is exported good; ϕ is CET parameter; PX_t is export price and PD_t is local price.

We derive the FOC, of the optimization, which gives the demand functions below:

$$EX_t = \left[\left(\frac{1-\mu}{\mu} \right) \left(\frac{PX_t}{PD_t} \right) \right]^{\frac{1}{1-\phi}} . XD_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \text{(vii)}$$

where $XD_t = Y_t - EX_t$ and PX_i is defined as follow:

$$PX_i = \frac{PWE_i . ER}{1 + te_i}$$

$$\dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \text{(viii)}$$

PWE_i is dollar price of exports; te_i is export tax (subsidy) rate; EX_t is total exports at time t

setting $PM_t = PD_t$

$rp_t = PX_t / PM_t$: Terms of trade at time t

The full derivation of the export sector is presented in appendix 1

3.5   The Model Closure

In any DSGE model, the problem of reconciling the total savings and total investment is an inherent one. In the literature, it is referred to as the ''closure'' problem since it has to do with closing the flow-of-funds accounts (Dervis, De-Melo and Robinson, 1985:165). The market clearing conditions for each market is given as follows:

Labour market: $$H_t = N_t \text{.........} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{(ix)}$$

Goods market: $$P_t C_t = M_t + X_t \text{.........} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{(x)}$$

where M_t and X_t are money held in time t and monetary injection, respectively.

$$C_t + \left(K_{t+1} - (1-\delta)K_t\right) + EX_t = K_t^\alpha \left(Z_t N_t\right)^{1-\alpha} \text{.........} \dots\dots\dots\dots\dots\dots\text{(xi)}$$

$$R_{F,t} = R_{H,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{(xii)}$$

Equation 14 states that at equilibrium interest rate on loans equals interest rate on deposits, which is the risk profile of the loans.

3.6   The stochastic Process

This study adopts a model in which three sources of exogenous perturbations are considered. There are two of them which are real shocks (the technology and terms of trade shock) while the third one, money supply shock is a nominal shock. We express the equations of these shocks as follows (See Nason and Cogley,1994: S39):

$$\ln z_t = \gamma + \ln z_{t-1} + \varepsilon_{z,t} \text{.........} \dots\dots\dots\dots\dots\dots\dots\dots\text{(xiii)}$$

$$\varepsilon_{Z,t} \approx iiN(0, \sigma_Z^2),$$

where $\varepsilon_{z,t}$ are innovations to capture unexpected changes in productivity.

$$\ln m_t = (1-\rho)\ln m^* + \rho \ln m_{t-1} + \varepsilon_{M,t} \dots\dots\dots\dots\dots\dots\dots\dots\text{(xiv)}$$

$$\varepsilon_{M,t} \approx iiN(0, \sigma_M^2)$$

Equation v is a simple monetary policy rule without feedbacks. The assumption here is that the money authorities (central bank) allow money stock, M_t to grow at the rate $m_t = M_{t+1}/M_t$. Therefore, innovations, ε_t, capture unexpected changes of the money growth rate due to "normal" policy making. Thus, changes in m^* or ρ correspond to rare regime shifts.

The third stochastic process is due to export supply growth shock measured by the terms of trade $rp_t = PX_t/PM_t$ and is also assumed to be an autoregressive process of order one, AR (1). It is given as:

$$rp_t = \rho_{rp} rp_{t-1} + \left(1-\rho_{rp}\right) rp_0 + \varepsilon_{rp_t} \dots\dots\dots\dots\dots\dots\dots\dots\text{(xv)}$$

where rp_t is terms of trade at time t and ρ_{rp} is coefficient of autocorrelation

$$\varepsilon_{rp,t} \approx Niid\left(0, \sigma_{rp}^2\right)$$

$$rp_0 > 0 \quad \text{and} \quad 0 < \rho_{rp} < 1$$

Following the above model description in the economy, we express the different system of equations to be estimated as follow:

$$m_t - p_t = y_t - \eta i_t \tag{1}$$

$$r_t = \rho + \sigma \psi^{ya}(p^a - 1)a_t \tag{2}$$

$$i_t = \rho + \phi^p i \pi_t + \phi^y y_t + \varepsilon_t^i \tag{3}$$

$$y_t = a_t + (1-\alpha)h_t \tag{4}$$

$$a_t = \rho^a a_{t+1} + \varepsilon_t^a \tag{5}$$

$$EX = \rho^{tot} tot_{t-1} + \varepsilon_t^{tot} \tag{6}$$

$$v_t = \rho^v v_{t-1} + \varepsilon_t^v \tag{7}$$

$$\pi_t = \delta \tilde{y}_t + \beta E_t \pi_{t+1} \tag{8}$$

$$y_t = y_{t+1} - \frac{1}{\sigma(i_t - \pi_{t+1} - r_t)} \tag{9}$$

$$X_t = \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}} \left[\sigma + \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}} \theta^{\frac{1}{\varphi-1}} \sigma\right]^{-1} \theta^{\frac{1}{\varphi-1}} \sigma y_t + \frac{1}{\phi_{t-1}} \tag{10}$$

To find the first order condition in order to solve this system of equations, we use decentralized optimization technique. This allows us to maximize each agent objective function individually. According to Nason and Cogley (1994), equilibrium requires the goods, credit, labor, and money markets clear. The assumption is that all markets are perfectly competitive. The goods market clears when total output equals aggregate consumption plus aggregate investment and total export:

$$C_t + K_{t+1} - (1-\delta)K_t + EX_t = K_t^\alpha [A_t N_t]^{1-\alpha}$$

Money market clears when money demand equals money supply. Here, consumption demand is equated with money demand and money supply is equal to the current money balances and the monetary injections. Hence, the money market equilibrium can be expressed as: $P_t C_t = M_t + X_t$. The credit market clears when the dividends paid by Financial intermediary to households equals the product of nominal interest rate and money injection, that is, $B_t = R_t X_t$ such that: $RH_t = RF_t \equiv R_t$. Lastly, the export market clears when export demand equals export supply.

The FOCs, the equilibrium conditions, the model closure including the stochastic processes are the system of equations we need to estimate.

4   Presentation of Results

Our models are estimated using DYNARE codes, MATLAB version 7.9.0.529, R2009b 32-bit (win32). This package for solving the DSGEM is holistic as it is specifically designed to address business cycle models based on DSGE for which the Bayesian has been chosen. The complete codes will be found in appendix 3.

4.1   Calibration

Appendix 2A describes starting parameters of the model and the Bayesian simulated solution.The process of choosing the values of these parameters in order to make the model match the observed data is known as calibration. The values obtained from the calibration are used as priors in the simulation of the model. The descriptions of

the parameters of the model as well as the definition of the variables have been discussed earlier.

4.2   Results

The DSGE model being estimated here is one that has been augmented by a Vector Autoregressive (VAR) representation. Consequently, the model solved was through the process of estimation/simulation of the DSGE-VAR method. This estimation/simulation process uses the Bayesian-based DYNARE (Matlab version) package. The equations of the model estimated are presented in appendix 1A and B, and we concentrated on three exogenous shocks namely technology shock, monetary shock and external trade shock. This is in consonance with the theoretical foundation of the study which is rooted in the New-Keynesian analysis and hence lay importance on nominal shocks as well as real shocks.

The impulse response functions and the variance decomposition are also presented. In simulating the model, the parameters of the model were kept fixed from the beginning of the estimation. This can be seen as strict prior. Table 4.2.1 contains the results from the posterior maximization. The table shows the assumptions regarding the prior distributions of parameters of the model.

In general, all the parameters estimated are significantly and statistically very different from zero at the level of 5 percent. In the same sense, the prior mode of the productivity shock, e_a: money supply shock, e_m: and export supply shock, e_x are highly statistically significantly different from zero as could be seen in table 4.2.3. The table also indicates the posterior mean and the confidence interval. These figures can be virtually compared with figure 4.2.3. Further information on the estimation results are found in table 4.2.2. In it are contained the prior mean and posterior mean, the confidence interval as well as the posterior deviation. The table also shows a relatively close value between the prior means and the posterior means.

4.3   Impulse Response Functions Results Of Shocks To Business Cycles In Nigeria

In the preceding section, we estimated dynamic stochastic general equilibrium vector auto regression (DSGE-VAR) model of the Nigerian economy using the Bayesian method, presented and discussed the results.

In studying macroeconomic policies and business cycles in Nigeria, we have restricted ourselves to three manageable macroeconomic shocks, in terms of model estimation, to specific drivers of the Nigerian business cycles. Our areas of interest in this study are productivity, money supply and export.

In analyzing this shocks, we adopt the impulse response functions (IRFs) and variance decompositions technique meaning the response/path of a variable to an exogenous perturbation and the proportion of the total variation of a variable due to itself and all the other endogenous variables, respectively.

Table 4.3.1 shows the matrix of covariance of exogenous shocks of the three shocks considered in this study. It is a diagonal matrix indicating non correlation of error among the variables. The entries on the principal diagonal show the variances of the exogenous shocks. The small magnitude of the variances may point to a good fit.

4.3.1   Productivity and Business Cycles in Nigeria

Figures 4.3.1 plots the impulse responses to the various structural shocks considered in this study. A positive productivity shock caused output to increase over time. On impact, the effect was positive and gradually became asymptotic to the steady state over the time horizon. Interest rate, r; export, x; labour force, h; real interest rate, I and price index, pi also behave in a similar manner. In contrast, money supply and the total productivity depict an inverse relationship indicating that a positive productivity shock leads to increased interest rate which lower money supply and leads to fall in productivity level and then converge non-linearly to the steady state as time goes on in the horizon.

From these observations, it follows that relationships between productivity and some macroeconomic variables follow standard patterns. In effect, a positive productivity shock is expected to cause rise in output as indicated above and a concomitant increase in labour supply, and even rise in prices. It is observed that all these variables converge to the steady state in the long run. From a policy prescription perspective, the results suggest that policy in form of productivity shock must be backed-up by complementary policies in order to bring about the desired fall in unemployment, increase in wages and price stability.

4.3.2   Monetary Policies and Business Cycles in Nigeria

By examining the effects of monetary policy shocks; a positive monetary policy shock leads to a rise in nominal interest rate. This causes an increase in nominal wage rate since price level has also increased nominally. In line with stylized facts, following a monetary policy shock, expansive monetary policy, interest rates are expected to rise in the face of rising inflation. In this case, price level increases at the same rate so that the wage rate remains nominally high. This encourages export supply, output production and labour force since the demand for labour rises following the increase in demand for goods and rise in production as a consequence. This assertion is drawn from figure 4.3.2.

The table 4.3.1 is policy and transition functions of the DSGE model. The approximate solution of the model takes the form of a set of decision rules or transition equations. In the presence of a positive productivity shock, the table shows that the decision coefficients are positive for all the endogenous variables except productivity which is negative while interest rate is zero. The zero entries are indications of no relationship between the variable concerned. The policy implication here is that the authorities should be weary of the adverse effect of technology growth shocks on the welfare of households.

Going also by Figures 4.3.2, a positive money supply shock on output; interest rate, total export, and money supply has the same effect similar to those of a positive productivity shock. These results seem to reflect the Nigerian economy.

4.3.3   Export Policies and Business Cycles in Nigeria

This study suggests there are many potential determinants of business cycles in Nigeria. And without doubt a leading candidate is export. In term of business cycle analysis, higher trade between one or more countries means more co-movement of business cycles. From figure 4.3.3, the export supply shock seems to have positive impact on money supply variable. In effect, a positive export supply shock led to a sharp fall in export and reached the steady state value within the first quarter. This result seemingly

suggests little relationship between export shocks and the other endogenous variables in the model.

These results suggest and amplified the ''marginalization'' of the Nigerian economy in the world trade. This maginalization of the economy is due to lagging growth in GDP and not due to low trade ratios (Nigeria Congress, undated: 26). Another issue is the fact that the economy is monocultural depending for most of its earnings from the export of crude oil. Consequently, the export sector both oil and non-oil export are not linked to the economy and hence no much value addition. Though our model do not explicitly incorporate the import sector, Nigeria is excessively dependent on the international economy and she is thus exposed to international shocks and the boom-burst cycles of the world macro- economy are not strange to her. However, the incorporation of the import sector could amplify the transmission of international business cycles into the Nigerian economy. The negative correlation between the export supply shock and the other endogenous variables may not be unconnected with the restrictions placed on our model. In effect, the model does not explicitly incorporate exchange rate, foreign direct investments, and other external trade variables. It is not impossible that a model that incorporates all these external sector variables may adequately capture the structural behavior of the Nigerian economy.

4.4   Variance Decomposition

The contributions of each structural shock on all the endogenous variables can also be appreciated using the variance decomposition technique. The variance decomposition shows the percentage of error variance in one variable due to one standard deviation shock of the variable itself and other variables in the system. The variance decomposition decomposes variations in an endogenous variable into the component shocks to the endogenous variables in the system. The results of variance decomposition help in ascertaining the relative importance of the various variables in explaining the variations in the variable being considered in other words the computation of variance decomposition assist in gauging the importance of individual shocks. The results are presented in table 4.4.1.

From the table, it could be observed that export supply shocks add to the explanation of the variations in mostly money supply variable as discussed in section 4.3.1. In general, productivity shock explains all of the variations in interest rate while monetary shocks explains most of the variations in labour supply, total output, real interest rate, price growth, and growth in productivity. However, export supply shock explains about 80 percent of total variation in total export while productivity and money supply shocks only explain 19 percent and 11.45 percent respectively.

4.5   Diagnostic Check

Furthermore, tables 4.5.1 and 4.5.2 provide more insight into the strength of relationships and directions among the variables of the model. The result seems to confirm the age old classical analysis stipulating that nominal changes will have effect on nominal variables while real changes will have implications on real variables. This study thus shows that business cycles in Nigeria have been propagated by real as well as nominal shocks.

5   Conclusion and Recommendation

5.1   Summary and Conclusion

DSGE-VAR model has been estimated and simulated using the DYNARE codes. Three shocks were introduced into the model as major drivers of Nigeria's business cycles. These are productivity shock, money supply growth shock and export supply shocks. Our endogenous variables are total output, labour, price level, interest rate, money supply, and export measured by the GDP.

The results obtained in this study show that productivity shock, money supply growth shock and export supply growth shock contributed in the statistical sense in explaining business cycle as driven by both real and nominal shocks. This has implications for the economy. In effect, it is a known fact that Nigerian economy is highly dependent on her export earnings especially crude oil exports. Foreign currency generated from this source is known to be often injected back into the economy without being sterilized for long. The consequence of this is the unprecedented growth rate of money supply into the economy. The impact of this confirms theoretical underpinnings in the sense that price increases, engendered by high money supply into the economy, have manifested in high nominal wage and interest rate over the most part of the period under study. High growth rate of money supply in the economy may also be explained by excessive non sterilization of foreign exchange earnings to finance expansionary monetary and fiscal policies.

The results also confirm the New Keynesian analysis (which forms the theoretical base of this study) that both real and nominal factors do explain business cycles.

Going by the results obtained in this chapter, and given the methods of estimation applied in this study, more elaborate model for the study of business cycle fluctuations in Nigeria can be envisaged. A major finding of the study is the fact that the export sector which is supposed to be the engine of growth of the economy is exhibiting weak linkages with the rest of the economy. This may not be unconnected with outward-looking nature of the Nigerian economy with import value almost matching the export value. Obviously, this is one of the consequences of Dutch Disease syndrome which can affect the economy in two ways: resource movement effect and spending effect.

5.2   Policy Implication/Recommendation

Some of the policy implications of this study include the need for specific sectorial policy to boost production; policy mix of fiscal and monetary policies to encourage both domestic and foreign investments; inflation and interest rate targeting approach by the monetary authorities; breaking resource curse through removal of inhibitive export promotion drives; encouragement of South-South trade to enhance inter-regional trade among emerging economies such as Nigeria; and putting in place good institutions to facilitate these policies.

This study has shown that business cycles do exist in the Nigerian economy and has demonstrated the co-movements between the gross domestic product and its main components. Consequent upon the findings of the study, one of the recommendations that could be made is that documenting business cycle analysis, dating and turning points, as well as analysis of the periods of booms and bursts should become major research efforts in the immediate future in the economy. Such studies will assist policy makers to take

appropriate policy measures given the available information on the position of the economy at any given time.

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Appendix 1 A Derivation and Loglinearizing of Internal Sector Models

The Household

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma}}{1-\sigma} + \frac{M_t^{1-\nu}}{1-\nu} + \frac{H_t^{1+\gamma}}{1+\gamma} \right] \tag{1}$$

$$P_t C_t + R_{H,t} \gamma_{t+1} + (1 - R_{H,t}) M_t \leq \gamma_t + W_t H_t + BF_t \tag{2}$$

$$\lim_{T \to \infty} E_t(\gamma_T) \geq 0$$

Using variational argument

$$\frac{U_{h,t}}{U_{c,t}} = \frac{W_t}{P_t} \tag{3}$$

$$R_t = \beta E_t \left[\frac{U_{c,t+1}}{U_{c,t}} \frac{P_t}{P_{t+1}} \right] \tag{4}$$

$$U_{c,t} dc_t + U_{h,t} dh_t = 0$$

$$U_{c,t} dc_t + \beta E_t [U_{c,t+1} dc_{t+1}] = 0 \tag{5}$$

$$P_{t+1}dc_{t+1} = -\frac{P_t}{R_t}dc_t \tag{6}$$

From equation 1; equation 3 and 4 becomes

$$\frac{W_t}{P_t} = C_t^\sigma H_t^\varphi \tag{7}$$

$$R_{H,t} = \beta E_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\sigma}\frac{P_t}{P_{t+1}}\right] \tag{8}$$

Log linearizing of equation (7);

$$w_t - p_t = \sigma c_t + \varphi h_t \tag{9}$$

Log linearizing equation 8

$$\log Q_t = \log\beta + E_t[-\sigma\log C_{t+1} + \sigma\log C_t + \log P_t - \log P_{t+1}$$

But, $$P_{t+1} - P_t = \pi_{t+1}$$

Multiply through by (-)

$$-\log Q_t = -\log\beta + E_t[+\sigma\log C_{t+1} - \sigma\log C_t - \log P_t + \log P_{t+1}$$

If, $-\log Q_{t=i_t}$, and $\rho = -\log\beta$, $P_{t+1} - P_t = \pi_{t+1}$

then,

$$\sigma c_t = \sigma E_t[C_{t+1}] + E_t[\pi_{t+1}] - \rho$$

$$c_t = \frac{1}{\sigma}[i_t + E_t(\pi_{t+1}) - \rho] + E_t(c_{t+1})$$

$$\sigma c_t = \sigma E_t[c_{t+1}] - i_t + E_t[\pi_{t+1}] + \rho$$

$$c_t = E_t[c_{t+1}] - \frac{1}{\sigma}[i_t - E_t(\pi_{t+1}) - \rho] \tag{10}$$

The Financial Intermediary

Deriving the ad-hoc money demand;

$$\frac{M_t}{P_t} = Y_t + \frac{1}{\sigma}R_t \tag{11}$$

Log linearizing this equation;

$$m_t - p_t = y_t - \eta i_t \tag{12}$$

Where; $\eta = \frac{1}{v(e^i - 1)}$

The Firm

The firm maximizes

$$P_t Y_t - W_t H_t \tag{13}$$

Subject to

$$Y_t = A_t H_t^{1-\alpha} \tag{14}$$

The FOC becomes;

$$\frac{W_t}{P_t} = (1-\alpha)A_t H_t^{-\alpha} \tag{15}$$

By log linearizing, the labor demand schedule becomes;

$$w_t - p_t = a_t - \alpha h_t + \log(1 - \alpha) \tag{16}$$

Log linearizing equation 14, we get the production function consisting of technology and labor.

$$y_t = a_t + (1 - \alpha)h_t \tag{17}$$

At equilibrium

$$y_t = c_t$$

From equation 10

$$y_t = E_t(y_{t+1}) - \frac{1}{\sigma}[i_t - \rho - E_t(\pi_{t+1})] \tag{18}$$

$$y_t^n + \tilde{y}_t = E_t[y_{t+1}^n + \tilde{y}_{t+1}] - \frac{1}{\sigma}[i_t - \rho - E_t(\pi_{t+1})] \tag{19}$$

$$\tilde{y}_t = E_t(y_{t+1}^n) - y_t^n + E_t(\tilde{y}_{t+1}) - \frac{1}{\sigma}[i_t - \rho - E_t(\pi_{t+1})] \tag{20}$$

$$= E_t(\tilde{y}_{t+1}) - \frac{1}{\sigma}[i_t - \rho + \sigma E_t(\Delta y_{t+1}^n) - E_t(\pi_{t+1})] \tag{21}$$

We know from the Fisherian equation that

$$r_t = i_t - E_t(\pi_{t+1}) \tag{22}$$

The natural interest rate is

$$r_t^n = \rho + \sigma E_t(\Delta y_{t+1}^n) \tag{23}$$

$$r_t^n = \rho + \psi_{y,a}^n E_t(\Delta a_{t+1}) \tag{24}$$

By substituting equation 23 into 21, we derive the equation of the IS curve

$$\tilde{y}_t = E_t(\tilde{y}_{t+1}) - \frac{1}{\sigma}[i_t - r_t^n - E_t(\pi_{t+1})] \tag{25}$$

Log linearizing equation 25, we have

$$y_t = y_{t+1} - \frac{1}{\sigma(i_t - \pi_{t+1} - r_t)} \tag{26}$$

The Taylor monetary policy rule shows that the central bank conducts monetary policy by changing nominal interest rate. Thus, the central bank interest rate rule is given as

$$i_t = \rho + \phi^p i\pi_t + \phi^y y_t + \varepsilon_t^i \tag{27}$$

Technology shock is assumed to follow an AR(1) process as;

$$a_t = \rho^a a_{t+1} + \varepsilon_t^a \tag{28}$$

Given that, $\qquad \hat{r} = r_t - \rho \tag{29}$

Substituting equation 29 int0 24

$$\hat{r}_t = \sigma \psi^{ya} E_t[a_{t+1} - a_t] \tag{30}$$

$$\hat{r}_t = \sigma \psi^{ya} E_t[\rho^a a_t - a_t] \tag{31}$$

$$r_t = \rho + \sigma \psi^{ya}(p^a - 1)a_t \tag{32}$$

Using the total cost function for the firm;

$$W_t H_t = W_t \left(\frac{Y_t}{A_t}\right)^{\frac{1}{1-\alpha}} \tag{33}$$

$$\frac{dW_t H_t}{dY_t} = W_t [A_t (1 - \alpha) N_t^{-\alpha}] \tag{34}$$

We divide through by P$_{t\ to}$ get real marginal cost

$$MC_t = \frac{W_t}{P_t} [A_t (1 - \alpha) N_t^{-\alpha}] \tag{35}$$

Taking the natural log

$$mc_t = w_t - p_t - mph_t \tag{36}$$

Where $\quad MPH_t = \log[A_t (1 - \alpha) H_t^{-\alpha}] \tag{37}$

$$mph_t = a_t - \alpha h_t + \log(1 - \alpha) \tag{38}$$

$$\underline{mc_t} = w_t - p_t - (a_t - \alpha h_t) - \log(1 - \alpha) \tag{39}$$

Making use of equation 9

$$\underline{mc_t} = (\sigma c_t + \gamma h_t) - (y_t - h_t) - \log(1 - \alpha) \tag{40}$$

At equilibrium,

$$\underline{mc_t} = (\sigma y_t + \gamma h_t) - (y_t - h_t) - \log(1 - \alpha) \tag{41}$$

$$= (\sigma y_t - y_t) + (1 + \gamma) h_t - \log(1 - \alpha) \tag{42}$$

$$\underline{mc_t} = \left(\sigma + \frac{\gamma + \alpha}{1 - \alpha}\right) y_t - \frac{1 + \gamma}{1 - \alpha} a_t - \log(1 - \alpha) \tag{43}$$

In the absence of restrictions, mc is constant

$$\underline{mc} = \left(\sigma + \frac{\gamma + \alpha}{1 - \alpha}\right) y_t^n - \frac{1 + \gamma}{1 - \alpha} a_t - \log(1 - \alpha) \tag{44}$$

Subtract equation 44 from 43;

$$\widehat{\underline{mc}}_t = \left(\sigma + \frac{\gamma + \alpha}{1 - \alpha}\right) (y_t - y_t^n) \tag{45}$$

The output gap is expressed as

$$\tilde{y}_t = y_t - y_t^n \tag{46}$$

Given the Phillips curve,

$$\pi_t = \lambda mc_t + \beta E_t \pi_{t+1} \tag{47}$$

Substituting for mc into equation 47

$$\pi_t = \delta \tilde{y}_t + \beta E_t \pi_{t+1} \tag{48}$$

Where $\delta = \frac{(1 - \theta)(1 - \theta\beta)}{\theta} \left(\sigma + \frac{\gamma + \alpha}{1 - \alpha}\right)$

We assume the monetary policy shock to be;

$$v_t = \rho^v v_{t-1} + \varepsilon_t^v \tag{49}$$

We assume the persistence of export demand shock as;

$$EX = \rho^{tot} tot_{t-1} + \varepsilon_t^{tot} \tag{50}$$

The final expression for export demand, derived below is given as;

$$X_t = \left(\frac{1 - \rho}{\rho}\right)^{\frac{1}{\varphi - 1}} \left[\sigma + \left(\frac{1 - \rho}{\rho}\right)^{\frac{1}{\varphi - 1}} \theta^{\frac{1}{\varphi - 1}} \sigma\right]^{-1} \theta^{\frac{1}{\varphi - 1}} \sigma y_t + \frac{1}{\phi_{t-1}}$$
(51)

Appendix 1 B Derivation and Loglinearizing of External Sector Models

In this appendix we discuss the procedure for the resolution of our DSGE model. The method used is based on the works of Meeks (2005) and Uhlig (1995). The key equations are as presented in the main text of the study. Here attention is drawn to the export sector only given that all the other equations are as derived in the preceding appendix.

The framework adopted is that of equilibrium reflecting the complex nature of stochastic dynamic rational expectations models. The standard procedure, as applicable in this case, is to maximize the expected discounted income flow of a representative agent as follows:

$$\text{Income Function: } MaxE\left[\sum_{t=0}^{\infty} \beta^{t+1}\left(PD_t XD_t + PX_t EX_t\right)\right] \dots\dots\dots\dots\dots\dots\dots(1)$$

$$\text{Subject to: } Y_t = A_t\left[\rho EX_t^{\varphi} + (1-\rho)XD_t^{\varphi}\right]^{1/\varphi} \dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

Solving the Model

Solving the model of this nature takes several steps: taking the first order condition, finding the steady-state values, detrending the endogenous variable so as to make them stationary and log-linearization. The first order condition needs to be calculated using decentralized optimization. Then the first order and the equilibrium conditions are stacked together to form a system of equation from which the demand functions could be derived. In this study, the problem is specified as an infinite horizon problem. This poses analytical problem that can be solved by exploiting its recursive structure i.e. the problem facing the social planner in each period is the same as that he faced the previous period and the next period. This recursive structure is known as the dynamic programming.

In essence the social planner's problem, equation (1), is the same over the period in the sense that given the initial stock of capital and technology shock, he chooses the combination of EX_t and XD_t in order to maximize the total income of the representative agent. The income function in equation (1) is time separable since the choice EX_t and XD_t at time t does not affect the marginal utilities of consuming EX_t and XD_t in any other time. The solution of the problem is characterized by a function called policy rule which indicates what the optimal choice is as a function of the current state of the economy.

The representative household faces only one constraint as described by equation (2). This is solved by employing decentralized optimization technique. In this case the value function in the following form may be used

$$V(K,\Omega) = \max\left[P_t Y_t + \beta E\left[v(K_{t+1,}\Omega_{t+1}\right]\right] \dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

However, because the income function is independent of the one period ahead capital stock, K_{t+1} we then resolve to the use of Lagrangean function with a view to finding the necessary conditions. The necessary conditions or the Euler's conditions for this sector will be added to other Euler conditions to which are added the equilibrium conditions to constitute the system of equations to be resolved in order to get the demand

functions of the endogenous variables. Thus, the FOC of this sector is obtained as follows:

$$L(.,\Omega) = (PD_t XD_t + PX_t EX_t) + \lambda \left[Y_t - A_t \left(\rho EX_t^\varphi + (1-\rho) \right) XD_t^\varphi \right]^{1/\varphi} \qquad \text{...........(4)}$$

Taking the first order condition (FOC), we have:

$$\frac{\partial L}{\partial EX_t} = PX_t - \lambda Z^{1/\varphi - 1} \rho \varphi EX_t^{\varphi - 1} = 0 \qquad \text{......................................(5)}$$

where: $Z = \left[Y_t - A_t \left(\rho EX_t^\varphi + (1-\rho) \right) XD_t^\varphi \right]$

$$\frac{\partial L}{\partial XD_t} = PD_t - \lambda Z^{1/\varphi - 1} (1-\rho) \varphi XD_t^{\varphi - 1} = 0 \qquad \text{.....................................(6)}$$

$$PX_t = \lambda Z^{1/\varphi - 1} \rho \varphi EX_t^{\varphi - 1} \qquad \text{...(7)}$$

$$PD_t = \lambda Z^{1/\varphi - 1} (1-\rho) \varphi XD_t^{\varphi - 1} \qquad \text{.................... ....(8)}$$

$$\lambda = \frac{PX_t}{Z^{1/\varphi - 1} \rho \varphi EX_t^{\varphi - 1}} = \frac{PD_t}{Z^{1/\varphi - 1} (1-\rho) \varphi XD_t^{\varphi - 1}} \qquad \text{............................. ...... (9)}$$

$$EX_t = \frac{PX_t}{PM_t} \left(\frac{1-\rho}{\rho} \right) XD_t^{\varphi - 1} \qquad \text{..(10)}$$

$$EX_t = \left[\left(\frac{1-\rho}{\rho} \right) \left(\frac{PX_t}{PM_t} \right) \right]^{\frac{1}{\varphi - 1}} . XD_t \qquad \text{...... ....(11)}$$

Solving for the Steady–State equilibrium:

The variables in the model is deterministic (i.e. none of the variables has a trend). Therefore the steady-state equilibrium is the solution to the equilibrium system of equations constituted by the F.O.C. after we have eliminated the expectation operator; set all exogenous variables equal to their unconditional mean; eliminated all time subscripts; and setting the stochastic term equals to unity. Thus, steady–state equilibrium is such that the endogenous variables are expressed as functions of the deep parameters of the model.

Linearization around the Steady State

The principle of log-linearization is to use Taylor approximation around the steady state to replace all equations by approximations, which are linear functions in the log-deviations of the variables. The log–linearization is obtained by using the technique of dynamic optimization to derive the first-order conditions or the Eulers equations, calculate the steady state and substitute (for all the equations in the FOC as well as the Equilibrium Conditions) each variable x_t by $xe^{\tilde{x}_t}$, where x is the steady state and

$\tilde{x}_t = \log\left(x_t / x^* \right)$ and linearization with respect to $\tilde{x}_t$, is carried out,` around $\tilde{x} = 0$.

Suppose that x_t denote the logarithmic deviation of X_t from its steady state value $\overline{X}$. Then, it follows that:

$$x_t = \log(X_t) - \log(\overline{X})$$

We can then use the following transformation tricks to log-linearize the first order condition around the steady state values:

1. $X_t = \overline{X} e^{x_t} \approx \overline{X}(1 + x_t)$

$2.\ X_t Y_{t-1}^{\rho} = \overline{X}\,\overline{Y}^{\rho} e^{x_t + \rho y_{t-1}} \approx \overline{X}\,\overline{Y}^{\rho}(1 + x_t + \rho y_{t-1})$

$3.\ X_t + Y_t = \overline{X} e^{x_t} + \overline{Y} e^{y_t} \approx \overline{X} + \overline{Y} + \overline{X} x_t + \overline{Y} y_t$

$4.\ x_t y_{t-1} \approx 0$

Thus,

$$EX_t = \left[\left(\frac{1-\rho}{\rho}\right)\left(\frac{PX_t}{PM_t}\right)\right]^{\frac{1}{\varphi-1}}.XD_t \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(12)$$

where PM is assumed to be equal to PD .

$$EX_t = \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}}(TOT_t)^{\frac{1}{\varphi-1}}XD_t$$

Set $\quad \lambda = \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}}$, so that

Using the technique of transformation above, it follows that:

$$EX = \lambda(TOT_t)^{\frac{1}{\varphi-1}}XD_t \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(15)$$

$$EXe^{ex_t} = \lambda TOT^{\frac{1}{\varphi-1}}e^{\frac{1}{\varphi-1}tot_t}XDe^{xd_t} \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\ \dots\dots\dots\dots(16)$$

$$EX(1+ex_t) = \lambda TOT^{\frac{1}{\varphi-1}}\left(1 + \frac{1}{\varphi-1}tot_t\right)XD(1+xd_t) \ \dots\dots\dots\ \quad\dots\dots\dots\dots(17)$$

$$EX + EXex_t = \lambda TOT^{\frac{1}{\varphi-1}}XD\left(1 + \frac{1}{\varphi-1}tot_t\right)(1+xd_t) \ \dots\dots\dots\dots\dots\dots\dots\dots(18)$$

Recall that $x_t y_{t-1} \approx 0$, then $tot_t xd_t \approx 0$. Therefore

$$EX + EXex_t = \lambda TOT^{\frac{1}{\varphi-1}}XD\left(1 + \frac{1}{\varphi-1}tot_t + xd_t\right) \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(19)$$

$$EX^* + EX^*ex_t = \lambda TOT^{\psi^*}XD^* + \lambda TOT^{\psi^*}XD^*\psi tot_t + \lambda TOT^{\psi^*}XD^*xd_t$$

$$EX + EXex_t = \lambda TOT^{\frac{1}{\varphi-1}} + \lambda TOT^{\frac{1}{\varphi-1}}XD\frac{1}{\varphi-1}tot_t + \lambda TOT^{\frac{1}{\varphi-1}}XDxd_t\dots\dots\dots(20)$$

But $EX = \lambda TOT^{\frac{1}{\varphi-1}}XD$, then

$$EX.ex_t = \lambda TOT^{\frac{1}{\varphi-1}}XD\frac{1}{\varphi-1}tot_t + \lambda TOT^{\frac{1}{\varphi-1}}XDxd_t\dots\dots\dots\dots\ \dots\dots\dots\dots\dots(21)$$

Since $\quad xd_t = y_t - ex_t \quad xd_t = y_t - ex_t$, then it follows that:

$$EX.ex_t = \lambda TOT^{\frac{1}{\varphi-1}}XD\frac{1}{\varphi-1}tot_t + \lambda TOT^{\frac{1}{\varphi-1}}XD(y_t - ex_t) \ \dots\dots\dots\dots\dots\dots\dots(23)$$

$$\left(EX + \lambda TOT^{\frac{1}{\varphi-1}}XD\right)ex_t = \lambda TOT^{\frac{1}{\varphi-1}}XD\left(y_t + \frac{1}{\varphi-1}tot_t\right)\dots\dots\dots\dots\dots\dots\dots\dots\dots(24)$$

$$ex_t = \left(EX \quad + \lambda TOT^{\frac{1}{\varphi-1}}XD\ \right)^{-1}\lambda TOT^{\frac{1}{\varphi-1}}XD\ \left(y_t + \frac{1}{\varphi-1}tot_t\right)\dots\dots\dots\dots(25)$$

$$ex_t = \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}}\left[\sigma + \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}}\theta^{\frac{1}{\varphi-1}}\sigma\right]^{-1}\left(\theta^{\frac{1}{\varphi-1}}\sigma y_t + \frac{1}{\phi_{t-1}}\theta\right)\dots\dots\dots\dots\dots(26)$$

Where σ = export demand=export supply at equilibrium, and θ = TOT and $ex_t = X_t$ for purpose of DYNARE coding.

$$X_t = \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}} \left[\sigma + \left(\frac{1-\rho}{\rho}\right)^{\frac{1}{\varphi-1}} \theta^{\frac{1}{\varphi-1}}\sigma\right]^{-1} \left(\theta^{\frac{1}{\varphi-1}}\sigma y_t + \frac{1}{\phi_{t-1}}\theta\right)$$

Appendix 2 A   Tables

Table 4.2.1   Results from Posterior Maximization

parameters	prior mean	mode	s.d.	t-stat	prior	pstdev
phi_y	0.190	0.2194	0.0110	19.9747	gamm	0.0100
rho_z	0.450	0.4495	0.0100	45.1327	gamm	0.0100
rho_d	0.600	0.6140	0.0197	31.0985	gamm	0.0200
rho_tot	0.300	0.2997	0.0100	29.9834	gamm	0.0100
alpha	0.420	0.4190	0.0200	20.9762	gamm	0.0200
beta	0.210	0.2070	0.0098	21.0886	gamm	0.0100
theta	0.540	0.5393	0.0200	26.9815	gamm	0.0200
psi	0.100	0.0960	0.0196	4.8990	gamm	0.0200
phi	0.290	0.2845	0.0396	7.1807	gamm	0.0400
lambda	0.180	0.1778	0.0199	8.9443	gamm	0.0200
epsilon	0.120	0.1167	0.0197	5.9161	gamm	0.0200
sigma	0.120	0.1348	0.0219	6.1656	gamm	0.0200

SD of shocks	prior mean	mode	s.d.	t-stat	prior	pstdev
e_x	0.035	0.1057	0.0182	5.7968	invg	Inf
e_v	0.004	0.0110	0.0008	13.6371	invg	Inf
e_a	0.035	0.0161	0.0066	2.4499	invg	Inf

Log data density [Laplace approximation] is 744.856885.

Table 4.2.2   Estimation Results

parameters	prior.mean	post. mean	conf.	interval	prior	pstdev
phi_y	0.190	0.2141	0.2028	0.2260	gamm	0.0100
rho_z	0.450	0.4480	0.4380	0.4582	gamm	0.0100
rho_d	0.600	0.6153	0.5853	0.6417	gamm	0.0200
rho_tot	0.300	0.2991	0.2862	0.3138	gamm	0.0100
alpha	0.420	0.4066	0.3811	0.4351	gamm	0.0200
beta	0.210	0.2076	0.1974	0.2223	gamm	0.0100
theta	0.540	0.5320	0.5111	0.5578	gamm	0.0200
psi	0.100	0.0997	0.0756	0.1287	gamm	0.0200
phi	0.290	0.2815	0.2289	0.3272	gamm	0.0400
lambda	0.180	0.1701	0.1353	0.1926	gamm	0.0200
epsilon	0.120	0.1116	0.0764	0.1419	gamm	0.0200
sigma	0.120	0.1330	0.0984	0.1652	gamm	0.020

Log data density is 739.744197.

Table 4.2.3 Estimated Standard Deviation of Shocks

SD of shocks	prior mean	post. mean	conf. interval		prior	pstdev
e_x	0.035	0.1121	0.0069	0.1522	invg	Inf
e_v	0.004	0.0109	0.0097	0.0121	invg	Inf
e_a	0.035	0.0213	0.0087	0.0344	invg	Inf
Log data density is 678.684751.						

Table 4.3.1: Matrix of Covariance of Exogenous Shocks

Shocks	e_a	e_v	e_x
e_a	0.000260	0.000000	0.000000
e_v	0.000000	0.000121	0.000000
e_x	0.000000	0.000000	0.011175

where: e_a: Productivity shock

e_m: Money supply shock

e_x: Export supply shock

Table 4.3.2   Theoretical Moments

VARIABLE	MEAN	STD. DEV.	VARIANCE
h	0.0000	0.1494	0.0223
y	0.0000	0.0832	0.0069
i	0.0101	0.0526	0.0028
r	0.0101	0.0001	0.0000
pi	0.0000	0.0536	0.0029
x	-0.0029	0.0003	0.0000
a	0.0000	0.0244	0.0006
m	-0.0211	0.0380	0.0014
v	0.0000	0.0267	0.0007

4.4.1 Variance Decomposition (in percent)

Variables	e_a	e_v	e_x	e_z
h	8.00	74.94	13.39	3.67
y	0.00	81.45	14.56	3.99
i	0.00	70.26	28.98	0.77
r	100.00	0.00	0.00	0.00
pi	0.00	84.92	13.11	1.96
x	19.00	11.45	79.55	0.00
a	0.00	70.00	30.00	0.00
m	0.00	40.00	34.78	14.52
v	0.00	100.00	0.00	0.00

APPENDIX 2B   Figures

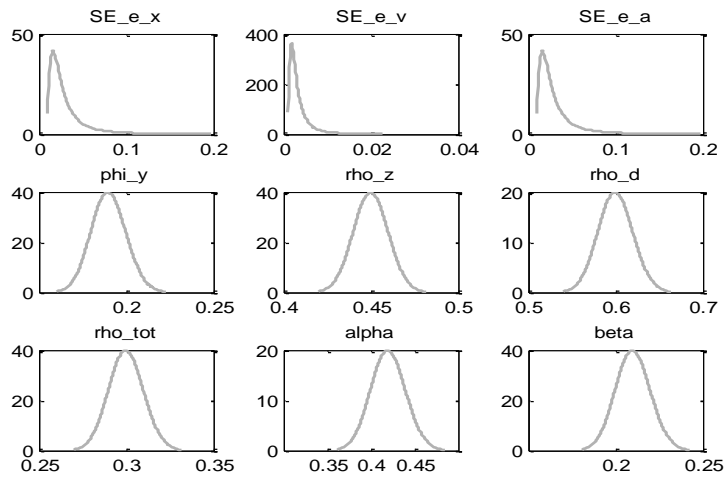**Figure 4.2.1: Prior Distribution of the Parameters**
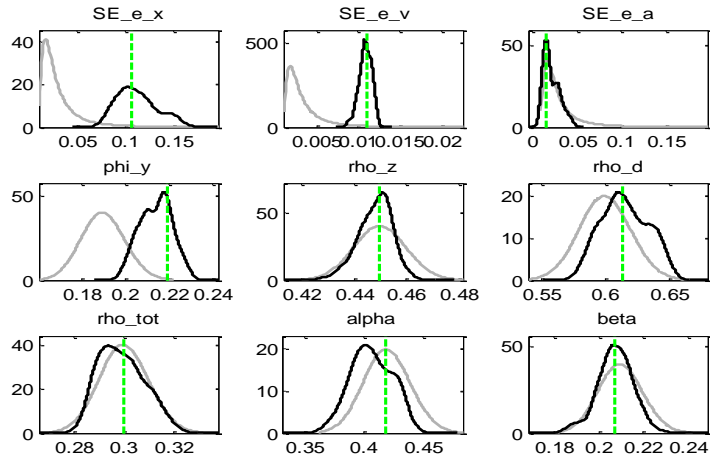

Figure 4.2.2: Priors and Posteriors
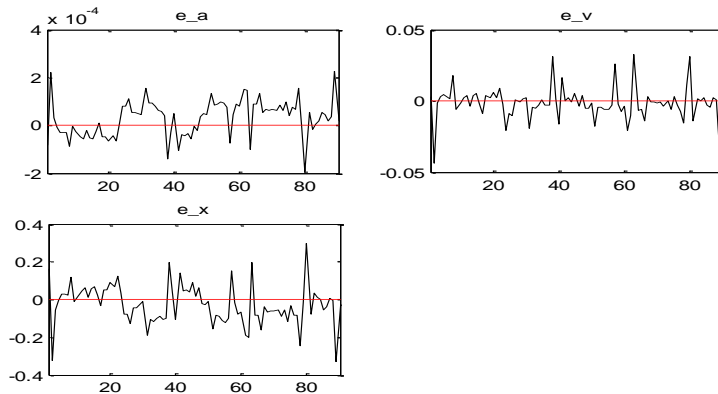

Figure 4.2.3: Smoothed Shocks

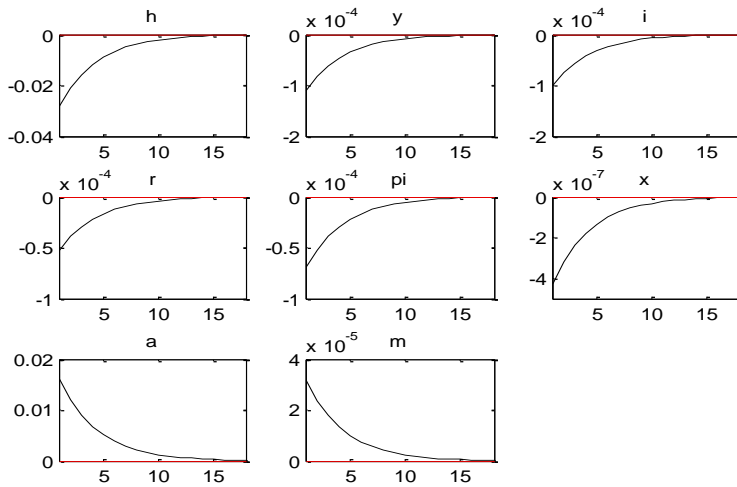**Figure 4.3.1: Orthogonalized Shock to e_a**

Figure 4.3.2: Orthogonalized Shock to e_v
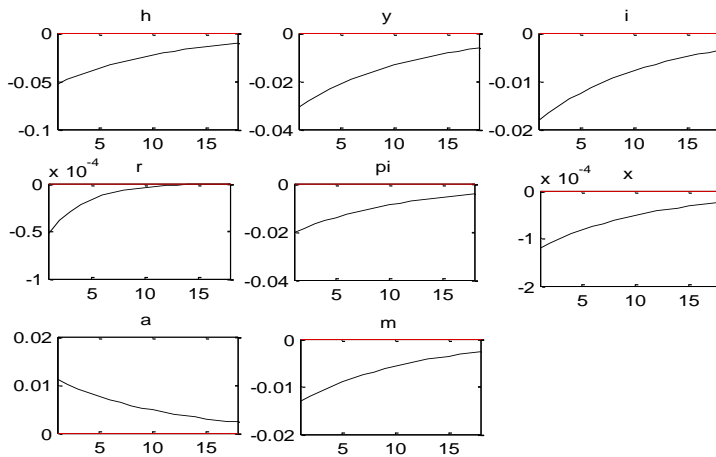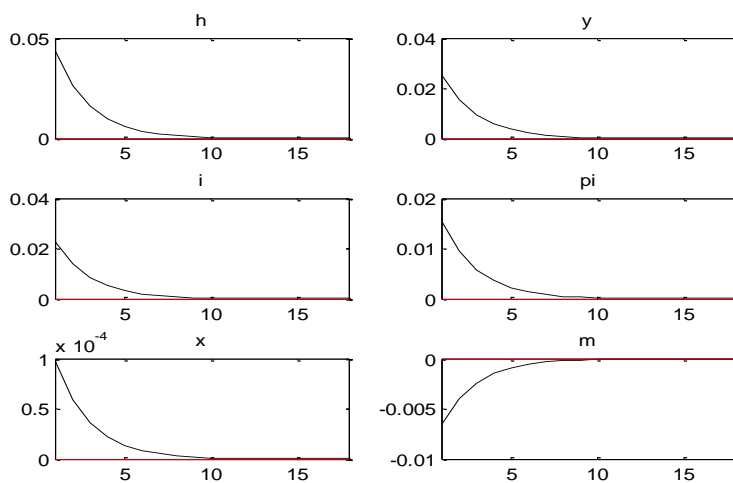

Figure 4.3.3: Orthogonalized Shock to e_x

Appendix 3   Codes Used In Dynare

```
close all;

clc;

%% Specify the variables and the parameters

var y pi i a r h m v d z x tot;

varexo e_a e_v e_x e_z e_d;

parameters alpha beta theta sigma rho_tot phi rho phi_pi phi_y rho_a rho_v
lambda delta psi epsilon eta rho_d rho_z;

alpha=0.33;             % If =0 we have a CRS production technology. Else it's
decreasing returns to scale (see model equation 5).

epsilon=1.66;          % Elasticity of substitution derived from the markup forumla
m=log(epsilon/(epsilon-1)). Using m=1.1.

beta=0.99;           % The discount factor.

theta=0.7;          % Measure of price stickiness. If =0 then prices are flexible.

lambda=0.2;                 % or alternatively derived endogneously through
lambda=(theta^(-1))*(1-theta)*(1-beta*theta)*(1-alpha)/(1-alpha+alpha*epsilon).

rho=-log(beta);         % Real interest rate in the steady state (no shocks).

%rho_tot=0.888;         % Persistence of the export demand shock.

sigma=1;              % Coefficient of risk aversion.

phi=0.787;             % Elasticity of labor supply.

phi_pi=1.1;           % Sensitivity of the central bank with respect to inflation.

%phi_y=0.3;             % Sensitivity of the central bank with respect to the output
gap.

rho_a=0.75;          % Persistence of the technology shock.

rho_v=0.911;            % Persistence of the monetary policy shock.

eta=2.1;              % Elasticity of the money demand with respect to the nominal
interest rate (see Eq.6).

%rho_d = 0.3;          % Persistence of demand shock

%rho_z = 0.5;           % Persistence of markup shock

% The next two parameters are generated for the solution of the model. Note that
when alpha=0, these equations get much easier.

delta=lambda*(sigma+(phi+alpha)/(1-alpha));

psi=(1+phi)*((sigma+phi+alpha*(1-sigma))^(-1));

%% Specify the model

model(linear);

y=y(+1)-1/sigma*(i-pi(+1)-r)+d;       % Eq. 1: The Dynamic IS equation - incl.
demand shock.

pi=beta*pi(+1)+delta*y + z;          % Eq. 2: The New Keynesian Philips Curve -
incl. markup shock.
```

```
r=rho+sigma*psi*(rho_a-1)*a;        % Eq. 3: The evolution of the natural rate of
interest.

i=rho+phi_pi*pi+phi_y*y+v;          % Eq. 4: The interest rate rule of the central
bank.

y=a+(1-alpha)*h;                    % Eq. 5: The production function consisting of
technology and labor. This relationship is only true up to a 1st order
approximation.

m=pi+y-eta*(i);                     % Eq. 6: Ad-hoc money demand.

x=((1-rho)/rho)^(1/(phi-1))*((sigma+((1-rho)/rho)^(1/(phi-1))*theta^(1/(phi-
1))*sigma))^(-1)*(theta^(1/(phi-1))*sigma*(y+(1/(phi-1))*theta)); % Eq. 7: Total
Export demand

a=rho_a*a(-1)+e_a;                  % Eq. 8: Technology shocks follow an AR(1)
process with persistence rho_a.

v=rho_v*v(-1)+e_v;                  % Eq. 9: Monetary policy follow an AR(1)
process with persistence rho_v.

tot=rho_d(-1)+e_x;                  % Eq. 10: Export demand shocks follow an AR(1)
process with persistence rho_tot

d=rho_d*d(-1)+e_x;

z=rho_z*z(-1)+e_z;

end;

%% Specify the observed variable

varobs y i pi;

%% Specify the Bayesian prior

estimated_params;

phi_y,     gamma_pdf, 0.19, 0.01;

rho_z,     gamma_pdf, 0.45, 0.01;

rho_d,     gamma_pdf, 0.60, 0.02;

rho_tot,   gamma_pdf, 0.30, 0.01;

alpha,     gamma_pdf, 0.42, 0.02;

beta,      gamma_pdf, 0.21, 0.01;

theta,     gamma_pdf, 0.54, 0.02;

psi,       gamma_pdf, 0.10, 0.02;

phi,       gamma_pdf, 0.29, 0.04;

tot,       gamma_pdf, 0.18, 0.02;

epsilon,   gamma_pdf, 0.12, 0.02;

sigma,     gamma_pdf, 0.12, 0.02;

stderr e_x, inv_gamma_pdf, 0.035, inf;

stderr e_v, inv_gamma_pdf, 0.004, inf;

stderr e_a, inv_gamma_pdf, 0.035, inf;
```

```
end;
%% Specify the initial values of the variables & the variance of the shocks
 initval;
%  y=0;
 m=0;
x=0;
 h=0;
%  pi=0;
%  i=rho;
 r=rho;
 tot=0;
 a=0;
 v=0;
 e_a=0;
 e_v=0;
 e_x=0;
 end;
shocks;
var e_a;
 stderr 0.014;
var e_v;
stderr 0.014;
var e_x;
stderr 0.014;
end;
%% To estimate the parameters - estimation(datafile=SA_data2010);
estimation(datafile=dataNK4,mh_replic=2000,mh_nblocks=1,mh_drop=0.45);
% The above equations only hold up to a first order approximation. Thus order=1
for the simulation.
stoch_simul(irf=18, order=1) h y i r pi x a m v;
% %% Perform forecast - results stored in
% forecast;
%
% %% Optimal
% optim_weights;
% y 1;
% pi 1;
% end;
```

% osr_params phi_y;

Features of Autism in Some Nigerian Children Seeking Speech Therapy

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Abstract

The autism spectrum disorder (ASD) is the most prevalent developmental disorder in children. Early intervention and intensive multidisciplinary therapy have been documented to improve the outcome of people with ASD. The incidence of autism in Nigeria and on the African continent is unknown. A review of the existing literature on ASD in Africa revealed that sufferers seek orthodox treatment very late. The average age was adduced at 8 years old. Intensive behaviour therapy for those with ASD is minimal, and completely absent from the public service in Nigeria. There are a few government owned speech therapy clinics. This study classifies the caseload of children at a predominant speech therapy clinic in Lagos into their various disorders. Its purpose is to determine the number of children with features of ASD amongst these and the age at which therapy is first sought. The participants were 309 children referred for speech therapy. They ranged in age from 2 to 12 years. They fell into the following categories ASD, attention deficit hyperactive disorders, specific language impairment, mental handicap, hearing loss, phonological disorders, disorders of rhythm, specific learning difficulties and psychological disorders. The largest category (40%) of the children had features of ASD. They sought for therapy at an average age of 3.9 years. This was slightly earlier than for any of the other categories in the study. Highlighted was the need for awareness concerning the benefits of early intervention and intensive therapy for ASD. Also emphasized is an urgent need in Nigeria for facilities and professionals with *autism-specific* training.

Key words: Autism spectrum disorder, Nigeria, early intervention, multidisciplinary therapy.

Introduction

The autism spectrum disorder (ASD) has become the most prevalent developmental disorder in children. Recent reports from a number of industrialized nations place its incidence at below 1 in every 90 live births now over taken Down syndrome which records 1 in 666 live births (Lenoir et al., 2009 & CDC, 2012).

Bakare *& Munir (*2011) reported that there is precious little information about the prevalence of *ASD* on the African continent. Initially, it was even averred that the disorder does not exist in Africa or at least not on the scale to which it occurs in more industrialized nations (Lotter, 1978). On the contrary, current research by Elsabbagh et al., (2012) suggests that the incidence of ASD is quite similar across geo-political regions despite their disparate cultural and economic variables. No epidemiological data yet exists on the prevalence of ASD in Nigeria. Nwanze (2012) summarized some reports emanating from various regions in Nigeria. These noted the existence of ASD in both urban and rural communities.

Intensive therapeutic intervention is associated with improved outcomes in ASD sufferers (Myers & Johnson, 2007; Makrygianni & Reed, 2010; Virues-Ortega, 2010; Nwanze, 2011 & Kovshoff et al., 2011). Research now indicates that early intervention greatly enhances future outcomes. In industrialized nations, ASD is usually diagnosed between the ages of 2 and 3, the period during which early grammars begin to emerge. Pressure is mounting for a diagnosis within the first year of life so that intervention may begin even sooner (Dawson et al., 2009 & Ingersoll, 2011). There is now evidence that some features of ASD may be detectable before the age at which children begin to generate speech (Ingersoll, 2011). An interesting study by Dawson et al., (2009) in which they intervened with children as young as 18 months of age, found that after 2 years of therapy there were notable gains in their cognitive abilities. Some children no longer met the criteria for a diagnosis of ASD. They were upgraded to the less severe condition of a pervasive developmental disorder, not otherwise specified (PDD NOS).

Nwanze, (2011) reported an encouraging outcome from a Nigerian child. At 2 years, 5 months old he met the criteria for the diagnosis of an autistic disorder laid down by the Diagnostic statistical manual of mental disorders - *DSM-IV* (American Psychiatric Association 1994). He then received intensive behaviour therapy for 6 years. Intervention commenced at 2 years, 8 months of age. At the conclusion of therapy, he no longer met the criteria for ASD or even for PDD NOS as stipulated by guidelines from the DSM-IV.

Bakare *& Munir, (*2011) in a survey of the available literature on Africa from 1982 to 2010 expressed some concern. They found that African ASD children appear not to be benefiting from early intervention. These sought professional help much later than did those from industrialized countries. The average age was 8 years old. At this age, many had no speech. The population of those with no speech appeared higher than that reported in the west. The authors suggested that perhaps this could be addressed by speech therapy.

Currently, Nigeria has very few speech therapy clinics and about 5 professional speech and language pathologists. Two clinics are located in Lagos, Nigeria's largest city and commercial hob. There is only one in the capital city of Abuja and another in western Nigeria. Most are manned by a single speech and language pathologist.

This brief report hopes to contribute to the existing Nigerian information on ASD. Following the initial inception of the predominant speech therapy clinic in Lagos in 1976, a survey of its clientele by 1978 revealed no ASD children within its case-load (Okewo & Nwanze, 1978).

This study classifies the case load of children referred to the same clinic over the last 2 years, to determine the quantity of children reporting, with features of ASD and the age at which they seek help.

Method

Participants
The participants were 309 children who were referred to a public service speech clinic in Lagos, for speech therapy. None had enjoyed any form of therapy prior to this referral. Those with multiple conditions were eliminated from the study. The sex distribution was 221 boys and 88 girls. They ranged in age from 2 years to 13 years.

Procedure
Information was gathered on each child with the help of parent interviews and direct observation. The DSM-IV checklists were completed for children who displayed behaviour disorders.

Classification of children
The children were categorized as follows: -

1. **ASD:** Children who fulfilled the DSM-IV criteria for the diagnosis of an autism spectrum disorder. The DSM-IV requires that a child persistently exhibits a minimum of 2 features listed in Category A, 1 from Category B and 1 from Category C of their checklist for a diagnosis of ASD.
2. **ADHD:** Children who fulfilled the DSM-IV criteria for a diagnosis of an attention deficit hyperactive disorder. The DSM-IV stipulates that six or more of the behaviours listed on their ADHD checklist persist in a child for six months or longer, for a diagnosis of ADHD. These behaviours include hyperactivity, inattention, impulsivity and disruptive behaviours which are inappropriate for the child's age level. The DSM-IV dictates that children who meet the criteria for ASD are excluded from this category even where they display these features.
3. **SLI:** The term *specific language impairment* refers to children with an otherwise high profile of abilities with delays specific to the development of language alone. Parents of children placed in this category reported age appropriate developmental milestones except for in the area of language acquisition. Their language was clinically assessed for delays.
4. **MH:** The term *mental handicap* refers to children with an across the board low profile of abilities. For the purpose of this study, this category includes children whose medical conditions restrict IQ such as chromosomal disorders, *athetoid* or *ataxic* cerebral palsy.
5. **HL:** Refers to children whose audiological evaluations indicated *hearing loss*.
6. **OTHER SPEECH DISORDERS (OSPE.DIS):** Children who stammer, clutter or have phonological disorders were placed in this category.

7. **SLD:** A number of children were referred for speech therapy who had no speech disorder but showed specific learning difficulties at school.

8. **PSYCHOLOGICAL DISORDER (PSYCH):** This refers to children with behavioural challenges other than *ASD* and *ADHD*.

Hearing assessment

Auditory Brain Stem Response audiometry (ABR) had been conducted on each child prior to their referral for speech therapy. This was to determine each child's hearing acuity.

Results

CASE	NO	PERCENTAGE (%)
ASD	124	40
MH	47	15
SLI	40	13
ADHD	35	11
SLD	29	9
HL	17	6
OSPE.DIS.	15	5
PSYCH.	2	1
TOTAL	309	100

The largest single category of children (40%) was those with features of ASD. Children with mental handicaps came in a distant second, comprising 15% of the children. Those with fluency disorders and children with phonological errors comprised only 5% of this population.

CASE	$\overline{x}$ Mean	Range	Standard deviation (SD)
ASD	3.9	2 – 12	1.769
MH	4.2	2 – 13	3.207
SLI	4.2	2 – 12	1.934
ADHD	4.7	2 – 12	2.066
OSPE.DIS.	5.3	3 – 11	
HL	6	2 – 12	
PSCHY	6	5 – 7	
SLD	6.8	3 – 12	

Children with *ASD* sought therapy at an earlier age than did children with other challenges. Most of the children who requested for therapy at a later age fell into categories which did not include language delays. These were the stutterers, clutterers, children with phonological disorders and learning difficulties.

CASE	MALE	FEMALE
ASD	2.6	1
MH	2	1
ADHD	2	1
SLI	5	1

All the conditions displayed a male preponderance over females. The *SLI* group had the highest male/female disparity.

Discussion

This report found that children classified with features of ASD comprise the largest single block of children seeking speech therapy, departing from an earlier report from the same clinic (1976 to 1978) in which no cases of ASD were reported (Okeowo & Nwanze, 1978). The ASD group exceeds in number other categories of children whose conditions are more *conventionally* seen in speech therapy clinics. The public service in Nigeria only provides a few speech and language therapy clinics. These alone cannot provide the intensive and multidisciplinary therapeutic requirements of people with ASD. A recommended therapy team should include speech and language, behaviour and occupational therapists, all of which are in short supply in Nigeria (Myers & Johnson, 2007; Makrygianni & Reed, 2010 & Kovshoff et al., 2011).Only a handful of privately owned services offering intensive behaviour therapy to ASD sufferers now exist. These are only assessable to the affluent few. There is an urgent need for the training of relevant therapists to enhance the outcomes of Nigerians suffering from ASD.

Lagos is a large upwardly mobile urban city in which perhaps the awareness about ASD is increasing and more people are exploring conventional help. It may not be representative of what obtains in other parts of Nigeria. In 2009, Bakare et al., surveyed 134 nurses with an added specialization in psychiatry or pediatrics. They were taken from specialist hospitals in a different region of Nigeria namely from the south-eastern and south-south zones. Forty percent of these respondents cited supernatural or preternatural causes of ASD as its perceived etiology. Their answers alluded to ancestral spirits, demonic activity, sin and an attack from enemies. Those authors raised concern that such health workers are unlikely to direct the families of ASD sufferers to orthodox treatments.

The children with ASD features in the present study were on average close to 4 years old when they first requested for therapy. This is younger than what generally appears to obtain on the African continent. A review of the literature on ASD between 1982 and 2010 adduced an average age of 8 years as the age of presentation for orthodox treatment across four African countries. These were Tunisia, Tanzania, Kenya and Nigeria (Bakare & Munir, 2011). There is however still a need to sensitize Lagos families with ASD children to seek treatment even earlier than 4 years. This is because there are encouraging results regarding the outcomes of children who begin intervention before the age of 3 years (Dawson et al., 2009 & Ingersoll, 2011). Hence even in Lagos much public enlightenment still needs to be done.

This article seeks to bring into focus the many needs of ASD sufferers in Nigeria. These include an urgent requirement for appropriate services, government involvement, trained professionals and public enlightenment campaigns. Much research is of the essence particularly in the areas of early detection and perhaps in the effective training of non-professional community workers to address what appears to be a rising challenge.

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Influence of Shading on the Early Seedling Growth of *Picralima Nitida* (Stapf).

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Abstract

Seedlings respond to different light regimes for their growth and development. This study focused on the growth of *Picralima nitida* (Stapf) seedlings under different light intensities. Seeds of *P. nitida* were extracted from the fermented fruits manually and raised in washed river sand. One hundred and twenty (120) uniformly growing seedlings were transplanted into polythene bags filled with top soil. After three weeks of acclimatization, thirty (30) seedlings were transferred under three levels of light intensity. Each level was obtained by using cages covered with one layer, two layers, and three layers of fine mesh – green coloured net to achieve 75%, 50% and 25% light intensities respectively. The remaining thirty (30) seedlings were left without cover to achieve full (100% light intensity). Metric characters of the seedlings were taken fortnightly; biomass production of the seedlings was assessed fortnightly from three months after transplanting (3MAT). There were significant (P≤0.05) differences in height, collar diameter, leaf area, shoot dry weight (SDW), leaf dry weight (LDW), root dry weight (RDW) and Total dry weight (TDW) of seedlings grown under different light regimes. The highest mean values of 4.22cm, 1.77cm, 7.65, 11.02cm, 0.47g, 0.82g and 156.72cm² for collar diameter, inter-node length, number of leaves, seedling height, SDW, RDW and Leaf area respectively, were recorded for seedlings raised under 25% light intensity. While the lowest mean values of 3.88cm,1.57cm, 6.96, 8.74cm², 0.30g, 0.66g, 0.15g and 91.43cm² for collar diameter, inter-node length, number of leaves, seedling height, SDW, RDW and leaf area respectively were reported for seedlings under 100% light intensity. *P. nitida* seedlings responded well in terms of growth and development to reduced light intensity, thus it is a shade tolerant species which can be used as an agroforestry species.

Keywords: Early seedling growth, light intensity, acclimatization and *Picralima nitida*

Introduction

Throughout the tropics there are numerous perennial tree species that have provided indigenous people with many of their needs for millennia {Leakey, (1998); Okafor and Lamb, (1994); Abbiw, (1990)} However, there is little experience on silvicultural management of many of these species in addition to the inadequate understanding of their ecological requirements, especially at the early stage of regeneration.

Light is generally recognized as the most influential environmental factor affecting the growth of trees (Karsai *et al*., 2008). Different authors confirmed the importance of irradiance on seedling growth and survival of tree species. Mayer and Mayber (1982) and Osunkoya *et al*. (1994) found that many trees reduced their growth in terms of root size and weight with reduced light intensity. Moreover, Aref (2000) indicated that reduced light was one of the factors that led to the mortality of young plants. Therefore, sufficient understanding of the influence of light on the survival, growth and regeneration of plant is needed for silvicultural guidelines for successful intercropping (Affendy *et al*., 2011).

Picralima nitida (Stapf) is a multipurpose tree species and a medicinal plant with numerous end-uses: extracts from its seeds, fruit rind and stem bark demonstrated anti-malaria activity (Iwu and Klayman, 1992), antimicrobial effect (Fakeye *et al*., 2002), anti-inflammatory and analgesic actions (Duweijua, 2002). It is used in traditional medicines in the treatment of jaundice and yellow fever, ottitis, pneumonia and other chest conditions. Sometimes it is used as laxatives and in the treatment of venereal diseases among others. Nevertheless, a series of important crystalline alkaloids have been identified in the seeds, and have acquired names based on it: akuammine, akuammidine, akuammiline, akuammigine. Akuammine is the main alkaloid found in the seeds (http://www.bluelight.ru/vb/threads/370536-Akuammine-and-other-Indolic-Opioids); it has a local anesthetic action almost equal to that of cocaine (Irvine, 1961).

Despite all the benefits derivable from this forest species, its genetic base is seriously threatened as a result of over exploitation hence, the need for reforestation. However, light intensity differential results in fluctuated seedling growth in the nursery and in return affect the development of the seedlings of forest species in reforestation and afforestation activities.

Various light regimes have been suggested for the growth of different species {Quero *et al*. (2008); Gbadamosi *et al*. (2009)}; therefore, this study was carried out to assess and recommend the optimum light regime for the early seedling growth of *P. nitida* in the nursery.

Materials and Methods

Mature fruits of *P. nitida* were collected from National Institute for Oil Palm Research, Benin, Southern Nigeria (Lat. 6^0 23^1N and Long. 5^0 13^1E). Seeds were extracted from the fermented fruits manually. Three hundred pure seeds were randomly selected and these were sown in washed and sterilized river sand in the screen house. The experiment was set up at the National Centre for Genetic Resources and Biotechnology, Moor plantation Ibadan, Nigeria (Lat. 7^0 24^1N and Long. 3^0 49^1E). At the two-leaf stage, 120 uniformly growing seedlings were transplanted into polythene bags filled with 800g of top soil. These were allowed to wean for three weeks and later transferred to the open nursery. The seedlings were grouped into three equal sets of 30 each. The first set was

taken under wooden cages covered with three layers of fine mesh green coloured net to achieve 25% light intensity. Another set was taken under wooden cages covered with two layers of fine mesh green coloured net to achieve 50% light intensity. The third set was placed under wooden cages covered with one layer of net to achieve 75% light intensity (Odeleye, 1998), while the remaining seedlings were left uncovered to receive 100% light intensity. The seedlings were laid out in completely randomized design. Readings were taken forth-nightly.

Seedlings morphological traits of height, collar diameter and number of leaves were measured fortnightly for 12weeks. Height of the seedlings were measured from the collar to the tip of the apical bud using a ruler calibrated in centimeter, Collar diameter readings were taken using veneer caliper while the number of leaves of each seedling were counted and recorded.

Five seedlings were randomly selected every fortnight under each light intensity treatment at three months after transplanting for biomass assessment. These seedlings were separated into root and shoot components. The leaf area of each seedling was determined using the Leaf Area Meter. The root and shoot components of each seedling were put into separate envelopes for ease of identification. Each envelope was weighed using an electronic weighing balance to determine the fresh weight of the samples after which the envelopes together with their contents were oven dried for 24h at 80°C. The samples were reweighed to get the dry weights.

The data obtained were subjected to ANOVA, using statistical analysis system (SAS) and means were separated using Duncan's Multiple Range Test (DMRT) at 5% level of significance.

Results

Seedling metrical traits

The effect of light intensity was significant ($P \leq 0.05$) on the collar diameters of seedlings of *P. nitida* under different light intensies (Table 1). The highest mean collar diameter value of 4.22cm was obtained in seedlings under 25% light intensity, which was significantly ($P \leq 0.05$) higher than the 4.02cm and 4.04cm obtained in seedlings under 50% and 75% light intensities respectively. Seedlings under 100% light regime had the lowest mean collar diameter value of 3.88cm.

There were no significant ($P \leq 0.05$) differences in the inter-node length among seedlings of *P.nitida* under different light regimes (Table 1). The highest mean inter-node length of 1.77cm was recorded in seedlings under 25% light intensity, followed by seedlings under 50% light intensity with a mean value of 1.72cm. Seedlings under 75% had a mean value of 1.59cm, while seedlings under 100% light intensity had the lowest mean inter-node length value of 1.57cm.

There were no significant ($P \leq 0.05$) differences in the number of leaves among seedlings of *P. nitida* under different light regimes. The highest mean number of leaves of 7.65 was obtained in seedlings under 25% light intensity, seedlings under 75% light intensity had a mean value of 7.37,mean value of 7.30 was recorded for seedlings under 50% light intensity while the lowest mean value of 6.96 was obtained from seedlings under 100% light intensity (Table 2).

The effect of light regime was highly significant ($P \leq 0.05$) on height growth of seedlings of *P. nitida* (Table 1). Seedling height increased with decreased light intensity.

The highest mean height value of 11.02cm was obtained in seedlings under 25% light intensity. This was followed by seedlings under 50% light intensity with a mean value of 10.07cm and seedlings under 75% light intensity with a mean value of 9.64cm, seedlings under 100% light intensity had the lowest mean value of 8.74cm (Table 2).

Seedling Biomass.

The biomass of *P.nitida* seedlings increased with reduced light intensity. There was no significant difference ($P \leq 0.05$) in root dry weight (RDW), shoot dry weight (SDW) and leaf dry weight (LDW) of seedlings under different light intensities (Table 3). The highest RDW of 0.82g was recorded in seedlings transferred under 25% light intensity, seedlings under 50% light intensity had a mean RDW of 0.80g, which was followed by seedlings under 75% light intensity with a mean value of 0.74g while the lowest mean value of 0.51g was obtained from seedlings raised under full light intensity. The highest mean SDW of 0.47g was recorded in seedlings raised under 25% light intensity, a mean SDW value of 0.43g was recorded in seedlings grown under 50% light irradiance, seedlings under 75% light intensity had a mean value of 0.39g. The lowest mean SDW value of 0.30g was obtained in seedlings grown under 100% light intensity (Table 4).

The effect of light intensity was significant ($P \leq 0.05$) on the leaf area of seedlings (Table 3). Seedlings placed under 25% light intensity had the highest mean leaf area of 156.72cm², this was followed by seedlings grown under 50% light intensity with a mean value of 151.78cm², seedlings grown under 75% light intensity had a mean value of 138.95cm² while seedlings grown under full light irradiance had the lowest mean leaf area of 91.43cm² (Table 4).

The effect of shading was significant ($P \leq 0.05$) on the total dry weight (TDW) of seedlings. TDW increased with reduced light intensity. Seedlings under 25% irradiance had the highest TDW mean value of 2.31g, seedlings under 50% irradiance had a mean value of 2.21g while the lowest value of 1.52g was obtained among seedlings under 100% irradiance. The mean TDW of seedlings under full light intensity was significantly different from those of other treatments (Table 4).

Net Assimilation Rate (NAR)

Overall NAR values in seedlings under different irradiance varied. Seedlings under 25% irradiance had a overall positive value of $0.0023 g/m^2/wk$, 75% irradiated seedlings had $0.003 g/m^2/wk$ while seedlings under full light had the lowest overall NAR value of $-0.0012 g/m^2/wk$ (Table 5).

Relative Growth Rate (RGR)

Positive overall RGR values of 0.1501g/g/wk, 0.0799 g/g/wk and 0.2046 g/g/wk were obtained in seedlings under 25%, 50% and 75% irradiance respectively. Seedlings that received full light intensity had -0.0578 g/g/wk overall RGR (Table 6).

Discussion

Light affects plant growth and development at all levels of organization and it is usually important in the initial establishment of seedlings; therefore the response of plants to light is vital to plant development. Plants in natural environments can experience frequent fluctuations in irradiance from full sun to deep shade caused by under storey shading and within canopy shading (Knapp and Smith, 1987). When plants experience a

change from high to low light intensity, a photosynthesis deactivation process occurs due to a reduction in stomatal conductance (Kirschbaum and Gross, 1988) and an increase in biochemical limitations.

The result of this study showed that *P. nitida* is a shade tolerant species at the early seedling growth stage, highest height growth in the seedlings was obtained when plants received one fourth of the available light. Similar result was obtained by Gbadamosi *et al.,* (2009) who concluded that increased light intensity reduced height growth of some tropical tree seedlings. On the other hand, some tropical tree seedlings have been found to increase in height and other growth parameters under increased irradiance (Welander and Ottosson, 1998).

The highest values for collar diameter, inter-node length and number of leaves obtained in seedlings grown under 25% irradiance, implies that the seedlings of *P. nitida* does not need much light intensity for effective growth.

The shoot dry weight increased with decreasing light intensity, also the allocation of biomass to leaves increased with decreasing irradiance with a simultaneous increase in root dry weight. The irradiance treatments had little effect on dry mass allocation to roots in that, there was no significant difference in the root dry weight among seedlings grown under 75%, 50% and 25% light intensities, but there was a distinct difference in the root dry weight between seedlings grown under 75% and 100%. This is because *P. nitida* seedlings can still survive under a moderate irradiance but the growth will be retarded or stunted when exposed to full light.

The leaf is the region for photosynthetic activities and it contains the apparatus that trap light energy for the production of photoassimilates. Highest biomass of leaf was obtained under 25% light intensity, this agreed with the findings of Vincent (2006) that increase in leaf temperature may reduce the production of leaves and leaf life span. However, the anatomy of some leaves is highly specialized for light absorption such that seedlings under high light intensities produce higher number of leaves (Terashima and Hikosaka, 1995) and in return high biomass production in the leaf region.

Juvenile growth of *P. nitida* seems to be favoured by shading as NAR and RGR values of seedlings under full irradiance were negative compared to those under shade.

Conclusion

Picralima nitida seedlings demonstrated low requirement of light intensity. Placement of *P. nitida* seedlings under shade or under low light intensity is recommended to enhance the early growth process and improve the quick establishment of the species on the field. Also, *P. nitida* is a shade tolerant species which can be used in enrichment plantings in natural forests as well as in agroforestry practice where light available for seedling growth is reduced.

Acknowledgement

Table 1: Analysis of variance for metrical traits in seedlings of *P. nitida* under different light regimes

		Height		Collar diameter		Number of leaves		Inter-node length	
SV	DF	MS	F	MS	F	MS	F	MS	F
Treatment	3	335	45.75*	7.29	14.57*	30.3	5.63	2.80	7.22
Error	1493	7.33		0.50		5.39		0.39	
Total	1496								

*Significance at 5% probability level

Table 2: Means values of seedlings biomass in *Picralima nitida* under different light intensities.

Treatment (Light intensity)	Collar Diameter(cm)	Inter-node length(cm)	Number of leaves	Seedling height(cm)
100%	3.88 [c]	1.57 [b]	6.96 [c]	8.74 [d]
75%	4.04 [b]	1.59 [b]	7.37 [ab]	9.64 [c]
50%	4.02 [b]	1.72 [a]	7.30 [b]	10.07 [b]
25%	4.22 [a]	1.77 [a]	7.65 [a]	11.02 [a]

[abc] Means with the same letter are not significantly different (P≤0.05)

Table 3: Analysis of variance for metrical traits of P. *nitida* seedlings under different light intensities

SV	DF	RDW		SDW		LDW		LA		TDW	
		MS	F	MS	F	MS	F	MS	F	MS	F
Treatment	3	0.36	4.69	0.09	3.13	0.42	4.41	16002.7	16.72*	2.58	6.34*
Error	68	0.08		0.03		0.10		957.04		0.41	
Total	71										

*Significance at 5% probability level

Table 4: Means values of seedlings biomass of *Picralima nitida* under different light intensities.

Treatment		Shoot DWt (g)	Leave DWt (g)	Root DWt (g)	Total DWt (g)	Leave Area (LA) (cm²)
100% intensity	light	0.30[b]	0.66[b]	0.51[b]	1.52[a]	91.43[b]
75% intensity	light	0.39[a b]	0.90[a]	0.74[a]	2.15[b]	138.95[a]
50% intensity	light	0.43[a]	1.01[a]	0.80[a]	2.21[b]	151.78[a]
25% intensity	light	0.47[a]	0.96[a]	0.82[a]	2.31[b]	156.72[a]

[ab] Means with the same letter are not significantly different (P≤0.05)

Table 5: Net Assimilation Rate (NAR) in *Picralima nitida* seedlings under different light intensities

Treatment	Wk2-4	Wk4-6	Wk6-8	Wk8-10	Wk10-12
100% light Intensity	0.0018	-0.0005	0.002	-0.0046	0.0001
75% light Intensity	0.0029	-0.0023	-0.0003	0.0015	0.0012
50% light Intensity	0.0011	-0.0013	0.0036	-0.0023	-0.0012
25% light Intensity	-0.0006	0.0024	0.0016	-0.0019	0.0008

Table 6: Relative Growth Rate (RGR) in *Picralima nitida* seedlings under different light intensities

Treatment	Wk2-4	Wk4-6	Wk6-8	Wk8-10	Wk10-12
100% light Intensity	0.1167	-0.0177	0.1146	-0.2798	0.0084
75% light Intensity	0.1929	-0.1452	-0.0275	0.1086	0.0758
50% light Intensity	0.0723	-0.0881	0.2528	-0.1493	-0.08
25% light Intensity	-0.0451	0.1582	0.0972	-0.1179	0.0577

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Effectiveness Teaching Methods (ETM) and Effectiveness Instructor Characteristics (EIC): A Comparative Study among Universiti Tenaga Nasional (UNITEN) accounting students.

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Abstract

The aims of the study included: 1) to determine the significant difference between male and female of bachelor accounting students on the perception of ETM, 2) to determine the significant difference between male and female of bachelor accounting students on the perception of EIC, 3) to determine the significant differences across the Malay, Chinese, Indian and other races students on the perception of ETM, 4) to determine the significant differences across the Malay, Chinese, Indian and other races students on the perception of EIC, 5) to determine the significant differences across Above Average, Average and Below Average CGPAs on the perception of ETM and 6) to determine the significant differences across Above Average, Average and Below Average CGPAs of EIC. The contributions of this study included to add to the literatures in this area in Malaysia and as guidance to academicians in order to deliver their services to certain groups of accounting students in UNITEN. The results suggest that there are no significant differences among gender and CGPAs on the perceptions of ETM and EIC but there are significant differences between the Malay and Indian students on the perceptions of EIC.

Keywords: effectiveness teaching methods; effectiveness instructor characteristics; significant differences

Introduction

The perception of higher education accounting students towards the service of higher accounting education provider remains significant. This matter which is parallel with Hassall and Joyce (2001) found that by studying the students' perceptions, it will decide how the students approach their learning. This research consists of a survey of 440 accounting students in Universiti Tenaga Nasional, Malaysia (UNITEN) in relation to their perceptions on the Effectiveness Teaching Methods (ETM) and Effectiveness Instructor Characteristics (EIC). Thus, this research leads to the following research questions:

- Is there no significant difference between male and female of bachelor accounting students on the perception of ETM?
- Is there no significant difference between male and female of bachelor accounting students on the perception of EIC?
- Are there no significant differences across the Malay, Chinese, Indian and other races students on the perception of ETM?
- Are there no significant differences across the Malay, Chinese, Indian and other races students on the perception of EIC?
- Are there no significant differences across Above Average, Average and Below Average Cumulative Grade Point Averages (CGPAs) on the perception of ETM?
- Are there no significant differences across Above Average, Average and Below Average CGPAs of EIC?

The contributions of this study included to add to the literatures in this area in Malaysia since the researcher found only three studies in this area in Malaysia namely by Fatima, Nik, Putri and Anita (2007) in the survey of third and final year accounting students in two public universities in Malaysia, Rosle, Junainah, Lim and Zaiton (2009) in the survey of accounting students in Universiti Malaysia Sabah, Malaysia and Norhidayah, Kamaruzaman, Syukriah, Najah and Azni (2009) in the survey of accounting students in Universiti Teknologi MARA Kedah, Malaysia. Furthermore, this study serves as a guide to academicians in order to deliver their services to certain groups of accounting students in UNITEN. This study varies from previous researches in two ways. Firstly, the sample is from private university which is referring to UNITEN. Secondly, the hypotheses development is to determine the significant differences among the groups of respondents. Therefore, the aims of the study are:

- To determine the significant difference between male and female of bachelor accounting students on the perception of ETM.
- To determine the significant difference between male and female of bachelor accounting students on the perception of EIC.
- To determine the significant differences across the Malay, Chinese, Indian and other races students on the perception of ETM.
- To determine the significant differences across the Malay, Chinese, Indian and other races students on the perception of EIC.
- To determine the significant differences across Above Average, Average and Below Average CGPAs on the perception of ETM.
- To determine the significant differences across Above Average, Average and Below Average CGPAs of EIC.

This study begins with the literature reviews that integrated the discussion of framework and development of hypotheses, research methodology included in the discussion of sample and measurement used, results and discussions and ends with the conclusion together with several recommendations and limitations.

Literature Review and Hypotheses Development

Many literatures view ETM in many ways and there are various implications on the teaching styles. Albrecht and Sack (2001) and French and Coppage (2000) argued that the accounting teaching methods need to be shifted to student-centered learning (SCL) approaches. The meaning of SCL approaches included the student participation in learning, case-studies, simulations, group projects that consist of guest speakers from the industries or accounting profession and etc. In his speech at the Book Launching on Case Study of Integrated Accounting Programme and Research Directions, YB, Dato Seri Mohamed Khaled Nordin, Minister of Malaysia Higher Education also requested for the application of the SCL at all higher education institutes in Malaysia.

According to Yilmaz (2009), character references apparent honesty and trustworthiness. Tootoonchi, Lyons and Hagen (2002) found that the knowledge of the teacher on subjects' matter is significantly important if teachers wish to be successful and the fundamentals to teaching excellence include the teachers' attitudes and communication and motivational skills. On the other hand, Patrick, Hisley and Kempler (2000) found that the instructor's enthusiasm is of paramount importance in motivating students to learn. When instructors are viewed as competent, trustworthy and caring sources of knowledge and academic support, several important classrooms elements are enhanced such as the learning and effects of the course and instructor (McCroskey, Valencic and Richmond, 2004).

Yilmaz (2009) mentioned that one of the challenges to perceived credibility occurs when instructors must provide detailed feedback about the students' work, advising the students' work and the face-threatening nature of instructional feedback. Furthermore, Nonis and Hudson (2004) found that there are five dimensions of the students' perception of effective teaching including the rapport, classroom interaction, enthusiasm, clarity and learning. Colker (2008) also found that there were four characteristics of an effective teacher including having a sound knowledge of the subject matter, having personal interest in each student, establishing a caring or loving or warm atmosphere and finally showing enthusiasm with students.

In the issue of gender, Fatima *et al.* (2007) found the differences in the perceptions of male and female students on ETM for only two items: *Have students conduct the lecture* (p = 0.041, significant levels at 5%) and *Use of Objective tests* (p = 0.08, significant levels at 10%). The male students believed in '*Have students conduct the lecture*' to be a more effective teaching method than the female students. Fatima *et al.* (2007) also found that the students' perceptions of EIC do not differ much across gender. Therefore, the following two hypotheses have been developed:

Ho1 There is no significant difference between male and female of bachelor accounting students on the perception of Effectiveness Teaching Methods (ETM).

Ho2 There is no significant difference between male and female of bachelor accounting students on the perception of Effectiveness Instructor Characteristics (EIC).

Fatima *et al.* (2007) also discovered that the Malay students have different perceptions of ETM and EIC compared to others. Only 15 statements differ between the Malay and others on ETM and 18 statements on EIC. Therefore, the following two hypotheses have been developed:

Ho3   There are no significant differences across the Malay, Chinese, Indian and other races students on the perception of Effectiveness Teaching Methods (ETM).

Ho4   There are no significant differences across the Malay, Chinese, Indian and other races students on the perception of Effectiveness Instructor Characteristics (EIC).

In terms of CGPA, Fatima *et al.* (2007) highlighted that the students' perceptions of the effectiveness of teaching methods are significantly different when compared to the basis of students' prior academic performance. Fatima *et al.* (2007) also found that students with above average of CGPAs tend to perceive student-centered teaching methods as being more effective compared to students with lower average of CGPAs. In terms of EIC, Fatima *et al.* (2007) indicated that EIC is deemed effective by the lower and average CGPAs as well as tend to be more teaching skills based, rather than knowledge based. On the other hand, they would require instructors with more effective communication and teaching skills to assist them to understand the subject matter. Therefore, the following two hypotheses have been developed:

Ho5   There are no significant differences across Above Average, Average and Below Average CGPAs on the perception of Effectiveness Teaching Methods (ETM).

Ho6   There are no significant differences across Above Average, Average and Below Average CGPAs of Effectiveness Instructor Characteristics (EIC).

Research Methodology

Instrument

The survey instrument was adapted from Tootonchi *et al.* (2002) as similar instrument was also adopted by Fatima *et al.* (2007), Rosle *et al.* (2009) and Norhidayah *et al.* (2009) in previous studies. The survey begins with a cover letter to introduce the purposes of the study, significance of the study and continues with the next three sections. Section A discusses on the demographics of the respondents that included the students' year, gender, race and current CGPA's. Section B consists of twenty three statements covering the effectiveness of teaching methods and Section C consists of twenty seven statements that cover the effectiveness of the instructor characteristics. All statements in Section B and C adopted the five-point Likert-type scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The researcher also ran through a pilot study of 90 accounting students in UNITEN and found that the Cronbach's alpha values are 0.839 (ETM) and 0.950 (EIC) respectively. Both values suggest that the two variables used in this study have an excellent internal consistency to represent the variables.

Sample

Biggs (2003) and Ramsden (2003) mentioned that the students' perceptions of teaching quality and teaching environment which are linked to their learning approaches play a pivotal role in their learning outcomes and the researcher agreed with the statement. As mentioned previously, the respondents in the survey consist of 440 students out of 1,136 from the first until final year of UNITEN accounting students in Semester III, 2011/2012, January 2011. The sample was more than enough since the expected

sample was 291 from 1,200 respondents with 95% confidence level and 0.05 degree of accuracy. This is based on the schedule proposed by Krejcie and Morgan (1970). Contact was made with several accounting lecturers to obtain their permission to consume their lecture time for 20 minutes. Once the permission is obtained, the researcher explained on the purposes of the study and significance of the study to the students. The researcher gave an opportunity to the students to ask if there were any doubts with the survey instrument.

Results

Table I summarizes the demographic profile of respondents. Based on the students' year, the final year students contributed to the highest percentage which is 42.3%. The percentage of male is 27.9% and 69.5% for female. Based on the race, the Malay students contributed to the highest percentage which is 71.7% and others are at the lowest percentage. The highest percentage for the current CGPA comes from the average CGPA which is 69.2%.

Table I

Demographic Profile of Respondents

		Frequency	**Percent**
Students' Year	1st year	75	16.6
	2nd year	34	7.5
	3rd year	140	31.0
	Final year	191	42.3
Gender	Male	126	27.9
	Female	314	69.5
Racial	Malay	324	71.7
	Chinese	21	4.6
	Indian	81	17.9
	Others	14	3.1
Current CGPA	3.50-4.00 (Above average)	79	17.5
	2.50-3.49 (Average)	313	69.2
	2.00-2.49 (Below Average)	48	10.6

Table II and III represent the descriptive statistics for the Effectiveness Teaching Methods (ETM) and Effectiveness Instructor Characteristics (EIC). Majority of the students agreed with all statements that represent ETM except for the item of *Have students conduct the lecture* where the respondents are neutral with this statement. Students are neutral with this item because they need lecturers to conduct the lectures instead they conduct the lectures. Based on Table III, majority of the respondents agreed with all statements. As a whole, the students' preference on the use of teaching methods and instructor characteristics are proposed in the survey. There are no negative statements to measure both variables.

Furthermore, the researcher adopted the reliability tests for the purpose of internal consistency of the data. The researcher discovered that the Cronbach's Alpha values are 0.868 for ETM and 0.955 for EIC. Therefore, both values suggest that both measures are

in excellent internal consistency to represent the variables. The researcher also adopted the Kolmogrov Smirnov analysis where the researcher found that the data is not normally distributed since all significant values for independent variables such as the gender, race and CGPA are less than 0.05 significant levels. Therefore, the researcher adopted the non-parametric techniques for the inferential statistics.

Table II
    Descriptive Statistics (ETM)

Effective Teaching Methods (ETM)	Mean	Standard Deviation
Use of "real world" examples	3.98	.822
Use of open classroom discussion	3.93	.702
Use of guest speaker (expert from business and industry)	3.46	.922
Use of case studies in class	3.70	.820
Use of case studies out of class	3.55	.912
Use of in-class group assignments	3.86	.849
Use of oral presentations	3.69	.865
Use of transparencies and other visual aids such as LCD projector, PowerPoint, etc	4.02	.875
Use of experiential exercises which involves or others' experiences and observations	3.89	.820
Use of computer-assisted simulation such as Microsoft Excel to calculate IRR, NPV, Payback method for capital appraisal topic	3.71	.905
Use of accounting software	3.76	.861
Use of objective tests (multiple choice, true/false, fill in the blank, matching etc.)	3.89	.885
Use of field trips like company visits	3.79	1.017
Use of films/videotapes	3.67	1.028
Use of outside group assignments	3.68	.944
Use of outside reading assignments	3.60	.887
Use of subjective tests (essay)	3.49	.950
Use of text such as textbook, other books, journals, or newspaper articles or other sources such as those available on the Internet	3.94	.811
Have students listen to and participate in interactive lectures (two-way interaction)	3.91	.825
Have students listen passively to a lecture (accepting or allowing what happens or what others do, without active response or resistance)	3.28	1.007
Have students conduct the lecture	2.97	1.009
Have student work on quantitative problems	3.55	.842
Instructor facilitates the teaching process by elaborating the teaching material and relating it to examples	3.88	.811

Table III
    Descriptive Statistics (EIC)

Effective Instructor Characteristics (EIC)	Mean	Standard Deviation
Instructors' communication skills	4.19	.741
Instructors' knowledge of the subject matter	4.25	.714
Instructors' overall attitude	4.16	.714
Instructors' fairness	4.06	.784
Instructors' general personality	4.03	.784
Instructors' willingness to provide outside class assistance	3.99	.900
Instructors' length of teaching experience	3.98	.811
Instructors' practical experience outside academia	3.93	.821
Instructors' sense of humor	4.01	.867
Instructors' ability to motivate students	4.18	.872
Instructors' personal appearance	4.03	.819
Instructors' immediacy (students who view their instructor as close for example, through more direct eye contact, gestures and body positioning)	3.98	.835
Instructors' willingness in giving feedback	4.20	.760
Instructors' shows his/her enjoyment in teaching	4.25	.818
Encourage students to develop critical thinking ability	3.93	.800
Instructor has in depth knowledge in issues of teaching	4.15	.763
Instructor is aware of students competencies	4.00	.789
Is creative	4.02	.813
Is flexible	4.08	.770
Is prepared to admit mistakes	3.97	.879
Is aware of personal strengths and weaknesses	3.94	.840
Is intuitive (using or based on what one feels to be true even without conscious reasoning)	3.71	.843
Is not afraid of putting personal ego at stake	3.70	.903
Is easy to approach and always available if students have problems	4.09	.854
Encourage mutual respect	4.08	.797
Enjoys being with students	4.19	.814
Female instructor is more effective	3.74	.982
Male instructor is more effective	3.66	.939

Table IV presents the output from the Mann-Whitney U tests. The output indicates that there are no significant differences for ETM and IC based on the gender, $U = 19,671$, $z = -0.092$, $p > 0.927$ for ETM and $U = 18,413.5$, $z = -1.135$, $p > 0.256$ for EIC. Therefore, the researcher accepted the following hypotheses:

Ho1　There is no significant difference between male and female of bachelor accounting students on the perception of Effectiveness Teaching Methods (ETM).

Ho2　There is no significant difference between male and female of bachelor accounting students on the perception of Effectiveness Instructor Characteristics (EIC).

Table IV

Test Statistics (Gender based)

	ETM	EIC
Mann-Whitney U	19671.000	18413.500
Wilcoxon W	69126.000	67868.500
Z	-.092	-1.135
Asymp. Sig. (2-tailed)	.927	.256

a. Grouping Variable: Gender

Table V and VI demonstrate the results the from Kruskal Wallis tests. The output indicates that ETM does not significantly differ across race, X^2 (2, $\underline{N}$ = 3) = 1.478, p > 0.05. However, the researcher found that there are significant differences across the Malay, Chinese, Indian and other races students on the perception of EIC, X^2 (2, $\underline{N}$ = 440) = 9.071, p < 0.05. The next issue is which race has the most significant difference to each other? Therefore, the researcher adopted the next level of analysis by using the Mann-Whitney U tests.

Table V

Test Statistics (Racial based)

	ETM	EIC
Chi-square	1.478	9.071
df	3	3
Asymp. Sig.	.687	.028

a. Kruskal Wallis Test

b. Grouping Variable: Racial

Table VI presents the output from the Mann-Whitney U tests. The output indicates that there is significant difference on the perception of EIC with z = -3.021, p > 0.003. Therefore, the researcher accepted the following hypothesis:

Ho3   There are no significant differences across the Malay, Chinese, Indian and other races students on the perception of Effectiveness Teaching Methods (ETM).

And the researcher rejected the following hypothesis:

Ho4   There are no significant differences across the Malay, Chinese, Indian and other races students on the perception of Effectiveness Instructor Characteristics (EIC).

Table VI

Test Statistics (Malay vs. Indian)

	EIC
Mann-Whitney U	10276.500
Wilcoxon W	13597.500
Z	-3.021
Asymp. Sig. (2-tailed)	.003

Since there was a significant difference between the Malay and Indian students, the researcher further proceeded with Table VII. The researcher found that only 17 statements differ in the perception on EIC since the p-values were < 0.05 as presented in Panel A, Table VII. The researcher proceeds with Panel A to present the differences

between two races on their perceptions on EIC. The researcher found that only four statements have similar ranks between two races. The statements included the *Instructors' knowledge of the subject matter* at the first rank, *Instructors' ability to motivate students* at the fourth rank, *Instructors' practical experience outside academia* at the 16th rank and *Is not afraid of putting personal ego at stake* at the 17th rank.

Table VII

Panel A: Mann-Whitney U Tests

Effectiveness Instructor Characteristics (EIC)	p-value
Instructors' sense of humor	.002
Instructors' knowledge of the subject matter	.004
Instructors' willingness in giving feedback	.007
Instructors' ability to motivate students	.007
Enjoys being with students	.008
Instructors' overall attitude	.010
Is easy to approach and always available if students have problems	.011
Instructor has in depth knowledge in issues of teaching	.011
Instructors' fairness	.014
Instructors' personal appearance	.014
Instructors' general personality	.020
Is creative	.025
Instructor is aware of students competencies	.026
Is prepared to admit mistakes	.034
Is aware of personal strengths and weaknesses	.034
Instructors' practical experience outside academia	.040
Is not afraid of putting personal ego at stake	.050

significant at 5% significance level

Panel B: Mean and Standard Deviation			Malay		Indian	
Rank		Effective Instructor Characteristics (EIC)	Mean	Standard Deviation	Mean	Standard Deviation
Malay	Indian					
1	1	Instructors' knowledge of the subject matter	4.30	.698	4.06	.764
2	3	Instructors' willingness in giving feedback	4.26	.717	4.00	.894
3	6	Enjoys being with students	4.25	.759	3.94	1.004
4	4	Instructors' ability to motivate students	4.23	.833	3.99	.994
5	2	Instructors' overall attitude	4.20	.699	4.02	.741
6	5	Instructor has in depth knowledge in issues of teaching	4.20	.728	3.98	.836
7	11	Is easy to approach and always available if students have problems	4.17	.801	3.78	1.037
8	10	Instructors' fairness	4.12	.737	3.79	.932
9	7	Instructors' personal appearance	4.10	.764	3.84	.968
10	8	Instructors' general personality	4.08	.736	3.81	.963
11	15	Instructors' sense of humor	4.07	.822	3.70	1.018
12	9	Is creative	4.06	.791	3.80	.928
13	12	Instructor is aware of students competencies	4.04	.749	3.74	.959
14	13	Is prepared to admit mistakes	4.04	.845	3.73	.975
15	14	Is aware of personal strengths and weaknesses	3.99	.787	3.72	.965
16	16	Instructors' practical experience outside academia	3.97	.772	3.68	.985
17	17	Is not afraid of putting personal ego at stake	3.76	.843	3.44	1.129

Table VIII presents the perceptions of ETM and EIC across CGPAs. The outputs indicate that there are no significant differences across Above Average, Average and Below Average CGPAs, X^2 (2, $\underline{N}$ = 440) = 1.465, p > 0.05 for ETM and X^2 (2, $\underline{N}$ = 440) = 2.461, p > 0.05. Therefore, the researcher accepted the following hypotheses:

Ho5   There are no significant differences across Above Average, Average and Below Average CGPAs on the perception of Effectiveness Teaching Methods (ETM).

Ho6   There are no significant differences across Above Average, Average and Below Average CGPAs of Effectiveness Instructor Characteristics (EIC).

Table VIII
Test Statistics (CGPA based)

	ETM	EIC
Chi-square	1.465	2.461
df	2	2
Asymp. Sig.	.481	.292

a. Kruskal Wallis Test
b. Grouping Variable: CGPA

5. Discussion

In the issue of gender, the researcher found that there are no significant differences between male and female students on the perceptions of ETM and EIC. These findings are not consistent with Fatima *et al.* (2007). Fatima *et al.* (2007) revealed the differences in the perceptions of male and female students on ETM for only two items:

Have students conduct the lecture (p = 0.041, significant levels at 5%) and *Use of Objective tests* (p = 0.08, significant levels at 10%). The male students believed that *Have students conduct the lecture* to be a more effective teaching method than the female students. Fatima *et al.* (2007) also found that the students' perceptions of EIC do not differ much across gender. These matters occur due to the different analyses adopted by Fatima *et al.* (2007) since the analyses were based on the individual statement from the survey but this study adopted the computation of the statements in the survey to signify two variables which are referring to the Effectiveness of Teaching Methods and Effectiveness of Instructor Characteristics.

In the issue of race, the results of the study are partially consistent with Fatima *et al.* (2007) who found that the Malay students have different perceptions of EIC than others but the results of the study indicate that the Malay students differ from the Indian students on the perceptions of EIC. Moreover, the results of the study are also in contrast with Fatima *et al.* (2007) who found that there are significant differences between the Malay students and others on the perception of ETM. Since there was a significant difference between the Malay and Indian students, the researcher found that only 17 statements differ in the perception on EIC.

In terms of CGPA, the results of the study are not consistent with Fatima *et al.* (2007) who found that the students' perceptions of effective teaching methods are significantly different when compared to the basis of the students' prior academic performance. This is due to the different analyses adopted by Fatima *et al.* (2007) and this study since this study involved the development of hypotheses.

Conclusion

This research is a survey of 440 accounting students in Universiti Tenaga Nasional, Malaysia (UNITEN) in relation to their perceptions on the Effectiveness Teaching Methods (ETM) and Effectiveness Instructor Characteristics (EIC). The contributions of this study included to add to the literatures in this area in Malaysia. This study varies from previous researches in two ways. Firstly, the sample is from private university which is referring to UNITEN. Secondly, the hypotheses development is to determine significant differences among the groups of respondents. Therefore, the aims of the study included: 1) to determine the significant difference between male and female of bachelor accounting students on the perception of ETM, 2) to determine the significant difference between male and female of bachelor accounting students on the perception of EIC, 3) to determine the significant differences across the Malay, Chinese, Indian and other races students on the perception of ETM, 4) to determine the significant differences across the Malay, Chinese, Indian and other races students on the perception of EIC, 5) to determine the significant differences across Above Average, Average and Below Average CGPAs on the perception of ETM and 6) to determine the significant differences across Above Average, Average and Below Average CGPAs of EIC.

The results suggest that there are no significant differences among gender and CGPAs on the perceptions of ETM and EIC but there are significant differences between the Malay and Indian students on the perceptions of EIC. As for the recommendations for the next study, it may be further exercised on other private institutions in Malaysia and it is also applicable on focus groups of students who failed by adopting the same instrument. Limitations on this study included the sample selection which is from

UNITEN and it could be contributing to the contrast of result if compared with previous studies as it only focused on accounting students.

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An analysis on the data quality of new financial reporting, XBRL

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Abstract

Today, the revolution of a business communication is faster and more sharing of data by several participant users apart from internal company's management such as clients, business partners, financial market analysts, investors and government regulators. The new development of internet financial reporting language is initiated and known as XBRL (eXtensible Business Reporting Language). XBRL is an extension of XML (eXtensible Markup Language), which provides machine-readable tags for each individual data elements in each financial statements. XBRL can ease the preparation, analysis, and exchange of business information along each part of financial reporting supply chain and across companies around the world. This research study how XBRL process and then analyse the quality of XBRL outputs. The findings basically are caused from common errors such as wrong entering, missing fact value, and moreover, errors were occurred from calculation setting in the XBRL calculation linkbase in some cases.

Keywords: XBRL, Financial statements, XML, Accuracy, Taxonomy, Instance documents

Introduction

A financial report is a formal record of the financial activities of a business, person, or other entity. Many business people use figures in financial report to make a decision either internal or external purpose. Although companies were forced by their regulators to disclose their financial statements to public as minimum requirement for increasing transparency in financial reporting, they do not strictly force on an output forms. Therefore, different kinds of output forms were produced and published to external parties. For instance of a variety of output forms, .xls from Microsoft excel, .pdf from adobe acrobat, or .txt from text files. It is good for business users who only read figure from that but it is not comfortable to further work on this. They cannot instantly make a comparative between one and another company or more than that if their financial reports' file cannot extract on the same format. Moreover, they are sometimes manually input into new formats that is likely to less a reliable and an accuracy of information. Therefore, an output format of these financial statements is significantly important.

Therefore, as with the need and important of data exchange, in recent years there is one of the evolutions of the reporting system called XBRL. The adoption of an eXtensible Business Reporting Language (XBRL) has been widely and rapidly growth around the world (O'Kelly, 2010; Reyes, Rodríguez, & Dolado, 2007). With XBRL-codes, anyone who requires using, or accessing, or redesign of business data for any purpose can directly find a figure and compare financial statements of vary industries or companies around the world. XBRL is the tools to eliminate main problems in the past that there were several different reporting standards throughout the world. The use of XBRL provides benefits in the preparation, analysis, and communication of financial information.

Research objectives

Recently, the objective of the financial statement presentation is to organizing financial information including an improving the disaggregation of the accounting data. The usefulness of the financial statements will assist management to better communicate its financial information to the users of its financial statements, and to help users in their decision making. XBRL is currently considering being a new project around the world; therefore, the purposes of this research are focused on studying and investigation of the current issues on development and implementation of XBRL. Importantly of this research, an accuracy level of financial statement in form of XBRL is exploring and finding out.

Research method

Methods for this research can be divided into four main phases as follows:

a). Study and understand to XBRL data filing

This phase is to discover how XBRL system works including the process to investigate area of data quality from using XBRL in current.

b). Review related works

Review all related works about XBRL to find out issues that inaccuracy of financial statements may caused.

c). Summarize result

After the aforementioned phases are nearly finished, the result will be identified and evaluated.

Importance and contribution of proposed research

An outcome from this research makes both academic and practical contributions to the extant research. This research is to contribute to the quality facts within XBRL instance documents by investigating the possible issues occurred that can help to improve the accuracy of the XBRL instance documents. Moreover, it will be expected that many companies are able to produce the XBRL instance documents without many type of errors. As output of XBRL, instance document, will enable the automatic exchange and reliable extraction of financial information with all technologies and across all software formats because it can portable to use on every software package. Therefore, efficiency and accuracy of XBRL instance documents will help to drive a transparency of financial reporting, this will also build up more reliable of financial information to all participants especially investors. Significantly, it will be used as a tool in data integration, consolidation and preparation for internal and preparation of external reporting. Consequently, users of business data – investors, analysts and regulators - stand to benefit greatly from XBRL by means of using XBRL as a helpful analysis tool (Romeo, Parrino, & Bell, 2008). This is more helpful to utilize an exchangeable of data across a variety of software applications or on web-based. Additionally, the contributions also enhance the confidence of users, reduce uncertainty of accuracy of the financial information. This will facilitate to promote the corporate governance and reducing problem of economic downturn.

Understanding Financial Business Reporting and XBRL

International Accounting Standards Board (IASB) has identified an objective of general purpose financial reporting as follows:

> *"To provide financial information about the reporting entity that is useful to existing and potential investors, lenders and other creditors in making decisions about providing resources to the entity." (IASB, 2010)*

From the IASB's objective, it draws attention to how important financial information is. The useful information should be prepared for related users when decision-making. To make companies' information easily accessible to users around the world, the most popular method of publishing financial statements are in PDF and HTML form (Debreceny & Gray, 1999). However, with a limitation of those methods, they are not easy to extract and modify the data to use for analysis. PDF can only view on screen or print to read it, like PDF, HTML only describes how data displays on the website but does not specify any meaning of the items inside it (Beattie & Pratt, 2001). Therefore, an initiative to create standardization for integration capacity is presently developed and implemented. A new method of electronic financial information that is called XBRL is being developed to provide a common transport language.

> *"XBRL is a language for the electronic communication of business information, providing major benefits in the preparation, analysis and communication of business information. It offers cost savings, greater efficiency and improved accuracy and reliability to all those involved in supplying or using business information."Definition by XBRL organization (XBRL International, 2012)*

XBRL is an open standard-based reporting system. A set of XML-type tags is developed and used in the purpose of financial statements which is the main purpose of XBRL. This tagging can be used to create instance documents that can be easily adopted

and presented in a variety of formats. XBRL is likely to be a platform that offers universal standards for defining business information. Therefore, the financial reports are more easily compared and collated for regulatory use and other purposes. Moreover, XBRL will help to promote the efficiency of electronic information and the exchange of financial reports around the world.

From summarized research paper of (Bartley, Chen, & Taylor, 2011) and (Southwell, 2005), a comparison between traditional financial process and after XBRL was adopted is depicted in Figure 1**Error! Reference source not found.**. Investors traditionally prepare their financial analysis model, by searching specific financial items in Excel or PDF formats and then manually enter them again in their spreadsheet model (Bartley, et al., 2011). After XBRL adoption, XBRL facilitates analytical process and helps to increase the usability of financial statement information, by reducing the need for re-keying financial data for analytical and other purposes (Southwell, 2005). It has been concluded (Enachi & Rotila, 2011) that XBRL is the initiative to help improve financial reporting and to meet the information needed by internal and external users at the end of each period.
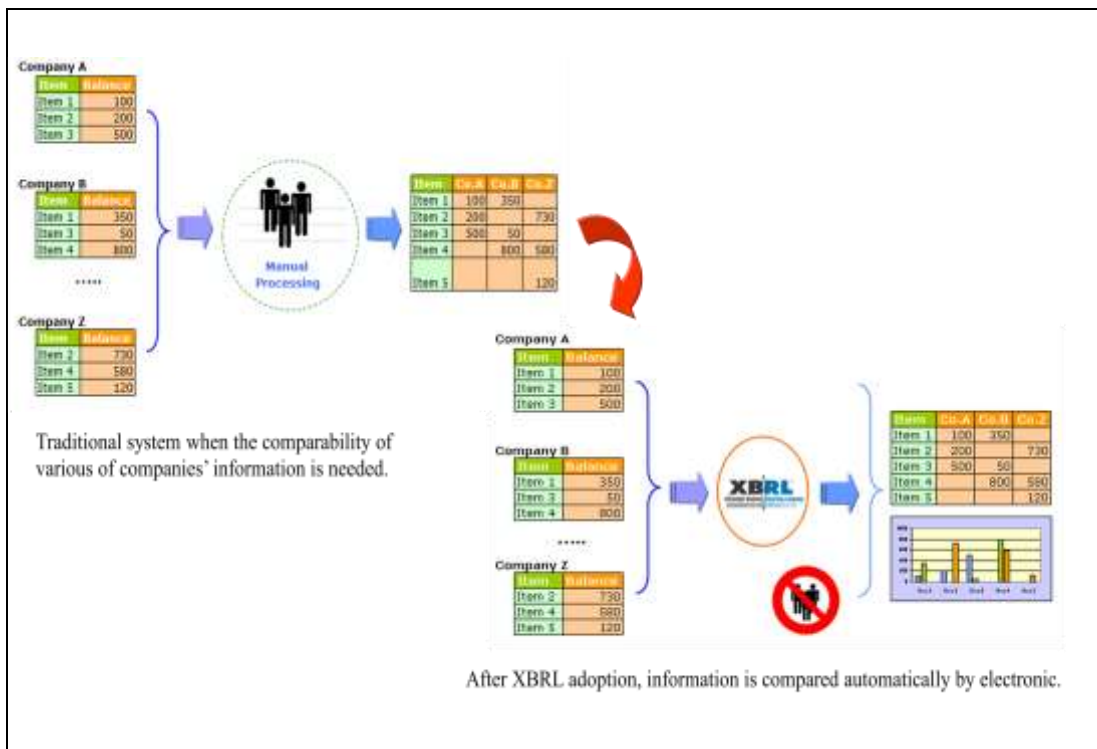

Figure 1 Process of preparing financial statements' comparison before and after XBRL adoption.

As stated previously, XBRL-an interactive data-tagging, is set to revolutionize business reporting around the world and is used to streamline disparate reporting systems and software helping them to communicate with each other directly (Malhotra & Garritt, 2004). Consequently, it can be seen that adoption of XBRL aids companies to serve globalized requirements on quality information. Users can easily retrieve items in financial statement by not concerning themselves with their location or language (Southwell, 2005). Furthermore, the benefits of XBRL come in several ways, such as transparency of financial reporting, reduction of time and errors, and enhancement of

analysis tools for globalized investments. XBRL helps to reduce the time and effort of preparing reports due to the fact that it cuts off the process to extract data from a various format, rekey, or convert it into the new file. (Stantial, 2007).

Structure of XBRL

By adopting concept of XML, XBRL is developed and separated into two major components, taxonomies and instances (as shown in Figure 2).
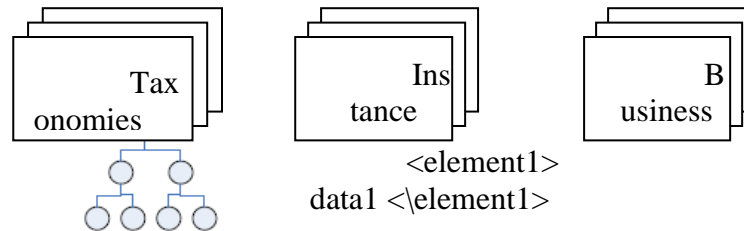

Figure 2 Composition of XBRL report (Reyes, et al., 2007)

Taxonomy takes a major role of XBRL to identify the specific tabs for each individual item on financial reporting in terms of the structure, label, and format of each element. Therefore, once taxonomy is set up, a unique tag is assigned to each item of financial information. Like bar coding, each item of financial information has an identified name which helps the users to further use it easily. Additionally, when users extract data, they do not get only numbers but also get context that makes information more useful.

To go along with taxonomy, an **XBRL instances document** is created in the file of XML which is applied to contain financial information in the format of XML tagged data.

In order to gain more understanding of XBRL, Figure 3 shows a structure of XBRL that is defined by XBRL international group.
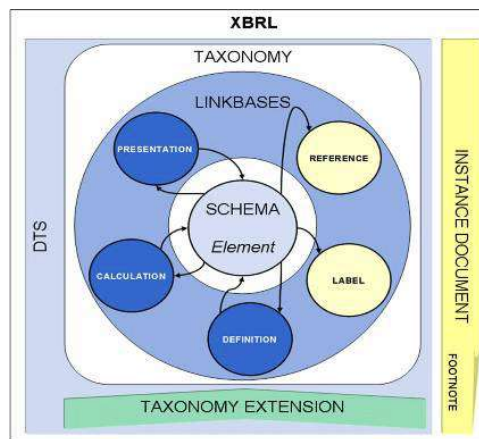

Figure 3 XBRL structure (IFRS Foundation and the IASB, 2012)

To explore for XBRL's flow, Figure 4 depicts the flow starting from the way of creating its own taxonomies which are combined from one of the published regulator's taxonomies and another by extension. XBRL automatically generated from one single information source. After the company's financial statements are finished in preparation for a specific period by any company's accounting software, every financial data item

will be mapped to the finalized taxonomies and generated into XML as instance document. With this instance document, it contains the actual XBRL data which all participants within the financial supply chain can easily access, interpret, and also reuse XBRL documents with the same data.
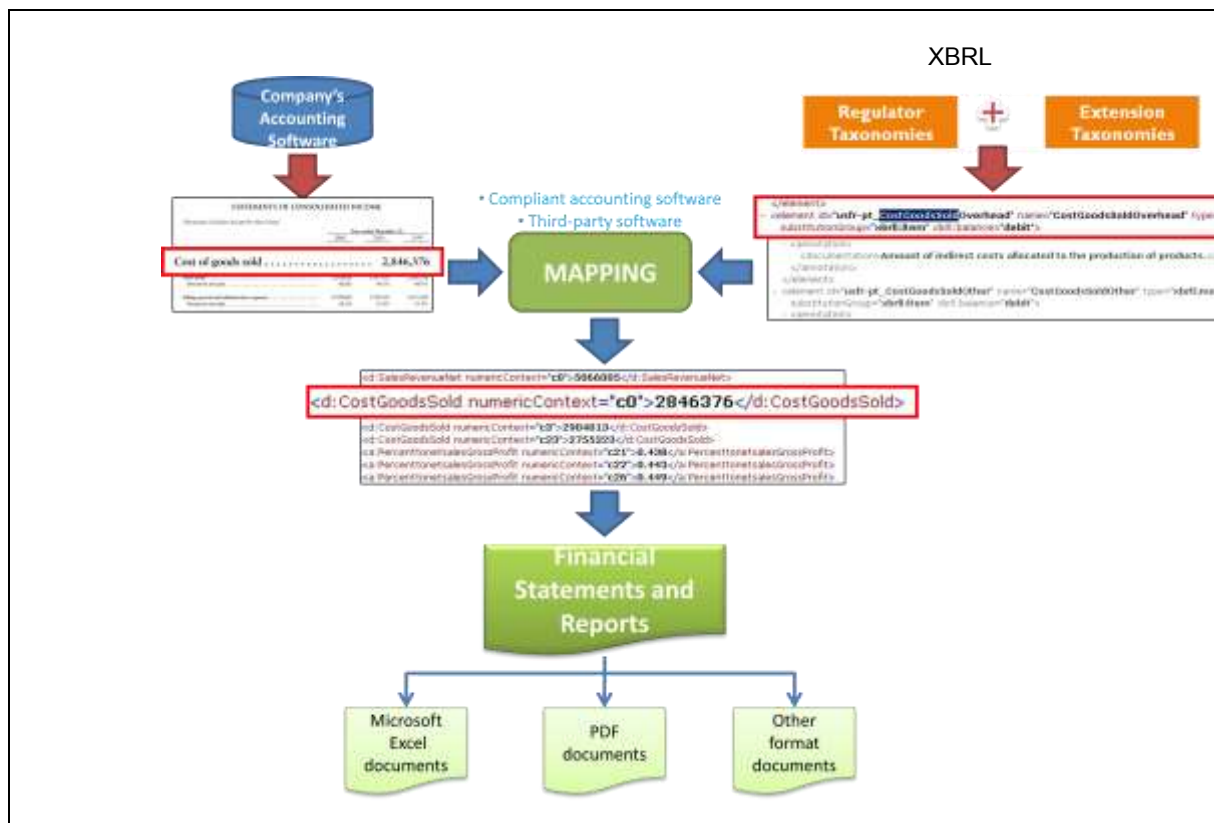

Figure 4 XBRL process flow

Stated problems

As previously stated, the adoption and used of XBRL is growing and taking place worldwide. XBRL is selected as a major tool for a sample data to design and develop a model. Nevertheless, from review in several research papers, they criticized that XBRL is too complicated (Singh, 2009). Moreover, since XBRL began to use, there is a main concern that related to a lack of accuracy which it will be brought to discussion to strengthen the XBRL's adoption. Importantly, XBRL gains use and is relied on more by investors and analysts so the demand for assurance is likely to be increased and necessary.

The questions especially about the accuracy are raised as follows:

(1.) How do you find the errors in the company XBRL reports?
(2.) What are the common errors on XBRL reports?

These aforementioned questions are the main focus to do analysis on XBRL reports. This analysis of the research is based on the XBRL data submitted to US SEC. The US SEC has a database to keep companies' financial statements through its system called EDGAR (Electronic Data Gathering, Analysis, and Retrieval). EDGAR is a valuable resource for extracting financial data of each company for every user especially

investors and the securities markets. In the past, the EDGAR database accept filings submitted in HTML and PDF formats (Gerdes Jr, 2003) but in the present, EDGAR requests the companies to submit in XBRL formats. Companies that have common equity above $5 billion are required by US SEC to submit an XBRL-tagged financial statements for quarterly report and annual report since fiscal period ending on or after June 15, 2009. And finally all remaining companies must submit of XBRL filings within June 2011.

The results of reviewing each research paper are described as follows:

(1) Research No.1: E. Boritz & W. G. No (2008)

Regarding Boritz J. and Gyun W. (Boritz & No, 2008), they examined the XBRL that were filed by voluntary to US's SEC from the initiation year 2005 to December 2007. The results can give for two findings; one was finding related the quality of XBRL filings, and another was claiming about inconsistency of validation report from software used.

- They found that nearly 200 of the 304 filings (65.8%) had error findings, these error mainly came from extension of taxonomy, and calculation error. It can claim that quality control over the XBRL output produced is insufficient.
- As this testing, the researcher performed validation tests by using available of two validation software, Fujitsu's Instance Creator and DecisionSoft's True North Personal Validator. Another finding was there are differences errors result with validation from that two software.

The assurance result that was discovered in this paper is not in the satisfied level. Thus, it showed results that a quality assurance program would be developed together with validation of taxonomies' and software's quality, completeness of guidance, and encouragement of companies' quality assurance.

(2) Research No.2: Bartley, et al. (2009)

Moreover, there is an assertion of finding errors, differences between figure in official form and in its XBRL filings to SEC (Bartley, Chen, & Taylor, 2009). As shown in Figure 5, this showed that there were many of the errors such as missing elements and amounts, sign flips, duplicate items, and incorrect amount. The most percentage of errors came from missing elements and amounts in XBRL filings. Other 28 percent and 26 percent of the error were occurred from mistaking on sign giving and duplication of items respectively.

They emphasized that all errors were the reason to destroy the usefulness of XBRL instance documents and also possible to reduce a level of data quality to low.
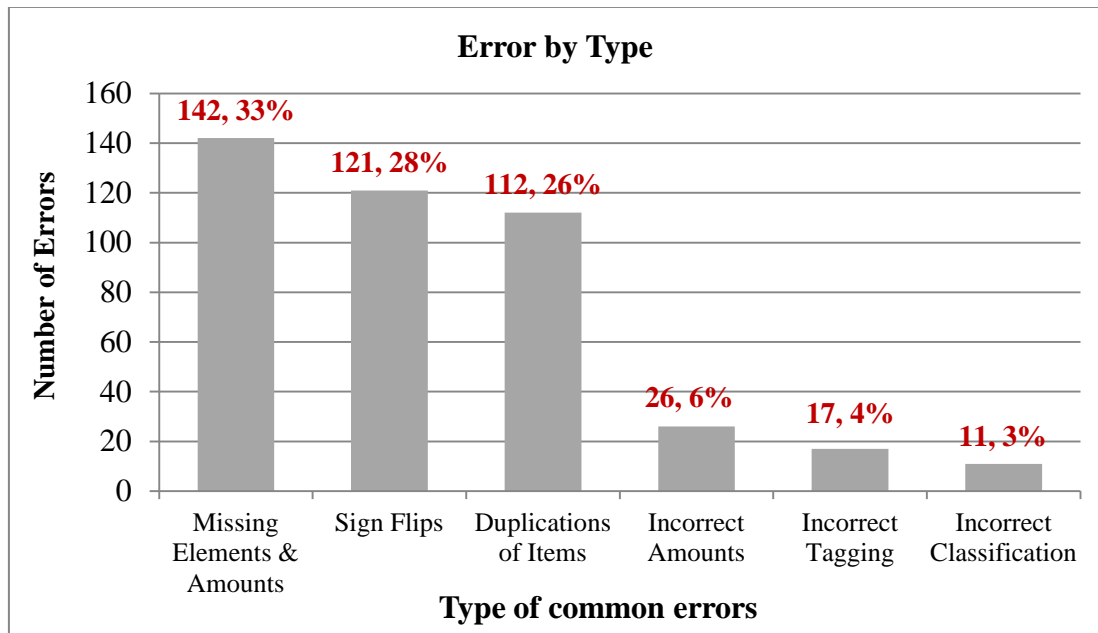
Figure 5 Number of Common Error by Type (Bartley, et al., 2009)

(3) Research No.3: Debreceny, et al. (2010)

Another study worth to be mentioned is (Debreceny, Farewell, Piechocki, Felden, & Gräning, 2010) that investigated the quarterly reports of nearly 400 large corporations which were submitted in XBRL format to the Securities and Exchange Commission (SEC) of United States from start date of XBRL filing to September 2009. And the result showed in Figure 6, total 43% of errors came from mistaken in debit and credit reversal, misusing of negative sign for debit or credit balance. Next was 26% of total errors had calculation errors which were occurred from missing fact value and extraneous concepts in calculation relationship.

85
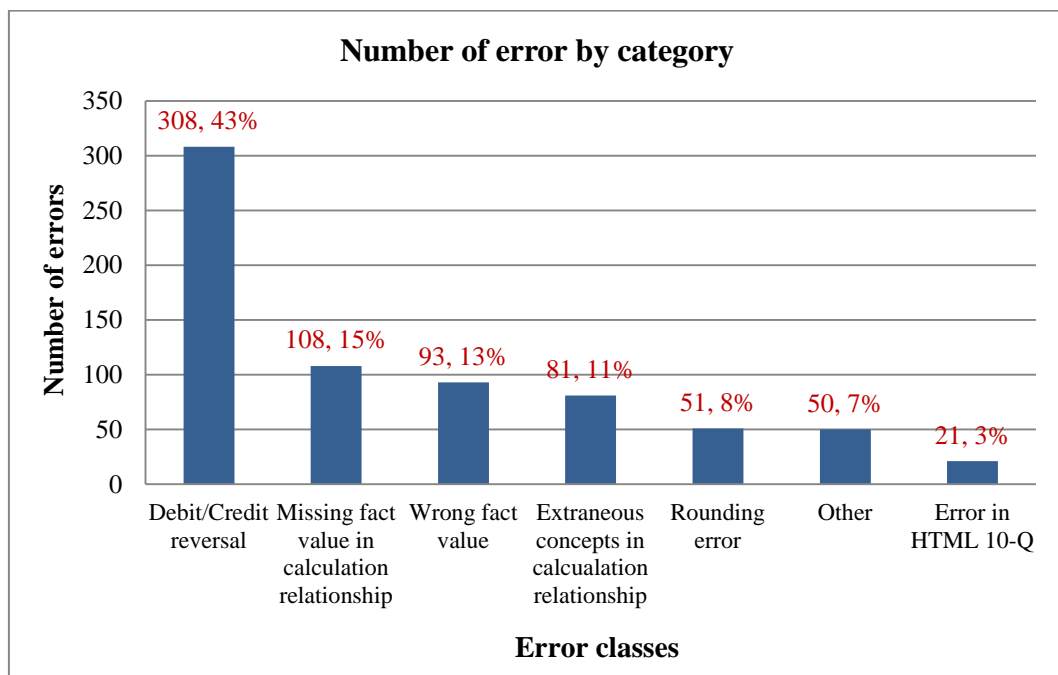
Figure 6 Number of Common Error by Category (Debreceny, et al., 2010)

Descriptive errors findings results

All categories of error findings from the previous research papers are outlined in Table 1.

Table 1 Summary of error findings

Error findings	E. Boritz & W. G. No	Bartley, et al.	Debreceny, et al.
Extension taxonomy	✓		
Missing Elements & Amounts		✓	✓
Sign Flips (Debit/Credit reversal)		✓	✓
Duplications of Items		✓	
Wrong fact value (Incorrect Amounts)		✓	✓
Incorrect Tagging		✓	
Incorrect Classification		✓	
Extraneous concepts in calculation relationship	✓		✓
Rounding error			✓
Other mixed error			✓

Since XBRL is now being used globally for financial reporting as well as XBRL is an internet-based exchange medium. This stimulates demand to use financial data for various purposes especially companies' comparison both in the country and outside. The error is able to bring an inaccuracy to an output of financial statements. Thus, it is very important to concern on how information quality is and how to reduce any risk of possible errors that will be occurred.

As the review of research papers and the subsequent errors over the time passed since XBRL filings were firstly submitted to US SEC. All errors findings are outlined as following table.

Table 2 Classification of errors findings

Taxonomy Mapping	Tagging	Calculation
• Unnecessary new elements • Extension taxonomy	• Sign flips • Wrong fact value • Missing elements and amounts • Duplication of items • Incorrect tagging	• Extraneous concepts • Incorrect classification • Rounding error

Mapping errors

As stated, new XBRL elements in the taxonomy are created for company's unique financial statements. Error in mapping, the mismatch between every financial statement items and the appropriate financial statements element for company's taxonomy always occur. Many of these errors are caused by the way that there is wrongly choosing the appropriate element from the long list of standard taxonomy. Moreover, some elements is created by its own company which some are unnecessary or duplicate with exist elements. This will bring a difficulty to users for comparison. Furthermore, different

countries have different accounting regulations; each may have its own taxonomy for financial reporting. The more development and extension of taxonomies lead to negatively of data quality (Piechocki, Felden, Graning, & Debreceny, 2009).

Even though accounting standards are changed throughout the world to become on using only common accounting standard, International Financial Reporting Standards (IFRS). In fact, Japan, the EU, and several South American are shift in the direction of applying this one (Southwell, 2005). Therefore, it implies that it should have only one taxonomy. However, in most cases each company's financial statements are structured to comply with the regulatory environment in that country. Then, different countries have developed their own accounting standards, making international comparisons of companies difficult. According to (Dunnagploy & G.Gray, 2005), "the different accounting practices among countries became a hindrance to effective use of financial statements for decision making." As result of this, XBRL taxonomies are being developed in a wide variation of areas depend on each country's accounting standard and moreover, each company still essentially requires adding taxonomies for their own purpose. In fact, one research paper (Bonsón, Cortijo, & Escobar, 2009) reasonably claimed that the taxonomies are not totally fit to reporting practices of each company. As a result, vary of taxonomies bring the trouble for comparison and make taxonomies more complexity. Consequently, it may increase the risk of roll-forward process due to incorrect order or wrong placing presentation of elements in financial statements. Therefore, checking process will be brought to boost an assurance for the data.

Tagging errors

Tagging is the process of entering data for financial statements elements which is including monetary amounts, signs, time period, and unit of measurement. All of the data in the source document which is required under applicable rules have been tagged and included in the XBRL instance documents. As errors that previously describes mainly lead to an accuracy of instance documents and distort the financial statements. For this reason, the output sometimes should be over sighted again by knowledgeable accountants or participations.

2.1 An example of value on "debit" or "credit" items is the main reason to make an error on tagging. Sign flips or sign errors generally occur because in accounting balance, the positive sign is given to natural debit or credit items, but that items don't always show the balance as it should be. Thus, incorrect sign will be assigned to tagged data.

2.2 Wrong fact value; this can be caused by data entry errors.

2.3 Missing elements and amounts; the fact value of some elements and amounts are not entered and were not provided in a manner consistent with an applicable requirement.

2.4 Duplication of items

2.5 In addition, there are possible to enter an incorrect time period and incorrect rounding also lead to inaccuracy of data.

Calculation errors

A concern about the correctness of total amount of figure in each group in the financial statements, the aspect of errors is related to the relationship of presentation

information. These are set up in the calculation linkbase of each type of financial statements.

    3.1. Extraneous concepts; mistaken to set up the relationship link of each elements in calculation file.

    3.2. Incorrect classification; this can cause by extension of standard taxonomy by company itself, and does not link the calculation relationship into related financial statements.

    3.3. Rounding error; this occurred from some cases that company presented the amount by rounding from original decimal amount to integer amount. These can cause to make a difference in total balance of statements.

       The errors findings in XBRL instance documents are problematic issues because they ultimately lead to mistake in company's financial statements that are publicly reported and presented. As a result of mistaken, a comparison in financial fundamentals from company to company will be lacked. Importantly, a focused of increasing the quality of financial information ended reports and outputs would be promoted.

Conclusion and future work

       The accounting standards environment has become more international so the quality of financial reporting continues to be a major issue for management, shareholders and regulators. Most importantly, unreliable or inaccurate information which can be significantly time-consuming will likely cause concern. Computer and information technology innovations have revolutionized how business is conducted and how information is exchanged across systems. As a result of this, the initiation and development of XBRL is triggered to solve these problems.

       On the studying and developing research area, there are some risks to use XBRL that companies and users should take into account especially about the accuracy. Therefore, XBRL is like just a more efficient way to convey financial data unless XBRL documents are more prove accuracy. Common material errors in company XBRL reports and related causes would be solved to mitigate these reporting risks.

       From the study, there are three main categories of errors that were found, errors from mapping of taxonomy, tagging, and calculation of data. Without assurance of data accuracy, the aforementioned benefits of XBRL's adoption are unlikely to be realized. Such errors can be prevented by carefully checking not only printed output but also XBRL content before submitting securities filings. The way to ensure that the data retrieved from XBRL documents represents valid and accurate transactions in the proper period will be defined. Therefore, for the future work, a set of guidelines and rules including a validation test framework or system will be developed in order to improve the accuracy of XBRL instance documents and increase more confident on complying with regulatory requirements.

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The Budget of the European Free Trade Association and the Importance for the European Union

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Abstract

Today, the European Free Trade Association (EFTA) has a very limited membership of only four states: Norway, Iceland, Liechtenstein and Switzerland. This is the reason why only a few recent publications on EFTA as a European economic organization exist. This research paper intends to look in a comprehensive manner at how EFTA institutions function and to address the question of EFTA's viability in the future. From the beginning in 1960, EFTA was created as an economic alternative to the European Economic Community (EEC), a far more ambitious plan of creating a "common market", based more and more on qualified majority voting, transfer of powers to the EU and a constant increase of the EU's general budget. The European Union, now with a membership of 27 states, is the unchallenged dominant economic power house in Europe. The EU's vast internal market became indispensable for EFTA's economic survival. For this reason EFTA and the EU concluded the "European Economic Area"(EEA) agreement in 1992 which secured Norway, Iceland and Liechtenstein the much needed unlimited access to the EU's internal market. This article argues that the benefits of EFTA still outweigh the disadvantages of a very limited membership. Norway, Liechtenstein and Switzerland have the same economic success or even a better economic performance than the average EU state today. Moreover, the minimal bureaucracy and institutions make EFTA more cost-efficient notwithstanding the substantial financial contribution EFTA makes to the EU's general budget and structural funds for the benefit of poorer EU regions and member states. However, the costs of EU membership would be far higher if EFTA states were to join the European Union.

Introduction

This article gives a summary of the different budgets inside the EFTA. The author wants to give an answer concerning the following questions: who is financing the EFTA ?, which are the different budgets inside these institutions ?, the impact of this budgets in relation with the EEA and the European Union ? and the special position of the Swiss confederation.

Finally this article analyses the contributions of EFTA member states to the EU budget if these countries should became a part of the Union.

This article has only as target to calculate the different EFTA budgets. This is not a study of the EU budget or a research concerning the possible integration of the EFTA and/or some members in the EU.

This article handles the budget figures concerning the different EFTA institutions. It's an analysis of the budget. This article doesn't have the intention to analyse the economic criteria of this states or the EFTA or the EU integration.

Knowing the fact that the item of the EFTA budgets wasn't and isn't the subject of scientific publications. Therefore this article is largely based on primary sources, namely: the budgets, audits and annual reports of this European institution.

A short history[1].

The European Free Trade Association (EFTA) originated in the dynamics of the "Organization for European Economic Cooperation" (OEEC) established in 1947 by the United States and several Western European states. The initiative for the OEEC came after the Marshall Plan for the recovery of war-shattered Europe with the aim of economic development through cooperation. A group of European OEEC countries – namely the three Benelux countries, West Germany, France and Italy – wanted to integrate fully and established the "European Coal and Steel Community" (ECSC) in April 1951 which created a common market for coal and steel products among West Germany, France, Italy, Belgium, the Netherlands and Luxembourg. Already in March 1957 the same six members states established the "European Economic Community" or EEC for the step-by-step creation of a customs union and a common market for all kinds of goods, services, capital and the free movement of persons. Also in 1957 the six EEC states established a community concerned with the non-military development of atomic energy, namely the "European Atomic Energy Community" or EURATOM. French diplomacy was the engine of the newly formed "common market" policy.

A group of OEEC countries, led by the United Kingdom, had a different view on the future of European economic cooperation. They did not wish to be part of a customs union and a common market, but instead they favored a free trade union. They were also opposed to the EEC's supranational decision-making and favored classical

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[1] * Götz, N. and Haggren, H. (eds.)(2009), Regional Cooperation and International Organizations: the Nordic Model in Transnational Alignment, Routledge, 133-151; * Bryn, K. and Einarsson, G. (eds)(2010). EFTA 1960-2010: Elements of 50 Years of European history, University of Iceland Press; * Steininger, R.(1997). 1961: Europe at Sixes and Sevens: the EFTA, the Neutrals and Great Britain's Decision to join the EEC. Journal of Economic History 26 (3): 535-568; *Von der Groeben, H. (1985). Combat pour l'Europe: la construction de la Communauté Européenne de 1958-1966, Brussels: EEC Commission, 170-178;

intergovernmental cooperation, allowing them a greater degree of self-rule. In 1956 some member states of the "OEEC" presented the idea of a broad free trade area across Western Europe. The agreement of Saltsjöbaden (near Stockholm) completed the negotiations between the seven OEEC countries and the EFTA convention was signed by Norway, Sweden, Denmark, Austria, Portugal, Switzerland and the United Kingdom on 4 January 1960 and entered into force on 3 May 1960.

EFTA was founded on the premise of a progressive elimination of customs duties on industrial products, but with the exclusion of agricultural products and maritime trade, and providing for closer economic cooperation. In 1961 Finland became an associate member of EFTA and a full member in 1986. Finnish tariffs applied to trade in industrial products with the other EFTA countries but were reduced to zero from the year 1968, one year after the same stage had been reached by the other EFTA members. Finland did have a special political status after the Second World War under strong influence of the Soviet Union. The USSR was suspicious towards EFTA and feared that Finland's rapprochement with EFTA would weaken the relations with the communist Eastern European world. Therefore the Finnish republic negotiated this matter with the Soviet Union separately. Moscow agreed that Finland could be an "associate" member of EFTA and the USSR was granted the same tariff reductions as the EFTA countries.

Iceland became an EFTA member in 1970. The reason for the country's delay was the importance of the fisheries industry and the fact that it depended almost exclusively on fish products for its export. Therefore Iceland could not benefit fully from the industrial free trade rules of the EFTA area. At that time Iceland was already a member of the "Nordic Council" together with the four other Scandinavian countries. The four other countries established an economic fund for the new member to foster the industrial development of Iceland. Iceland was granted tariff and quota free entry to the markets of the other countries immediately upon accession. Thus in the beginning of the seventies EFTA had eight full member states and one associated member.

Following a meeting of EFTA ministers in London in June 1961 several EFTA states applied for membership or association with the EEC/EURATOM. But the negotiations ended already in January 1963 without any result. A main point of discussion was the demand by the then U.S. Secretary of State Douglas Dillon for a new round of trade talks taking into account the fact that the United States had a deficit balance of payments. Already in January 1963 France under President De Gaulle vetoed the enlargement of the EEC with the United Kingdom, and did so again in 1967. There was certainly a French "non" against the United Kingdom for historical reasons (Second World War disputes) and cultural reasons. After the Second World War French European policy was based on a close and privileged relationship with West Germany. In December 1969 the heads of state or of government - for France the newly elected conservative president George Pompidou - decided at The Hague to open negotiations for accession of new members states, including the United Kingdom. Immediately thereafter three EFTA states applied for EEC membership, namely Denmark, Norway and the United Kingdom. The departure of General De Gaulle as the French President was in fact crucial for British accession Finally, on 1 January 1973, Denmark, the United Kingdom and Ireland became members of the trio EEC–EURATOM–ECSC. But Norwegian voters had rejected EEC membership by a referendum held in September 1972. Since then the EEC had nine member states and EFTA was reduced to seven member states including

Finland. Thereafter all EFTA members signed cooperation agreements with the EEC[2]. These FTA's became the general economic framework between the EEC and the EFTA states until the creation of the European Economic Area in 1992. They also served as a guarantee of the maintenance of the trade between the two new EC Member States and their ex-EFTA colleagues[3] and provided for a gradual reduction of import duties.

Denmark and Ireland were not interested in the EEC during the fifties and sixties. Both countries were heavily depended on agriculture, so the ECSC had little to offer them. Also Denmark did have strong economic links with the other Scandinavian countries and the United Kingdom. Ireland was in the same situation as the United Kingdom[4]. However, the negotiations in the beginning of the seventies changed the situation for Ireland through the UK application for EEC membership. Denmark was in duo with Norway for gaining EEC membership but, contrary to Norway, Denmark joined the EEC in 1973. In 1979 EFTA concluded a free trade agreement with Spain after that this country became a Western democracy. Portugal left EFTA on 1 January 1986 for membership of the EEC and this together with Spain. Also in 1986 Finland became a full EFTA member.

A protocol attached to the treaty establishing EFTA provided that the EFTA treaty was also applicable to Liechtenstein as long as it formed a customs union with Switzerland, dating back since 1923. Liechtenstein became an EFTA member in 1991 and joined the EEA from 1 May 1995. In the beginning of that year Austria, Finland and Sweden moved from EFTA to the European Community. Norway was also a candidate, but the application didn't survive a national referendum held in November 1994. This was the second time that the Norwegian population voted against membership of the EEC. Swiss voters rejected the EEA in a referendum of December 1992. However, Switzerland later concluded bilateral agreements with the European Community as an alternative to the EEA (European Economic Area). In Vaduz on 21 June 2001, the four member states signed an amended EFTA convention which entered into force on 1 June 2002. It includes 21 annexes and one protocol on the free movement of persons between Switzerland and Liechtenstein. The main changes were the following: the scope of the convention was expanded to include new areas such as trade in services and investment, mutual recognition of conformity assessments, free movement of persons, social security and mutual recognition of diplomas, land and air transport, public procurement and intellectual property rights. According to Article 2 EFTA is set up for the promotion of a continued and balanced strengthening of trade and economic relations between the member states with fair conditions of competition, the promotion of free trade in goods, the progressive liberalisation of the free movement of persons, trade in services and investments, the promotion of fair conditions of competition, the opening up of the public

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[2] The agreement between Austria, Portugal, Sweden and Switzerland and the EEC started 1 January 1973; the agreement between Iceland and the EEC started 1 April 1973; the FTA of Norway and the EEC started 1 July 1973; the agreement of Finland with the EEC started 1 January 1974; the agreement of Austria, Iceland, Portugal, Sweden, Switzerland and the ECSC started 1 January 1974; the agreement between Finland, Norway, and the ECSC started 1 January 1975.

[3] Blanchet, T. (1994). The Agreement on the European Economic Area (EEA). Oxford: Oxford University Press.

[4] Nugent, N. (2010). The Government and Politics of the European Union/ London: Palgrave McMillan.,36.

procurement markets of its member states, and the appropriate protection of intellectual property rights.

The four remaining EFTA member states have made important reservations to the EFTA convention by means of four annexes. They should be read concurrently with the EFTA convention. The use of reservations has made the EFTA convention a far more complex treaty network in daily practice although it allows EFTA states a greater degree of autonomy in these matters.

The next list gives an overview of the most important trade partners of EFTA in 2010[5]:

- EU-27:   69.9 %
- FTA countries[6]:   8.8 %
- USA: 6.9 %
- China: 3.7 %
- Japan: 2.3 %
- Etc…

This figures do underline the trade integration of EFTA and EU within the European Economic Area.

The EFTA institutions.

Since the beginning EFTA, as an international organization, has some institutions responsible for the daily work and budgetary control: the Council, advisory bodies, the Secretariat and the Board of Auditors. It was the clear intention of EFTA's founding fathers to keep the ministerial and bureaucratic apparatus to a strict minimum. This is in marked contrast to the EU's ever expanding institutional machinery, budget and political mandates such as high representatives and special representatives.

This article gives a short description of these institutions because they are one of the reasons of the different budgets inside the EFTA.

The Council.

The Council is responsible for the EFTA convention which will be amended from time to time in order to reflect the legislative developments under the EEA agreements and the Swiss-EU agreements[7]. It is the highest political institution where the four member states consult, negotiate and act together. The Council is responsible for the administrative and budgetary matters of EFTA. It is not only the internal organization of EFTA that is in the hands of the Council, but also the policy orientations and the conduct of relations with the European Union, other international organizations and third states. Each member state is represented in the Council and has one vote, though decisions are usually taken by consensus. The presidency of the Council is chaired every half year by another member state, e.g. Iceland and Switzerland in 2012; Norway and Liechtenstein in 2013. The meetings deal with internal EFTA affairs, third country relations and other points such as the WTO developments. In the first half of 2011 Iceland's application to join the European Union and the Swiss-EU negotiations were among the chair's priorities. The Council meetings are held at ministerial level twice a year, usually in June

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[5] Grønningsaeter, T. and. Reynolds, J. (2012). This is EFTA 2012. Brussels: EFTA.15.
[6] FTA means Free Trade Agreements with non E.E.A. countries
[7] The 49th annual Report of the EFTA: 2009, Brussels, 2010,7.

and December. The Council discusses matters related to free trade, technical cooperation projects, administrative and budgetary matters. Between Council meetings there are EFTA meetings at ambassadorial level once a month in Geneva. Several committees and expert groups are reporting to the Council, e.g. the third country relations committee, the customs committee and the budget committee. A number of committees are managing the updating of the EFTA convention[8].

Advisory bodies.

EFTA has two advisory bodies, namely the EFTA Consultative Committee and the EFTA Parliamentary Committee. The first mentioned committee is composed of the representatives of trade unions, chambers of commerce and industries. It is a platform for dialogue and consultation between EFTA social partners and EFTA institutions. The committee adopts opinions and resolutions as well as working papers. It discusses economic and social issues related to the EEA, taking into account the important impact of EC legislation, and to FTA-related matters. The Consultative Committee is composed of eighteen members: five from Iceland, two from Liechtenstein, six from Norway and five from the Switzerland. One of the members is the president and another is the vice chairman. On an alternate basis they are representatives of employers or of commerce. The committee meets five times yearly and, in addition, holds annual meetings with the EFTA Parliamentary Committee. The EFTA Consultative Committee is in regular contact and dialogue with the EU's Economic and Social Committee and this dialogue is formalised by the EEA Agreement. Since Switzerland is not an EEA member, the committee receives updates on Swiss-EC bilateral relations and assesses the influence of EEA current developments on Switzerland.

The Parliamentary Committee is an assembly of members of the national parliaments of the four member states. The presidency and the vice presidency are divided between two different member states. Since the EEA Agreement of 1994 there are two EFTA parliamentary committees. The first is the Committee of Members of Parliament of the EFTA states (MPS) which deals with EEA related matters and forms the EFTA side of the EEA Joint Parliamentary Committee. Switzerland is an observer in the MPS with a delegation of five Swiss parliamentarians. MPS has six members from Norway, four from Iceland and two from Liechtenstein. The second is the Committee of Members of Parliament (CMP) of the EFTA Countries which deal with all other matters, in particular EFTA relations with third countries. CMP has five members from the national parliament of each EFTA country. CMP holds four meetings yearly, in addition to the two customary joint meetings with EFTA ministers and a third country visit. CMP operates as a link to the EFTA countries' national parliaments on issues that traditionally fall under EFTA jurisdiction.

The Secretariat.

The EFTA Secretariat is led by the Secretary-General, who in 2012 still is Kare Bryn from Norway. Its several departments are located in Geneva, Brussels and Luxembourg[9]. The Secretary-General is assisted by two deputies, one based in Geneva and the other in Brussels. The three positions are shared among the four member states. The Geneva administration is responsible for the free trade agreements with the non-EU

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[8] Grønningsaeter,T. (2010). This is EFTA: 50 Years Anniversary. Brussels: EFTA. 27.
[9] Ibidem, 28-29.

countries and assists the EFTA Council. Nearly thirty people are work at the Geneva post. The Brussels part of the EFTA secretariat is supporting the member states in the preparation of new legislation under the EEA agreement and is helping the four countries in the elaboration of their input into EU decision-making. Approximately 60 people work in the Brussels headquarters of EFTA. Coordination among EFTA states and between EFTA states and third countries is conducted through the EFTA Secretariat which is the central administrative organ in the EFTA institutional structure. The EFTA statistical office in Luxembourg contributes to the development of a broad and integrated European statistical system[10]. EFTA officers do not have a civil service status since they are employed on the basis of a three year contract, renewable once. While working for EFTA the officers are servants of the association and therefore they are not answerable to their national governments. There could ne no greater difference between EFTA and the EU than in the number of civil servants: EFTA counts slightly more than 100 civil servants While the EU employs over 30,000 civil servants.

The Board of Auditors.

Since May 1992, EFTA has a Board of Auditors on a permanent basis. It makes a yearly budget audit of the EFTA secretariat, the Surveillance Authority and the Court. It also functions as a contact point for the European Court of Auditors regarding the control and auditing of EFTA/EEA contributions to the EU budget. The board has one representative of each member state and reports directly to the EFTA Council. Only the audit board concerning the secretariat is composed of four members. In the two other institutions the audit is carried out by the three states which are members of the EEA.

The EEA/EFTA Court[11]

The EEA Agreement obliged the three EFTA states to establish a court of justice or an EEA/EFTA Court with regard to the implementation of the EEA Agreement by the participating EFTA states[12]. Switzerland is not under its jurisdiction. The EEA/EFTA Court fulfils the judicial function within the EEA Agreement with regard to Norway, Iceland and Liechtenstein only. The seat of the Court is in Luxembourg, which is also the location of the European Court of Justice. Although modelled on the European Court of Justice, the infringement actions submitted by the EFTA Surveillance Authority against Norway, Iceland or Liechtenstein for failure to fulfil obligations under the EEA Agreement, settlement of disputes between EFTA member states, appeals against decisions of the Surveillance Authority, and rendering advisory opinions by means of a judgment to national courts of the EFTA States on the interpretation of the EEA law. The

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[10] EFTA-EU Statistical Cooperation Handbook. (2011). Brussels: EFTA. 7.

[11] * Baudenbacher C. and Tresselt P. (eds.) (2005). EFTA Court 10th Anniversary. Oxford: Hart.
  *Baudenbacher, C. (2010). The contribution of the EFTA Court, in: EFTA 1960-2010 (eds. Brynand W.and
    Einarsson, G. University of Iceland press. 191-196.

[12] The Court has been formally established by the Agreement between the EFTA States on the Establishment of a Surveillance Authority and a Court of Justice or ESA/Court Agreement, signed in Oporto on 2 May 1992 and amended occasionally. Amendments have been made by the "Protocol Adjusting the Agreement between the EFTA States on the Establishment of a Surveillance Authority and a Court of Justice of 17 March 1973 and by the "Protocol Regarding the Application to Liechtenstein of Decisions and Other Measures taken under Certain Agreements between the EFTA States of 18 May 1995.

EEA/EFTA Court follows closely the case law of the European Court of Justice in order to guarantee homogeneity between the EFTA convention and the EEA Agreement. In the first 15 years of its existence, the EEA/EFTA Court rendered judgment in little more than 100 cases. Thus, the case law of the EEA/EFTA Court[13] is more limited than the case law of the European Court of Justice, although it contributed to further explaining the meaning of EEA law. During its years of existence, the EEA/EFTA Court was careful to avoid EEA-specific case law that would give the EFTA States greater political leeway than the EU states.

The EEA/EFTA Surveillance Authority[14]

The Surveillance Authority has been established by the "Agreement between the EFTA States on the Establishment of a Surveillance Authority and a Court of Justice", signed on 2 May 1992. The Surveillance Authority is an EEA/EFTA institution concerning the interpretation and application of the EEA by the three participating EFTA States. It is the equivalent of the European Commission. In order to avoid different interpretations a system of consultation between the European Commission and EFTA's Surveillance Authority has been developed; the Surveillance Authority's seat is Brussels for close communication with the European Commission. The authority ensures that the three EEA/EFTA States respect their obligations under the EEA treaty. It seeks to protect the rights of individuals and companies and to enforce restrictions on state aid. The Surveillance Authority also ensures that companies operating in EFTA countries respect the competition rules[15]. As a general rule, the EEA/EFTA States notify the Supervisory Authority of their transposition of EEA provisions into national law. The EEA Agreement is based on the principle that either the European Commission or the Surveillance Authority, is competent to handle a case of merger or cartel law enforcement. The EFTA Surveillance Authority has exclusive merger control jurisdiction only for concentrations with an EFTA dimension.

The European Economic Area and free trade agreements

The external economic policy of EFTA is based on two kinds of instruments, the "European Economic Area" (EEA), concluded with the European Union, and the more than 30 free trade agreements worldwide. The EEA is the indispensable economic instrument for EFTA to access freely the EU market. Whereas the EEA incorporates the EU's internal market legislation into Norway, Iceland, and Liechtenstein, the free trade agreements (FTA's) of EFTA are worked out according to EFTA's own model as a free trade zone. FTA's guarantee EFTA's commercial interests in the world and independently of the EU.

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[13] Any natural or legal person may institute proceedings before the EEA/EFTA court against a decision of the EFTA Surveillance Authority addressed to that person or against a decision addressed to another person, if it is of direct and individual concern to the former (called action for annulment of a decision of the EFTA Surveillance Authority). If the action is well founded the decision of the EFTA Surveillance Authority will be declared void. Also any natural or legal person may complain to the EEA/EFTA Court that the EFTA Surveillance Authority has failed to act, in infringement of the EEA Agreement, an EFTA state or a natural or legal person may bring an action before the EEA/EFTA Court to have the infringement established.

[14] Sanderud, P. The EFTA Surveillance Authority: The Watchdog. EFTA 1960-2010 o.c.. 187-190.

[15] Van Bael, I. (2005). Competition Law of the European Community. The Hague: Kluwer Law. 193-201.

The "European Economic Area" or EEA

After the introduction of an "internal market" the EFTA realized the need to negotiate unlimited access to the EEC's internal market and this on the condition that EFTA States adopted the internal market legislation. The European Economic Area treaty was characterized by common decision-making and based on two pillars: the EEC and EFTA. It was signed on 2 May 1992 by the European Economic Community, Norway, Liechtenstein and Iceland[16] and entered into force on 1 January 1994, although Liechtenstein joined the EEA in 1995. Switzerland opted to stay out of the EEA after a negative result in a referendum.

Today the EEA comprises 30 European states (27 EU member states as well as three EFTA states: Norway, Iceland and Liechtenstein) and it is the most comprehensive treaty ever concluded by the European Union and EFTA. Every extension of the European Union has been followed by a parallel enlargement of the EEA. The EU enlargements have not fundamentally challenged the EEA Agreement nor its institutions. [17] Article 1 of the EEA Agreement extends the internal market of the EU and all its related "acquis communautaire" to the EFTA states Iceland, Liechtenstein and Norway.

One may say that the general economic objectives of the EEA resemble the classical free trade approach, whereas the adoption of the EU "acquis communautaire" and its monitoring system within the EEA reflects a novelty in economic treaty law. The EEA Agreement is also a complex "mixed agreement" because on the EU part some matters fall under exclusive EU competences while others remain under national competences[18]. Contrary to EU law, the principle of direct effect of the EEA Agreement is not applicable in EEA law[19]. The rejection of direct effect follows from the legal rationale that the EEA is based on national sovereignty and intergovernmental cooperation. The EEA does not include matters relating to the common agricultural and fisheries policy, the common commercial policy, fiscal harmonization, monetary union, foreign and security policy, and justice and home affairs. Regarding The EEA does not provide for a customs union.

In order to avoid different interpretation a system of consultation between the European Commission and EFTA's Surveillance Authority has been developed. The EFTA Surveillance Authority and the EEA Joint Committee keep under constant review the development of the case law of the European Court of Justice and the EFTA Court[20] in order to preserve the homogenous interpretation. Since EFTA is a free trade zone and does not entail a customs union, it was necessary to provide detailed rules concerning the origin of products.

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[16] MATTHIJS , H. (1993). De Europese economische Ruimte. Rechtskundig Weekblad 56 (41): 1385-1391.

[17] Sverdrup, U. (2006). The EU Enlargement: Challenges to the institutions – or the Existence – of the European Economic Area, In Müller-Graff P.C. and Selvig E. (eds.). The European Economic Area Enlarged. Berlin: Wissenschafts-Verlag. 11-32.

[18] Blanchet T. (1994). The Agreement on the European Economic Area (EEA). O.C. 20.

[19] Harbo, T.I. (2009), The European Economic Area Agreement: a Case of Legal Pluralism. Nordic Journal of International Law. 78(2): 201-223.

[20] Fredriksen, H.H. (2010). One Market, Two Courts: Legal Pluralism vs. Homogeneity in the European Economic Area. Nordic Journal of International Law 79(4): 481-499.

The EEA Agreement provides that all participating states may, on a voluntary basis, start closer cooperation in other fields, such as research and development, the environment, education and social policy[21].

The free trade agreements or FTAs

As of the end of 2011 the EFTA has 24 operational free trade agreements in force covering 33 countries[22]. Through EFTA the member states have created one of the largest networks of preferential trade relations world wide. Current FTA's network secures economic operators access to markets of around 670 million consumers outside the European Union. The main reason that the four EFTA states use this organization as their common vehicle for preferential trade relations is that , as a group, they carry more economic and political weight, thus being more attractive to potential trade partners[23].

The FTAs establish a free trade area between the partner countries by providing for free trade in industrial goods -- including fish, liberalising trade in processed agriculture products,industrial goods, intellectual property rights, capital movements and rules of competition.

The budgets.

Inside the working of the EFTA there are two internal budgets, namely: the general EFTA budget with which five institutions and the EEA are linked. There is a separate budget for the ESA. The expenditures and the financing of the partly situated in the general budget , but mostly related with the EEA budget. The two other budgets (financial mechanism and the Swiss contributions) are related with the EU expansion and is based on the solidarity from the richer EFTA countries with the eastern and south EU member states.

EFTA budget (in CHF).

The EFTA secretariat prepares the annual budget of this organization while the Council takes the final decision. The Council's budgetary powers are laid down in Article 44-C of the EFTA convention: " ... to establish the financial arrangements necessary for the administrative expenses of the association, the procedure for establishing a budget and the apportionment of those expenses between the member states." The current currency used by the EFTA budget is the "Franc Suisse" (CHF), the official currency in Switzerland and Liechtenstein. The most important budget posts in the EFTA budget are the following ones expressed in CHF for the years 2009, 2010, 2011 and 2012.

- managing the EEA Agreement: 2009: 5,756,000
                                  2010: 9,624,000
                                  2011: 8,824,000
                                  2012: 7,712,000

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[21] *Zaglmayer, B. (2009). The Social Security Relations between the EU and EFTA states. In Pieters D. and Schoukens P. (eds.), The Social Security Co-ordination between the EU and the non-EU Countries. Antwerpen: Intersentia. 57-84.

   * Gronningsaeter T. (2011). This is EFTA 2011. Brussels: EFTA Secretariat. 18.

[22] This is EFTA 2012. o.c. 12-16.

[23] Ibidem. 12

- trade relations: 2009:   2,998,000
                                                                2010:   4,540,000
                                                                2011:   4,682,000
                                                                2012 : 4,696,000

- internal activities: 2009:   10,614,000
                                                                 2010:   4,330,000
                                                                 2011:   4,192,000
                                                                 2012:   4,057,000

- EU/EFTA cooperation programs :   2009:   3,323,000
                                                               2010:   3,471,000
                                                               2011:   3,245,000
                                                               2012:   2,958,000

- secretary general services: 2009:   1,220,000
                                                               2010:   2,160,000
                                                               2011:   1,964,000
                                                               2012:   1,964,000

- EFTA/EU statistical cooperation: 2009:   526,000
                                                               2010:   885,000
                                                               2011:   747,000
                                                               2012:   679,000

- Total EFTA budget in CHF   2009: 24,437,000 (or 20,3 million
  Euro)

                                                               2010: 25,010,000 (or 20,8
                                                               million Euro)
                                                               2011: 23,654,000 (or 19,6 million
                                                               Euro)
                                                               2012:   22,066,000 (or 18,3 million
                                                               Euro)

Source: EFTA budgets 2009- 2010-2011-2012

The most important expenditures in this budget are the salaries and the administration. This general EFTA budget isn't an operational one. The EFTA budget is only a fraction of the general budget of the European Union (in 2012: 129,000 million Euro and in 2010: 122,955 million Euro). The fact that Switzerland is not a member of the EEA has an impact on the contributions of the states regarding this budget. The yearly budget contributions of the four EFTA member states are determined by the Council – the figures are expressed in CHF.

Following the shares of the member states in the financing of this budget. Their contributions is partly based on the national GDP of the states and partly on the GDP per

capita. Of course Norway and Switzerland are the main contributors of this financing system.

But the Swiss contribution depends also on the level of the expenditures concerning the managing of the EEA agreement.

Budget 2009

- Norway	53.00%	or	13,382,000 CHF
- Switzerland	41.44%	or	9,679,000
- Iceland	4.59%	or	1,151,000
- Liechtenstein	0.97%	or	225,000

Budget 2010

- Norway:	56.29%	or	14,079,000
- Switzerland:	38.02%	or	9,508,000
- Iceland:	4.81%	or	1,204,000
- Liechtenstein:	0.88%	or	219,000

Budget 2011

- Norway	57.12%	or	13,510,000
- Switzerland	37.68%	or	8,914,000
- Iceland	4.33%	or	1,025,000
- Liechtenstein	0.87%	or	205,000

Budget 2012

- Norway	56,65%	or	12,501,012 CHF
- Switzerland	38,64%	or	8,525,430
- Iceland	3,83%	or	844,360
- Liechtenstein	0,88%	or	195,198

Over the last years the share of Norway is in an increasing line. Switzerland is going in the other direction. That's the impact of the fluctuations in the outlays for the EEA. These expenditures were increasing between 2009 and 2010 with the result that the Confederation had to pay less to the EFTA budget. Between the budget years 2011 and 2012 these EEA expenditures in the EFTA budget went down with the result that the Swiss contribution is increasing.

The EFTA Surveillance Authority (in Euro).

The EFTA Surveillance Authority (ESA) is a collegial body of three persons and its administrative organization has four departments: the administration, the internal market, competition and state aid, and legal affairs. The Surveillance Authority has nearly 60 people in service with a fixed term contract of three years. In general these individuals are national experts from the pubic administrations of the EFTA states. The headlines of the Surveillance Authority budget for 2010, 2011 and 2012 (expressed in millions of Euro) are as follows:

	2012	2011	2010
Salaries, allowances	9,5	9,3	9,3
Travel and training	0,7	0,7	0,7
Office accommodation	1,1	1,1	1,1
Supplies	1,1	1,0	1,0
TOTAL expenditures	12,4	12,1	12,1

Source: ESA Annual Report 2010, 2011 and budget 2012.

The Surveillance Authority budget is strictly internal and for administrative expenditure. Inside the EFTA these three countries have negotiated their national contribution to the ESA in a fixed percentage. The following figures confirm the importance of Norway in the budget which is financed by contributions of the three EFTA-EEA states:

- Norway: 89% or 10,813,047 Euro (2011) - 89% or 11,047,885 Euro (2012)
- Iceland: 9% or   1,093,453 Euro (2011) - 9% or   1,117,202 Euro (2012)
- Liechtenstein 2% or   242,989 Euro (2011) - 2% or   248,267 Euro (2012)

.The EFTA Board of Auditors is in charge of the financial statements of the preceding budgetary year. Their financial audits need the approval of the member states and thereafter the Surveillance Authority is discharged of its accounting responsibility for that year.

The financial mechanism.

The EEA Agreement of 1992 established a financial mechanism according to which EFTA/EEA states contribute financially to the reduction of disparities between the regions of the European Economic Area. EFTA accepted to contribute funds to the EU for the benefit of the poorer EU regions and states, a great exception in EFTA's philosophy of limiting budgetary resources to a minimum. The mechanism is further worked out by Protocol 38 to the EEA Agreement which mentions interest subsidies and gifts as the two support facilities for poorer regions. The financial mechanism system allocates resources to the new EU member states since their admission in 2004, namely ten South and Eastern European states, and in 2007 (Romania and Bulgaria). Pursuant to Protocol 38 EEA other poorer member states or regions can also enjoy financial support, namely Portugal, Ireland, Greece and some Spanish regions. Consequently, the three EFTA-EEA states have to contribute to the financial mechanism for reducing the economic and social disparities between the EEA states. The financial flows are managed by the "Financial Mechanism Office" (FMO), located in Brussels, which is administratively linked to the EFTA secretariat. The budget of the 'FMO' is not part of the EFTA budget.

EEA and Norway grants.

In accordance with the EEA Agreement the three member states contribute to social and economic progress in the least developed EU member states. The idea behind this was and still is that the EFTA states have a higher standard of living compared to the poorest EU member states. In 2004 Norway declared that it would contribute more financial grants to the poorer EU member states. That year was also the moment of a

very great expansion with ten new states to the EU. The EU wanted a greater contribution from the EFTA states in the financial mechanism. However, the smaller countries Liechtenstein and Iceland were not convinced. Therefore Norway decided unilaterally to create the Norwegian grants which are thus separated from the EEA grants.

Financial overview.

The First Financial Mechanism was established on 1 January 2004 and covered support for Greece, Portugal, Ireland, Northern Ireland and some Spanish regions with a sum of two billion Euro. Spain got the greatest part with a share of 45.4%, Greece: 24.3%, Portugal:

21 %, Ireland: 7.1% and Northern Ireland: 2.2%. By the admission of Sweden, Austria and Finland to the EU on 1 January 1995 the Commission took over responsibilities for the contributions of these three EFTA member states.

The Second Financial Mechanism was fixed for the period 1999-2003 with a support of 119,6 million Euro for the same countries or regions as in the first system. The greatest part of this support went again to the Spanish regions and about 93% of the funding was spent on projects related to environmental protection.

In 2004, the European Union was enlarged with ten new member states. On 1 May 2004, the Third Financial Mechanism became operational consisting of the old one with the EFTA/EEA members and the New Norwegian grants. The enlargements of the European Union and the EEA in 2004 with ten countries and in 2007 with Romania and Bulgaria were seen as a justification for a substantial increase in the resources earmarked for the European cohesion. Indeed nearly all the new member states had a level of welfare below the EU average. The ten new states of 2004, with 75 million inhabitants, have a joint GDP below the joint GDP of the four EFTA states at nearly 13 million. In the period of the Third Financial Mechanism (2004-2009) contributions were distributed as follows:

- EFTA contribution: 672 million Euro with a share of 95% by Norway;
- Norwegian grants for the ten new EU members: 567 million Euro;
- Norwegian grants for the two new EU states from 2007: 68 million Euro

In total the grants in this period were fixed at 1.307 million Euro.

The financial streams from the three donor countries to the beneficiary countries are as follows (in million Euro):

1. Poland :   558,63
2. Hungary: 135,06
3. Czech Republic: 110,91
4. Slovakia: 70,33
5. Lithuania: 67,26
6. Latvia: 53,76
7. Romania: 50,50
8. Spain: 45,84
9. Greece: 34,26

10. Estonia:	32,76	
11. Portugal:	31,32	
12. Bulgaria:	21,50	
13. Slovenia:	18,59	
14. Cyprus:	4,66	
15. Malta:	3,62	

Source: EEA and Norway Grants, Annual Status Report 2011,6.

Out of 1,197 projects approved between 2004 and 2009, nearly 1,057 (88%) has been completed by the implementation deadline of 30 April 2011. By 30 April 2012, nearly 97% of the projects will have been concluded.

The distribution of the contributions over the projects by sector is as follow:

- Environment: 246 million
- Cultural heritage: 243 million
- Health and children: 161 million
- Schengen and judiciary: 120 million
- Human resources: 119 million
- NGO funds: 85 million
- Academic research: 80 million
- Etc…

The Fourth Financial Mechanism is for the period 2009-2014 with a split system between the EFTA grants and the Norwegian grants.

- EFTA grants : 988,5 million Euro with a share of 95% by Norway
- Norwegian grants: 800 million Euro

The total sum of these grants in the fourth period is 1.78 billion Euro.

The grants are divided over the twelve new members and the three old states (expressed in million Euro).

1. Poland: 578,1
2. Romania : 306
3. Hungary: 153,3
4. Czech Republic: 131,8
5. Bulgaria: 126,6
6. Lithuania: 84
7. Slovakia: 80,8
8. Latvia: 73
9. Greece: 63,4
10. Portugal: 58
11. Estonia: 48,6
12. Spain: 45,9
13. Slovenia: 26,9

14. Cyprus: 7,9
15. Malta: 4,5

Source: EEA and Norway Grants, Annual Status Report 2011,14

These grants are divided among the EU states on the basis of parameters such as population, GDP etc. The financial grants are related to completed programs in areas such as the environment, cultural heritage, academic research, the "Schengen acquis", cross-border activities, regional policy etc. in the 15 beneficiary states (in million Euro):

- Human and social development: 270 million
- Climate change and renewable energy: 166 million
- Cultural heritage: 162 million
- Carbon, capture and storage: 144 million
- Justice and home affaires: 117 million
- Research and scholarship: 112 million
- Civil society: 111 million
- Environment protection: 99 million
- Etc…

Comparing with the 2004-2009 FMO the present system is a lot greater in budget terms (from1.307 million Euro to 1.780 million Euro).

The EEA budget.

Article 82 and protocol 32 of the EEA agreement are setting the budget rules concerning the EFTA contributions to the EU general budget. Inside the EFTA standing committee the working group on budgetary matters is responsible for the coordination concerning the procedure establishing the budget in cooperation with the European Commission. The EEA Joint Committee in which the budgetary decisions are taken holds a central position. The representatives of the three EFTA/EEA states and the European Commission are the members of this joint committee. Concerning the EEA budget only Norway, Iceland and Liechtenstein are contributing EFTA states. The EEA budget is an annex of the general EU budget. There are two kinds of EU expenditures in which the EFTA members are contributing to, namely the operational and the administrative expenditures. The contributions of the three EFTA member states (Norway, Iceland and Liechtenstein) are paid directly by the national budgets through their treasuries. In practice, every year these three countries receive a bill from the European Commission during the summer period.

The operational budget.

The EFTA/EEA contributions are calculated in accordance with the rules of Article 82 of the EEA agreement which stipulate that the GDP of each EFTA/EEA state will be divided by the sum of all the GDP's of the 27 EU member states plus the GDP of the EFTA state. For example, the GDP of an EFTA state is 450 million Euro and the GDP of all EU member states is equal to 13,050 million Euro. The proportionality factor of this country is: 450 / 13.050 + 450 or 3.33% share. Another way of calculating is to take the amount of all GDP's of the three EFTA states and divide it by the sum of the global GDP of the EU plus the global GDP of these three EFTA states. The

proportionality factor is the following percentage as a share in the contribution for all the three EFTA states in the EU/EEA budget[24], namely:

    2004 : 2.29% (Norway: 2.18%; Iceland: 0.10% and Liechtenstein: 0.01%)
    2011:   2.38% (Norway: 2.28%; Iceland: 0.07% and Liechtenstein: 0.03%)
    2012:   2.60% (Norway: 2.49%; Iceland: 0.08% and Liechtenstein: 0.03%)

The share of Norway in this EFTA/EEA financial mechanism continues to rise in accordance with the banking problems of Iceland. But also the share of the three EFTA countries is going up compared with the EU states in the EEA financial mechanism. The reason here is the financial problems and the difficult situation of the public finances in a lot of EU member states, which lead to a reduction of the GDP in several countries, for example in Spain, Portugal, Greece, Ireland and East European countries.

I.   The administrative budget.

The EFTA/EEA states contribute to the administrative costs of the European Commission. This contribution is negotiated every year, with each EFTA/EEA state. It regards the rental of offices, meetings, publications etc. The contribution is financial. This kind of contribution is related to the EFTA/EEA supply of human experts to the European Commission in order to manage the programs with EFTA/EEA participation.

II.   Summary of the general EU budget.

In the EU budget 2012 an annex related to the Commission budget, outlines the budget concerning the EEA. The contributions for the payments from the EU budget and the EFTA are the following figures (in Euro):

    EU budget administrative costs in payments: 626,153,808
    EFTA part: 2,085,368
    EU operational budget: 9,854,093,700
    EFTA part: 248,852,598

The contributions of EFTA states are related to programs, such as Galileo, and/or agencies such as the European Environment Agency. Some contributions are based on the proportionality factor: 2.60% (all three), 2.57% (Norway and Iceland) or 2.49% (only Norway).

III.   Overview payments.

The EU budget contains two kinds of appropriations, namely: commitments and payments.

The commitment amount of an EU program is the ceiling decided by the EU budgetary authorities, namely the European Parliament and the Council. The total commitment amount is decided for a multiannual period and is broken down into yearly commitments amounts. As the implementation period of each project is multiannual, the committed funds are not paid out in full the year of signature but are spread over several years. The EU general budget is an estimation of expected payments. The differences

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[24] Matthijs, H. and Kerremans, B. (2004). De begroting en de openbare financiën van de Europese Unie. Antwerpen: Intersentia. 217.

between the budgeted payments and the actual payments is the final result. Since 1995 the summary of commitments and payments is as follows expressed in millions of Euro and mentioning the shares over the three members states (ISL = Iceland, LCH = Liechtenstein, NOR= Norway).

	payments	ISL	LCH	NOR
1995	31	5.69%	0.64%	93.67%
1996	45	4,93%	0.86%	94.21%
1997	57	4.73%	0.90%	94.37%
1998	66	4.45%	0.82%	94.73%
1999	65	4.45%	0.82%	94.73%
2000	75	4.74%	0.77%	94.49%
2001	78	4.74%	0.77%	94.49%
2002	94	5.156%	0.70%	94.13%
2003	108	4.43%	0.63%	94.94%
2004	94	4.69%	0.66%	94.65%
2005	108	4.36%	0.64%	95%
2006	127	4.36%	0.64%	95%
2007	137	4.84%	1.01%	94.15%
2008	199	4.84%	0.97%	94.19%
2009	236	4.84%	0.97%	94.19%
2010	229	3.16%	1.07%	95.77%

Total :   1,749

Source: internal EFTA documents.

These figures confirm the importance of Norway in the EFTA/EEA financial system. The Icelandic reduction in the system is due to the serious problems in this country concerning the national public finances.

1.1   The Swiss contributions.

Switzerland is not a member of the EEA although it contributes on a bilateral way to some EU budget lines, e.g. to the 'Schengen acquis'. The Swiss financial contributions are the result of bilateral agreements between the European Commission and Switzerland. After Swiss voters had rejected participation in the EEA in December 1992, an amendment to the original formula of the financial mechanism became necessary. The cancellation of the Swiss contribution was compensated by higher interest subsidies on loans[25].

1.1.1 The Swiss-EU budget contribution

Switzerland participates in several projects and agencies of the European Union. Examples are research projects, the Schengen area, space projects, media, the environmental agency and Eurostat. Swiss participation is the result of direct bilateral talks between the EU and Switzerland. The following contribution amounts were fixed by Switzerland for the years 2010, 2011 and 2012 (expressed in millions CHF).

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[25] Matthijs,H. De Europese Ruimte. O.c., 1389.

- 2010: 376
         Research: 327; Schengen: 24; Eurostat: 8 etc…
- 2001: 434
         Research: 370; education: 23; Schengen: 20; media: 9; etc…
- 2012: 484
         Research: 414; Schengen: 24; education: 24; media: 9; etc…

Source: Rapport du Conseil Fédéral sur l'évaluation Européenne de la Suisse, September 2010 [26].

Since the beginning of the Swiss contribution to the EU projects, we do see an important rise of these amounts of nearly 30% (difference 2010-2012). The item of research is the most important following by Schengen (open borders) and education.

Switzerland also contributes financially to the new EU member states, which is resembling the EFTA/EEA Norwegian grants system. In a referendum on 26 November 2006 Swiss voters supported with 53.4% a federal law for financial assistance to Eastern European states[27]. Since 2007 Switzerland effectively paid as contribution for the benefit of new EU member states. The Swiss government negotiates directly with the beneficiaries and splits its total contribution in a first basket for ten new EU member states and a second basket for Romania and Bulgaria. The ten new EU member states. The basket for the ten new EU member states amounts to 1 billion CHF for the period June 2007 – June 2017.. Of the 1 billion CHF only 50 million CHF is earmarked as administrative costs for Switzerland. Financed projects are supervised and audited by the local offices of the Swiss Agency for Development and Cooperation. Financing is distributed according to sectors and expressed in millions CHF:

Environment and infrastructure:

Poland:	464,5	Latvia:	56,9
Hungary:	124,2	Estonia:	37,9
Czech Republic:	104,3	Slovenia:	20,8
Lithuania:	67,3	Cyprus:	5,7
Slovakia:	63,5	Malte:	4,7

Source: La contribution Suisse à l'élargissement. Rapport d'activité 2011, 5.

At the end of 2011, he Swiss confederation has given the approval on an amount of already 694 million CHF. Over this ten countries, 144 projects are financed by Switzerland.

Bilateral cooperation agreements with Romania and Bulgaria were signed in Bern at 7 September 2010. Their financial support covers the period until end 2019 and

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[26] This 2010 report of the Swiss federal government fixes these contributions for the years 2010-2013.

[27] The question put forward: "Should Switzerland the new EU member states support with 1 billion CHF over ten years?" It was a so-called optional referendum which can be tabled by 50,000 voters or by eight cantons.

contains the same sectors as mentioned above for an amount of 257 million CHF divided over:

- Romania: 171,95 million
- Bulgaria: 72,2 million

The rest of 12,85 million CHF are here the administrative costs for the confederation.

All together, the Swiss support to the twelve new EU member states amounts to 1,257 billion CHF (1.046.801.917 Euro)[28].

1.2   Total EFTA contribution.

The rapport from the EFTA countries to the European Union is as following divided over the two most important member states of the free trade association (figures 2012 in Euro):

I. <u>Switzerland</u>

-	EU budget:	484,00 million
-	EU new members:	<u>125,70 million</u> (average per year)
	Total:	690,70 million

II.   <u>Norway</u>

-	ESA:	11,00 million
-	FMO:	347,8 million (average per year)
-	EU/EEA/admin:	1,90 millions
-	EU/EEA/oper.	<u>238,00 million</u>
	Total:	598,70 million

Thus the Swiss confederation is the greatest contributor to the European Union (budget, EEA, new members), which can be explained by its considerable GDP[29].

The Swiss government calculated the price for the Confederation if Switzerland should be a EU member state[30]. The application of the financial system concerning the own resources if the EU should cost Switzerland in 2011 nearly 5,3 billion CHF (4,4 billion Euro).

This amount is a lot higher than the present Swiss contributions to the EU projects and the new member states.

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[28] Exchange rate 31 May 2012

[29] Figures for 2010: Switzerland (398 billion Euro) and Norway (311 billion Euro), source: EFTA 2012,11. GDP per capita: Norway (43,700 Euro), Switzerland (36,100 Euro).

[30] Rapport du Conseil Fédéral sur l'évaluation de la politique européenne de la Suisse, 17 September 2010,6704-6705.

If we compare Norway with the other three Scandinavian EU members, then we come to the same conclusion as for the confederation[31]. A Norwegian membership of the EU shall cost this Nordic country a lot more money than the present EFTA/EEA/grants contribution.

Knowing the fact that the Norwegian GDP is in total and per capita higher than in the three other Scandinavian member states, a membership will cost Norway a lot more than the present contribution.

Conclusion

After 50 years of existence, the European Free Trade Association is still a viable economic alternative for European countries wishing to remain outside the European Union while being able to benefit from participating in the European Union's enlarged internal market. The reasons for being a member state of EFTA are today exactly the same as they were 50 years ago: EFTA states can maintain their independent monetary policy, foreign affairs, defence and agriculture and fisheries policies. On average, EFTA states enjoy a higher GDP per capita and a lower unemployment rate than the EU-27.

Norway, Iceland and Liechtenstein are the EFTA states that signed the EEA Agreement of 1992 with the European Community whereby they accepted the four freedoms of the internal market "acquis" as well as future secondary legislation with the exception of the European Union's customs unions and other flanking policies. Since then, the EU became the unchallenged and most important trade partner of EFTA, representing nearly 70% of external EFTA Trade.

As an organization, EFTA maintained a minimal structure and a minimum of personnel. It proves that a light-footed organization can perform efficiently if supported by national administrations. This is one of the major lessons of the EFTA experience. It also guarantees that operational costs are kept at a very low level and therefore the organization is cost-efficient. The EFTA budget is limited to administrative expenditure. Three EFTA states (Norway, Iceland and Liechtenstein) are financial contributors to the social and economic development of the EU via the EFTA budget as part of the general budget of the EU and its financial mechanism. These three EFTA states become important financiers of the EU programs, especially with regard to the poorer EU regions and states. At the same time the three EFTA states are the most important external sponsors of the European Union. Switzerland has its own independent position by making bilateral contributions to the EU programs related to the EU's internal market. The two most important financial contributors to the EU are Norway and Switzerland which have sufficient budgetary means at their disposal. This is an unique example of a one-way solidarity between EFTA and the EU. However, full EU membership would be more expensive for Switzerland and Norway. It is perhaps the biggest achievement of EFTA that three of its member states form part of the enlarged internal market of the European Union but at a much cheaper budgetary price.

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[31] Based on the EU budget 2012 the contributions are for Danemark: 2,6 billion Euro; Finland: 1,9 billion Euro and Sweden: 3,5 billion Euro.

Mathematical Values Inculcation: A Perspective of Islamic World Views

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Abstract
The emergence of the need of education of best quality by many world nations brought the idea of values inculcation in the attainment of this noble objective. Therefore, this paper examined Islamic universal mathematical values inculcation model in mathematics teaching and learning. Comparison between Islamic universal values and the values in the context of mathematics contents delivery were examined. The study employ mixed methodological techniques for its data analyses which include: Structural equation modeling (SEM) and qualitative approach. A purposeful sampling technique of n=509 mathematics teachers respondents were used for the study. The authors also argue that for effective mathematical contents delivery should be one that advocates values inculcation. Suggestions were made on effective Islamic universal values inculcations in mathematics teaching and learning in encounter.

Key words: Mathematics; Values; Inculcation and Islamic world view.

Introduction

The inculcation of values in the attainment of quality education generally and mathematics education in particular cannot be over emphasized. This was because value based system of education guaranteed human and national development tendencies. Value can be seen some things worth valuing and it could be inform of ideas that we believe are important or some things that we rate highly important. Examples of some of these values are: helping others; having fun; being honest; good health; love of family; beauty; education; liberty; justice; money and so forth (Rokeach, 1973).

The general perspective of the terms 'values' can be referred to as something of interests, pleasures, likes, desires, goals needs and many other kinds of selective orientation (Rokeach, 1973). It may be viewed as a conception, explicit or implicit distinctive of an individual or characteristic of a group, of the desirable which influences the selection from available modes, means, and ends of action (Kluckhohn, 1951).

Accordingly, values have three dimensions: cognitive, affective and directive. The cognitive dimension refers to value as an internal code or mechanism that enables us to distinguish between good and bad, right and wrong and that constituting the grounds for decision-making process and the final course of action, (Kluckhohn & Strodtbeck, 1961). In addition to that, values function as a standard which assists individual in decision-making to formulate judgments and to select the most sound, acceptable and appropriate course of action (Grundstei, 1991).

The affective dimension refers to values as an expression of human needs which create a specific mode of conduct or end-state of existence and it project the state of desirability and human aspirations that are activated by human needs and predispositions. The directive dimension implies that values provide direction and guidance in resolving conflicts or dilemmas, and in coping with needs or claims for social and psychological defences of choices made, (Rokeach, 1973).

Therefore, these assertions indicated that the amalgamation of cognition, affection and direction generates a comprehensive and inclusive notion of value. Values can be classified into subsets or clusters: for example, basic values, moral values, social and political values, spiritual values and other more specific values. Basic values include: survival, caring, comfort, dignity, freedom, knowledge and self-respect. They are universal ends in themselves, and are rooted in human nature, (Beck, 1993).

Basic values represent the ultimate life-goals that people have and in order to promote these ultimate life-goals people need various intermediate or instrumental values that function as a means of attaining the fundamental or basic values. These instrumental values include moral, social and spiritual values. While moral values are the subset of values which include among others: carefulness, responsibility, courage, self-control, reliability, honesty and truthfulness (Beck, 1993).

Spiritual values include awareness, breadth of outlook, integration and gratitude, while social and political values include peace, justice, cooperation, sharing, loyalty, solidarity and tolerance. These diverse values are interconnected and ordered within a system that provides a frame for their ongoing interactive relationship and for weighing them against one another, (Beck, 1993).

Conclusively, mathematical values usually referred to those affective qualities which mathematics teachers' poster and promote through schools' mathematics teaching and learning. These values usually tend to stay longer than the normal procedural

mathematics teaching and learning (Bishop, 1988 & 1999). The Figure1below gives the Islamic conceptual model for values inculcation model in mathematics teaching and learning.

Conceptual Frame-work of Islamic Mathematical values inculcation

There were several dimensions and conceptualization of values in mathematics teaching and learning, for instance, Bishop, (1988 &1999); Bishop & Clarkson (1998) and Liman et al., (2011ab). But this study developed a conceptual Islamic frame-work for mathematical values inculcation. Figure1: shows the conceptual Islamic model for values inculcation in mathematics teaching and learning.
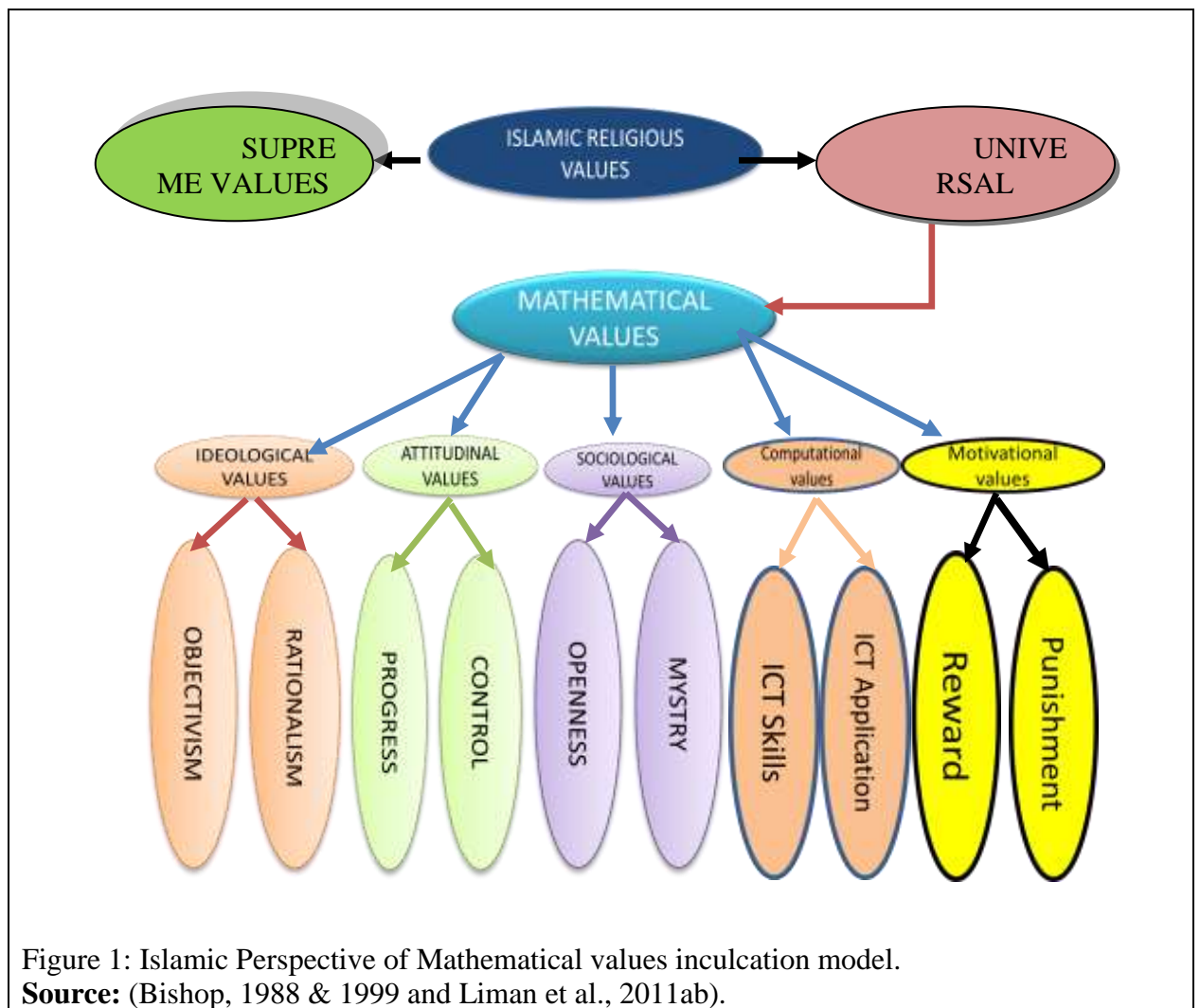
Figure 1: Islamic Perspective of Mathematical values inculcation model.
Source: (Bishop, 1988 & 1999 and Liman et al., 2011ab).

Previous Study

There were numerous researches conducted on mathematics values, such as Krathwohl, Bloom and Masia, (1964); Raths, et al., (1987); Tomlinson and Quinton, (1986), on affective aspects of mathematics education. Buxton, (1981); Fasheh, (1982); McLeod, (1992); Thompson, (1992) and Sosniak, et al, (1991) on the social and cultural aspects of mathematics education. Bishop, (1988; 1991; 1999; 2002); Davis and Hersh,

(1981) and (1986); Joseph, (1993) and Wilson, (1986) made tremendous contribution on the affective domain and values education generally.

With regard Krathwohl's (1964), analysis of the affective domain of Bloom's well-known Taxonomy first introduced the ideas of 'values' and 'valuing' as important educational objectives in the area of mental cognitive development of individual and that analysis suggested five levels of response to a phenomenon in an increasing degrees of commitment and these were: (i) Acceptance of value (ii) Preference for a value (iii) Commitment (iv) Conceptualization of a value and (v) Organization of a value system. These values concurred in contrast with Islamic universal values in the sense that Islam advocated the concept of likeness and sincerity of purpose in whatever worthy of doing. For instance, in one of the Prophet (P.B.U.H) Hadith said that, the actions of any one of you in doing any things will be judged according the intention.

Raths, et al., (1987) drawing an analogy from the oft-quoted book, offer seven criteria for calling something a value. They said (p.199) unless and until something satisfies all the seven criteria namely: (i) Choosing freely (ii) Choosing from alternatives (iii) Choosing after thought (iv) Prizing and cherishing (v) Affirming (vi) Acting upon choices and (vii) Repeating. We cannot call it a value, but rather either a 'belief' or 'attitude' or something other than a value. In Islam Allah (SWT) said, "There is no compulsion in religion. Verily, the right path has become distinct from the wrong path" (Qur'an, 2: 256). Therefore, their assertion concurred with Islamic belief.

In relation to values education generally, the work of Tomlinson and Quinton (1986) was particularly important since it moved the discussion from earlier reliance on the work of Kohlberg (1984) and associates into the mainstream subject curriculum. They argued strongly that when considering this area due attention should be given to three elements namely: (i) Aims or Intended outcomes (ii) Means or Teaching/Learning Processes and (iii) Effects or Actual outcomes. This is also similar to the saying of the Prophet Muhammad (P.B.U.H) that the action of any one of you is judge according to his intentions (Al-Bukhari, 1997).

Buxton (1981); Fasheh (1982) and McLeod (1992) separated the field of research on mathematical values into studies of beliefs, attitudes, and emotions. They asserted that ideas about both beliefs and attitudes towards mathematics were related to values held by both mathematics teachers and learners. In Islam believing on a thing enables valuing it. For example believing in the ones of Allah (SWT) and the Prophet Muhammad (P.B.U.H) enable one to imbibe and practice the religious obligations and the traditions of the Prophet (P.B.U.H)

Sources such as Davis and Hersh (1981) and (1986) and Joseph (1993) asserted that mathematical values inculcation proved helpful, even though they do not address values directly. Wilson's (1986) review whilst pointing out the paucity of writing and research on values in mathematics teaching also discussed on two values in mathematics teaching and learning which include:, a respect for truth, and the authority of mathematics. In contrast to Islamic values, the concept of truth and authority were regarded as an (*Amanah).*

Another area of concern which this study needs to be addressed is the introduction of two additional constructs which seems to be of importance in the course of values inculcation in mathematics teaching and learning. As such, the conceptualized values

inculation model founded by Bishop, (1988) will be extended by these two constructs namely: motivational and computational mathematical values respectively.

Motivation plays a vital role in mathematics teaching and learning and students' achievement; it is intimately linked to the ways students think, feel, and act in schools mathematics learning. At the current situation of high demand of mathematics literacy one of the fundamental challenges in mathematics teaching is convincing students that serious effort in study of mathematics as a subject will be rewarding and learning mathematics can also be an enjoyable experience. Motivation in Islam is one of the Islamic values which across of segment of human lives. Allah (SWT) repeatedly mentions in the Holy Qur'an about the rewards and punishments for those who belief in His entity and who goes astray.

There were evidences from researches on students learning in general Pintrich and Schunk, (2002), and mathematics and science education in particular, for example, Fennema, (1989) and Schoenfeld, (1992), revealed that students motivation, affect strategies and beliefs about knowledge discipline and that significantly influence the learning and performance of students in mathematics.

Furthermore, researches had proven that students' motivation and related outcomes in mathematics teaching and learning are sensitive to the characteristics of the learning context, which include teachers' instructional practices as well as school and classroom climate (Ames, 1992; Anderman & Maehr, 1999 & Eccles, et al., 1989). The figure 2 below depicts the hypothesized Islamic model for values inculcation in mathematics teaching and learning.
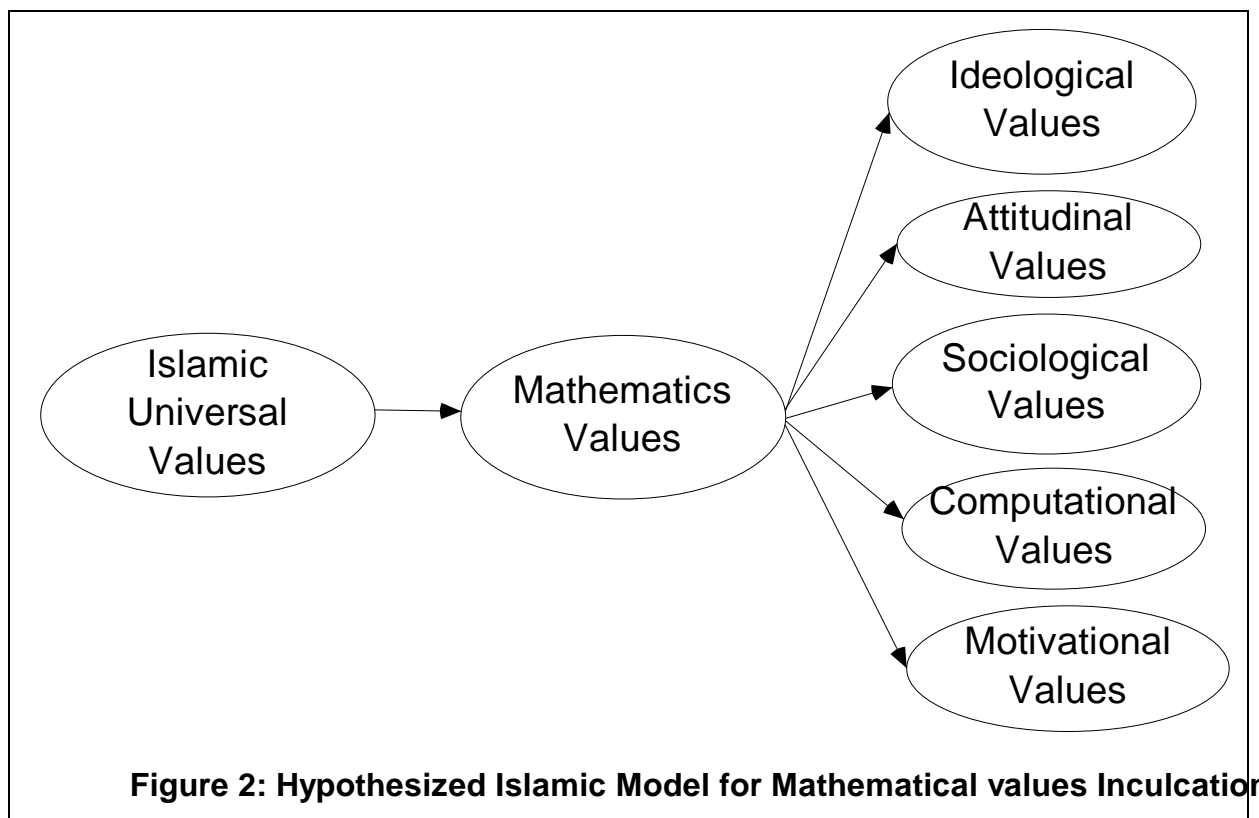

Figure 2: Hypothesized Islamic Model for Mathematical values Inculcation

Research Questions and Hypotheses

The study will answer the following research questions and hypotheses based on the underline hypothesized Islamic model for mathematical values inculcation in order understand and confirmed how Islamic values are inculcated in mathematical contents delivery.

Research Questions

Q1: Do the hypothesized universal Islamic mathematical values inculcation model adequately support the data?

Q2: What are the main differences between Islamic religious values and contextual mathematical values?

Q3: What are the area of similarities between Islamic religious values and contextual mathematical values?

Q4: What are the ways of inculcation of Islamic universal values in mathematics teaching and learning?

Research Hypotheses

H1: The hypothesized universal Islamic mathematical values inculcation model will support the data.

H2: There is difference between Islamic religious values and contextual mathematical values.

H3: There is area of similarity between Islamic religious values and contextual mathematical values.

H4: There are different ways of inculcation of Islamic universal values in mathematics teaching and learning.

Qualitative Framework for Islamic Religious Values

The concept of values in Islamic religion was sub-divided into two categories namely: supreme values and universal values. Supreme Islamic values referred to those values attributed to the unity of Allah (SWT). This includes: believing that there is God worthy of worship except Allah (SWT) and the Prophet Muhammad (P.B.U.H) is His last messenger of Allah (SWT). Therefore, each of the believers believes that Allah is the One and Only and the Sustainer, there is no deity worthy of worship except Him and there is no Lord except Him. There were many verses of the Holy Qur'an which stresses the need for one to be a believer. For example, Allah (SWT) said in His Holy book that, "Each one believes in Allah, His Angels, His Books, and His Messengers. (They say,) "We make no distinction between one another of His Messengers" (Qur'an, 2: 286). While the Islamic universal values were those values which are universal in nature. Example of these types of values include: being trustworthy, justice, equity, respect, kindness, love and among other Islamic universal values. These values were expected to be part and parcel of Muslim lives and should be practiced in all human transactions either between Muslims or non Muslims counterpart. Mathematical values were themselves a subset of Islamic universal values. For instance figure 3: gives illustrative outlook of Islamic religious values, Islamic supreme values, Islamic universal values and mathematical values.
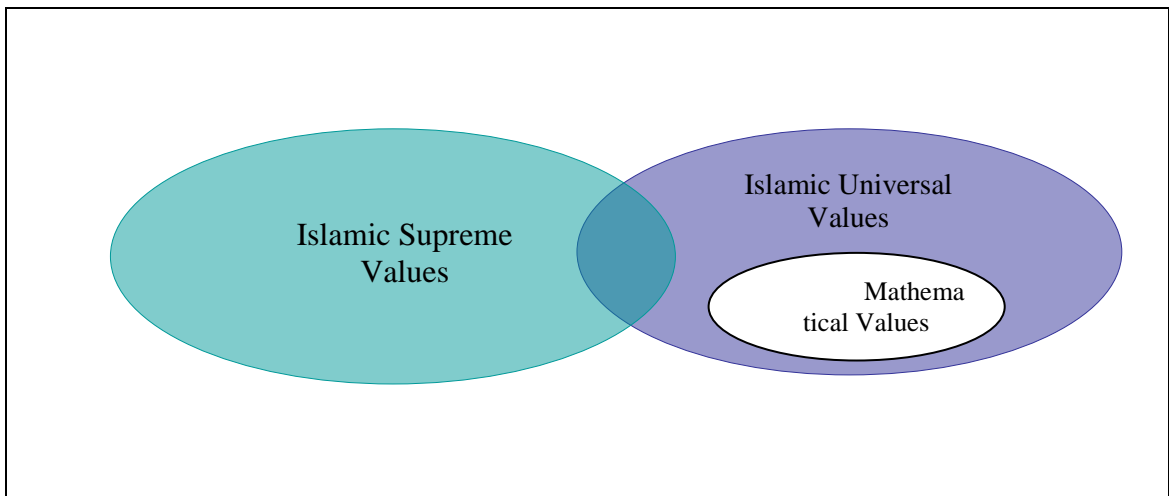
Figure 3: Relationship between Islamic Religious Values

From figure 3 above we can vividly see that Islamic religious values (IRV) is a bigger umbrella where Islamic supreme values (ISV) and Islamic universal values (IUV) emerges. While mathematical values were found to be the proper subset of Islamic universal values (IUV). Mathematically this relationship can be interpreted as, let μ denotes the set of Islamic religious values (IRV), let ISV denotes the set of all Islamic supreme values, IUV denotes the set of all Islamic universal values and MV denotes the set of all mathematical values containing in IUV. Therefore, the following relationships hold good. μ = (ISV $\cup$ IUV), ISV = (μ-IUV), IUV = (μ-ISV). Another description on the classification of Islamic religious values can best be presented by the following diagram.
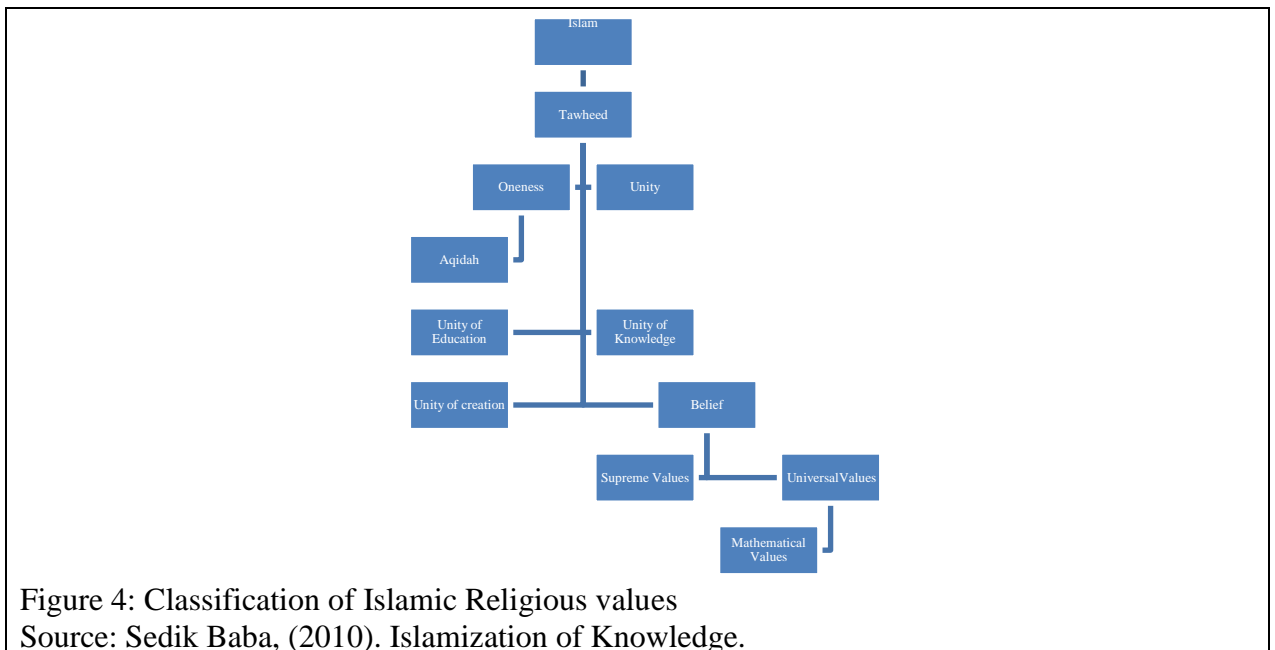

Figure 4: Classification of Islamic Religious values
Source: Sedik Baba, (2010). Islamization of Knowledge.

Methodology

Population and Sample size

The population of this study comprised all secondary schools mathematics teachers in the North-Eastern Religion of Nigeria with population figure of 1145. The researcher sampled n= 509 respondents for this study via a purposeful sampling technique. Furthermore, 3.5% margin of error and 95% confidence interval and online sample size calculator were used for the determination of sampling adequacy of this study (Krejcie & Morgan, 1970). Table 1depicts the criterion for the sampling adequacy of required sample size for this study.

Population Size (1)	Confidence = 95% Margin of Error (2)				Confidence = 99% Margin of Error (3)			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376

Source: The research advisors (2006).

Research Instrument

A self constructed 7-point likert-type scale survey measure of values inculcation in mathematics teaching and learning was used in the data collection of this study. The first section is on demographic information of the respondents. The second section consisted of 42 items measure cutting across the five hypothesized dimensions of values inculcation in mathematics teaching and learning which include: ideological, attitudinal, sociological, computational and motivational mathematical values respectively. The 42 item measures were used to obtain the teachers' responses on the nature of values they inculcate in their mathematics teaching and learning.

Data Analysis

Descriptive Statistics

The major analysis of this study is to test the casual relationship in the hypothesized model. Prior to these analyses, descriptive statistics is examined to determine the stability of the data. The information below provides detail information regarding the sample and the variable distributions of the study. In terms of gender, the proportion of male and female were found to be dissimilar in the sense that majority of the mathematics educator responded to this survey were male. Male mathematics teachers comprised 301 of the respondents (59.1%) leaving 208 female mathematics teachers (40.9%) responded to the survey questionnaire. Table1: shows the distribution of gender for the survey. Table 2 gives the profile of respondents according to gender.

Table 2: Profile of Respondents for the study (Gender)

Characteristics	Item	Frequency	Percentage
Gender	Male	301	59.1%
	Female	208	40.9%
Total		**509**	**100%**

Testing Structural Equation Modeling (SEM) for Values Inculcation Measures

The hypothesized 5-factor dimensions for values inculcation in mathematics teaching and learning was validated using AMOS graphic window (version 16). It was used to assess the factorial validity of the model. The fit statistics showed that the model did not fit the data. ($\chi2$ (855)=1889.230; P=.000; $\chi2/df$=2.210 ;CFI=.859 ;TLI=.851; IFI=.860; GFI=.850; RMSEA=.049 ; SRMR=.045).The results also suggest for a revision of the model since there were few cases of cross-loaded indicators, some of which showed big error variances (Byrne, 2010; Hair, et al., 2010; Sahari, (2011); Hu & Bentler, 1999). Figure 5: shows the initial structural equation modeling for values inculcation constructs in mathematics teaching and learning among secondary schools mathematics teachers in the North-Eastern Region of Nigeria.
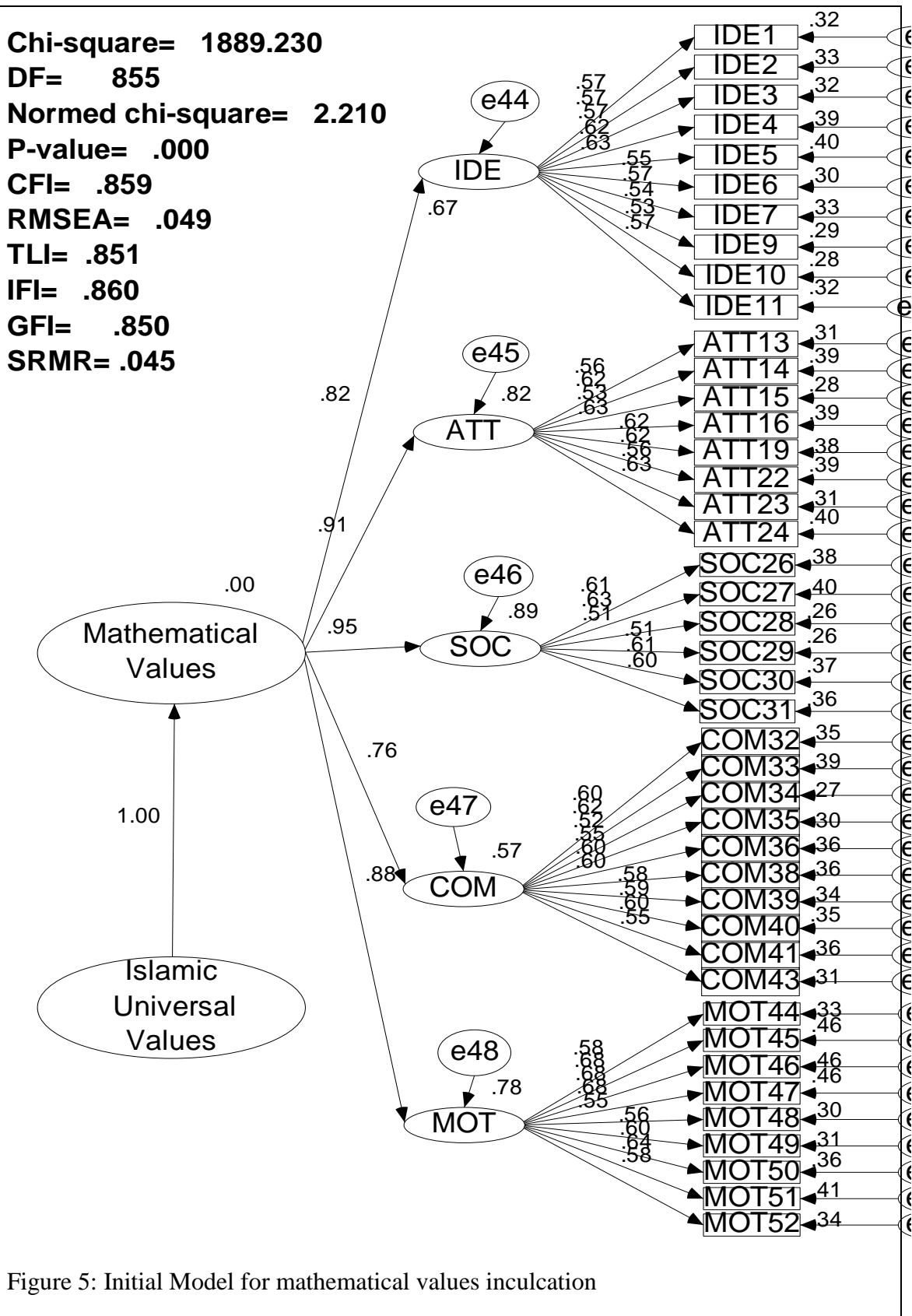
Figure 5: Initial Model for mathematical values inculcation

Figure 6: presents the final 28-item five-factor dimensions model analyzed using path measurement model analysis for values inculcation in mathematics teaching and learning among secondary schools mathematics teachers in the North Eastern Region of Nigeria. The analysis showed that the revised and final model was consistent with the data. ($\chi 2$ (345) =709.928; p=.000; $\chi 2/df$=2.058; CFI=.916; GFI= 909; TLI=.908; IFI=.916; RMSEA=.046; SRMR=.044). The direction and magnitude of the factor loading were substantial and statistically significant (Hair, 2010 & Kline, 2011).
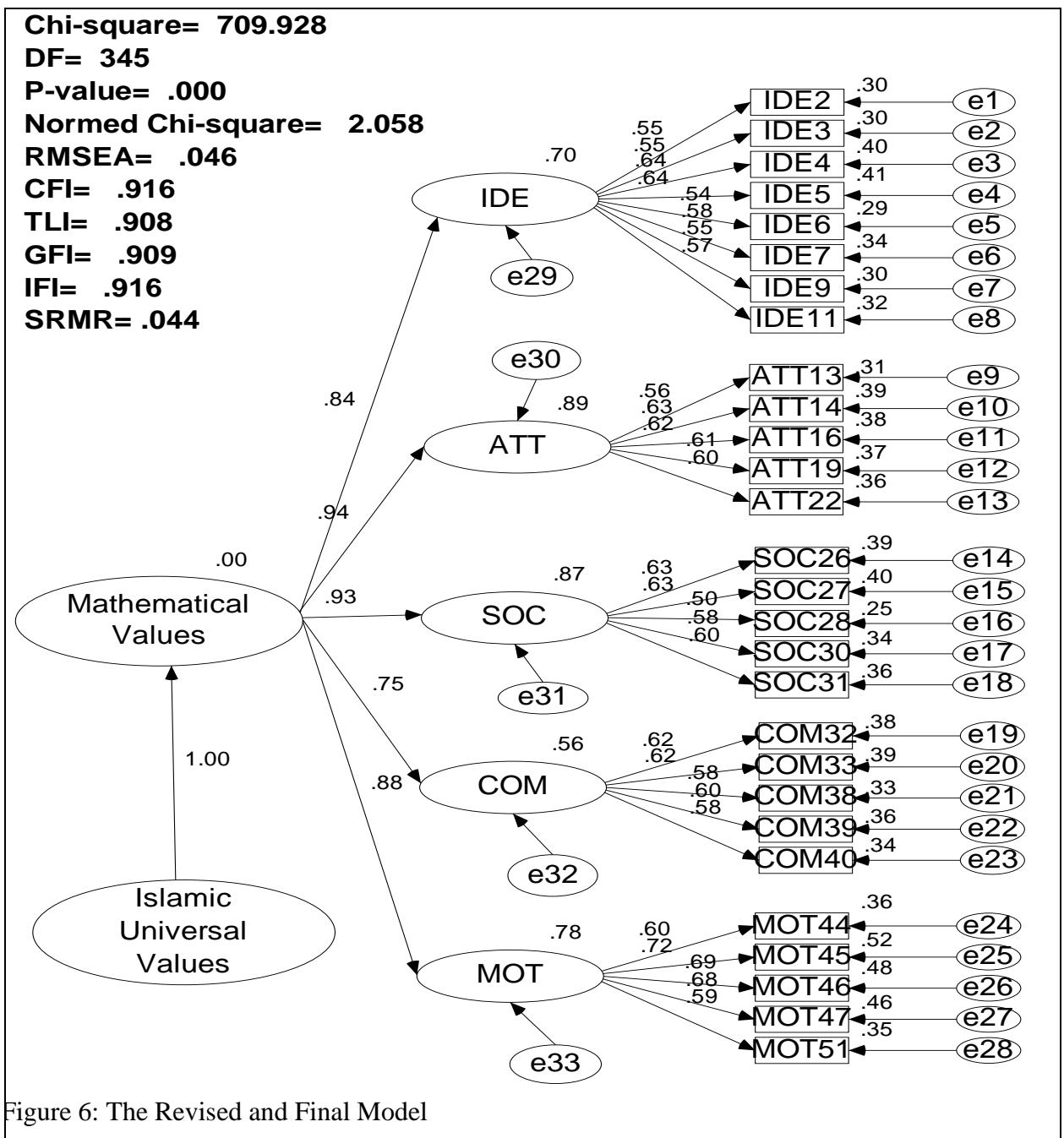

Figure 6: The Revised and Final Model

Testing the Hypotheses of the study

H1: The hypothesized Islamic universal values inculcation model will adequately support the data.

The analysis in figure 5 and 6 revealed that the hypothesized Islamic universal values model for the values inculcation in mathematics teaching and learning adequately fitted the data. The revised model fit statistics indicated model fit with Normed Chi-square statistics = 2.058; RMSEA = .046; CFI= .916 and SRMR =.044.

H2: There is difference between Islamic religious values and contextual mathematical values.

The qualitative analysis between Islamic religious values and contextual mathematical values revealed a distinctive nature of the Islamic religious values. The analysis showed that there were two categories of Islamic religious values namely: the supreme values and interactive/universal values. The supreme values referred to the ownership of the unity of Allah (SWT) and believing in the messenger ship of the Prophet of Muhammad (P.B.U.H). It was also encompasses: Tawheed; Aqida; Unity of Education; Unity of Creation and Unity of Knowledge. While the Islamic universal values or interactive values referred to those values of relationships between individual and groups, Muslims and Non-Muslims counterpart. Example of these values include: trustworthiness, respect, honesty, equity, transparency, justice and among other Islamic universal values and these values were found to properly contain mathematical values.

H3: There is area of similarity between Islamic religious values and contextual mathematical values.

The qualitative analysis (figure 3) also revealed that there exist areas of similarity between Islamic supreme values; Islamic universal values and Mathematical values. For example, the analysis showed that Islamic religious values were a bigger umbrella where Islamic supreme and universal values came from. On the vein we have seen in also in same figure 3 that mathematical values were proper subset of Islamic universal values. Mathematically, Islamic religious value (IRV) = $\bigcup$ {Islamic supreme values (ISV) and Islamic universal values (IUV)}.

H4: There are different ways of inculcation of Islamic universal values in mathematics teaching and learning

The qualitative analysis revealed that there are numerous Islamic values which fall under the category of interactive or universal values which Islam admonishes each and every Muslim to poses them for the harmonious existence of all mankind. These values which include among others are: Trust, Justice, Competency, Verification, Peace, Equity, Modesty, Respect, Tolerance, Patience, Perseverance, kindness, love, compassionate, unity, cooperation/collaboration, Punctuality, Precision etc. Therefore, the analysis on the strategies and approaches to the inculcation of these values in the teaching and learning of mathematics can be viewed in the following section.

Embedding the concept of truth in the course of mathematics teaching and learning can also be done through comparison between the theoretical mathematics teaching and learning and the real or (practical) mathematical concepts application in order to establish the agreement that existed between mathematical quantities. For example, in teaching factorization of algebraic expressions:

$$Expand, (2x + 2y)^2 = 2x^2 - 3y^2 \ \ldots\ldots\ldots\ldots.*$$

$Solution:$

$$(2x + 2y)(2x + 2y) = 2x^2 - 3y^2$$

$Distributing\ the\ first\ bracket\ on\ the\ second\ or\ otherwise\ we\ get$

$$2x(2x + 2y) + 2y(2x + 2y) = 2x^2 - 3y^2$$

$$4x^2 + 4xy + 4xy + 4y^2 = 2x^2 - 3y^2$$

$Collecting\ the\ like\ terms, we\ get$

$$4x^2 - 2x^2 + 4xy + 4xy + 4y^2 + 3x^2 = 0$$

$$2x^2 + 8xy + 7y^2 = 0$$

The final result of the expansion shows the degree of the agreement between the variables of some quantity $x^2, y^2\ and\ xy$. By so doing, the learners of mathematics can figure out by themselves the degree of accuracy of mathematics as a schools subject and from there mathematics teachers could be able to link it with the concept of truth in Islam.

The concept of justice/equity/fairness can be inculcated in mathematics teaching and learning through the following ways: first, mathematics teachers should be just and fair in dealing with their students. Students should be treated equally without any partiality or any degree of preference and students learning mathematics should be given equal opportunity in terms of freedom of questioning and appropriate answers should be given to students and it should be free from any ambiguity. Mathematics teachers' should give to each and every student the mark he/she deserves in terms of assessment achievement scores. Mathematics teachers should have the fun of demonstration on the basic laws and principles governing the mathematical conceptual operations. For example, when mathematics teacher is teaching algebraic linear equation in one variable say, 2x + 4 = 10. This linear equation has two sides separated by an equality sign (=), so in finding the solution of this equation, we proceed as follow:

$$Solve,\ 2x + 4 = 10\ \dots\dots\dots\dots.i$$

$$Solution\quad 2x + 4 = 10$$

$$Subtracting\ 4\ from\ both\ sides\ of\ \dots\dots.i$$

$$2x + 4 - 4 = 10 - 4 \dots\dots\dots.ii$$

$$2x + 0 = 6 \dots\dots\dots\dots\dots iii$$

$$2x = 6 \dots\dots\dots\dots..iv$$

$$Dividing\ both\ sides\ of\ iv\ by\ 2$$

$$\frac{2x}{2} = \frac{6}{2}$$

$$x = 3$$

Therefore, from the above solution, mathematics teacher can be able to inculcate the value of justice/ equity / fairness through such a demonstration of whatever happens to one side of the equation should equally be done to the other side of the polynomial

above. Through such a processes and indeed other practical application to the real life phenomenon such as through weighting scale of certain quantities of solid or liquid substances will be an added advantage to the understanding of the teaching and learning of mathematical concepts.

Mathematical competencies could also be demonstrated in the course of mathematics teaching itself by having different and diverse techniques, procedures and methodologies that could help in aiding the understanding of mathematics learning. For example, when solving simultaneous linear equations in two variables, mathematics teachers should be able to master all the three techniques leading to the solutions of these systems of equations. Techniques or methodologies like elimination method, substitution method and graphical method of solutions should be at finger tips of mathematics teachers. Mathematics teachers can inculcated the values of verification through mathematical theorems such as Pythagoras theorem, Sine and cosine rules of trigonometry functions, proof of the Quadratic equations by completing the square method etc, using these techniques mathematics teachers could be able to embed the concept of information verification to the group of mathematics learners.

Mathematics teachers can instill the value of tolerance in the following ways: mathematics teachers should always try to be humble modest, patience accommodating, easiness in approaching and tolerance as their personal qualities. These qualities may likely to be copy by majority of students and it may remain with them throughout their life time. In similar perspective mathematics teachers should try show to students that nothing good comes easy; there is always need for patience, perseverance, and tolerance for one to achieve success in life. Mathematics teachers should demonstrate that, through proving of mathematical theorems and assumptions which consumes time and required critical thinking.

Kindness as one of Islamic universal values can be inculcated through collaborative and cooperative learning, project based learning, team work and others constructivist approach to teaching and learning of mathematics. Mathematics teachers should deviate from the traditional methodologies of mathematics teaching and learning. They should imbibe the constructivist approaches to teaching of mathematics, whereas teachers could only act as facilitators of students learning not real key players. If these strategies are adopted the spirit of knowledge sharing and collaboration in knowledge discovery would results in building this concept of kindness in students and this type of relationship usually last longer and continue even outside mathematics classroom.

Respect as one of the Islamic universal values can be inculcated, if mathematics teachers respect and conduct themselves in accordance to the ethnic and religious values and these values should serve as their guiding principles, this is because there exist no religion that condone disrespectfulness, as such mathematics teachers could used techniques such as: orderliness, respect of mathematical theoretical principle and laws in doing their mathematics worksheet.

The concept of love, as one the Islamic value is significant to the extent that, Islam is called the religion of peace and love and Islamic guidance are based on love. The Prophet Muhammad (P.B.U.H) send to guide mankind and this guidance is born out the greatest love that Allah (SWT) through our noble Prophet (P.B.U.H) has for all mankind (Al-Bukhari, 1997). In inculcating this value, the strategies that mathematics teachers should adopt is the strategy of showing affection and friendliness between students and

their mathematics teachers. Mathematics teachers should not be autocratic or dictatorial, they should be subject of approach as well as caring, sympathy and willingness to participate accommodates students' mathematics problems at any point in time. Mathematics teachers through such strategies would gain students interest in loving mathematics and it could be, as one of their best schools subject.

Perseverance as one of Islamic universal values can be imbedded in the teaching and learning of mathematics through admonishment and encouragement of learners of mathematics. Therefore, for Muslims and indeed Islam to gain back its rightful position in the present-day modernization in terms of mathematics and sciences knowledge acquisition and discoveries. There is need for self-assurance, creative and innovative tendencies of not only mathematics teachers but also all Muslims in all fields of human endeavors.

Discussion

This study evaluated structural equation path measurement model for Islamic universal values inculcation in mathematics teaching and learning. The findings confirmed that the values inculcation model is a valid and reliable multidimensional model with five latent constructs namely: ideological, attitudinal, sociological, computational and motivational mathematical values respectively, (Bishop, 1988 & 1999, Bishop, et al., 2010 & Liman et al., 2011ab). The ideological dimension was represented by eight indicators related to objectivism and rationalism of mathematical contents delivery (Bishop, 1988 & 1999 & Liman et al., 2011ab).The attitudinal dimension was represented by five indicators, which emphasized on the values of control and progress of mathematics teaching and learning procedures (Bishop, 1988 & 1999 & Bishop & Clarkson, 1998 & Liman at el., 2011ab). The sociological dimension is represented by five manifests which were much related to the values of openness and mystery of mathematical contents delivery (Bishop, 1988 & 1999 & Bishop & Clarkson, 1998 & Liman at el., 2011ab).The computational mathematical values dimension is related to the values of computer application and usage (Batusk, 2005). Motivational mathematical values dimension linked to the values of reward and re-enforcement of mathematics teaching and learning processes (Pintrich & Schunk, 2002).

Furthermore, the findings also revealed that Islamic universal model for values inculcation in mathematics teaching and learning adequately supported the data. Moreover the study also outlined the area of differences and similarities between Islamic supreme values and interactive/universal values. The findings revealed that mathematical values were proper subset of Islamic universal values. Lastly, the paper also examined a number of ways as well as strategies of inculcation Islamic universal values in mathematics teaching and learning encounter.

Concluding Remarks

This study validated Islamic universal values inculcation model in the teaching and learning of mathematics in Sub-Sahara Africa North-Eastern Region of Nigeria. Furthermore, the study examined differences and area of similarities between Islamic supreme values and Islamic universal values (figure 4). This paper also pin-points the relationship between Islamic universal values and contextual mathematical values (figure 3). Lastly, the study revealed possible ways and strategies of inculcating a number of Islamic universal values in mathematics teaching and learning. The practical implications

of the findings of this study can be in the area of mathematics teachers' rediscovery and restoration of the lost glory of Islamic universal values civilization". The findings can ginger mathematics teachers on the need of rebuilding of an Islamic ideology which was based on justice, integrity, tolerance and the quest of knowledge of the classic Islamic civilization (Ahmed, 2002 & Faruqi, 2007). Furthermore, today's Muslims should learn and practice the holistic Islamic approach in teaching and learning the facts and figures about the medieval Islamic contributions to Western Mathematics and sciences. This can be achieved through researches, acceptance and incorporation of this knowledge in the teaching materials of schools and colleges around the world.

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