Global Journal of Human Social Sciences

discovering thoughts and inventing future

Volume 10 Issue 1 Version 1.0

ISSN: 0975-587X

April 2010

highlights

- Multivariate Analysis of Development
- Surface Biophysical Descriptors
- Foreign Direct Investment
- Vocational Special Education

5 Papers of Innovations

 ENG

Global Journal of Human Social Science

Global Journal of Human Social Science

Volume 10 Issue 1 (Ver. 1.0)

Global Academy of Research and Development

Editorial Board Members

Dr. Bart Lambrecht
Director of Research in Accounting and Finance
Professor of Finance
Lancaster University Management School
BA (Antwerp); MPhil, MA, PhD (Cambridge)

Dr. Carlos García Pont
Associate Professor of Marketing
IESE Business School, University of Navarra
Doctor of Philosophy (Management), Massachussetts Institute of Technology (MIT)
Master in Business Administration, IESE, University of Navarra
Degree in Industrial Engineering, Universitat Politècnica de Catalunya

Dr. Fotini Labropulu
Mathematics - Luther College
University of Regina
Ph.D., M.Sc. in Mathematics
B.A. (Honors) in Mathematics
University of Windsor

Dr. Lynn Lim
Reader in Business and Marketing
Roehampton University, London
BCom, PGDip, MBA (Distinction), PhD, FHEA

Dr. Mihaly Mezei
ASSOCIATE PROFESSOR
Department of Structural and Chemical Biology
Mount Sinai School of Medical Center
Ph.D., Etvs Lornd University
Postdoctoral Training, New York University

Dr. Söhnke M. Bartram
Department of Accounting and Finance
Lancaster University Management School
Ph.D. (WHU Koblenz)
MBA/BBA (University of Saarbrücken)

Dr. Miguel Angel Ariño
Professor of Decision Sciences
IESE Business School
Barcelona, Spain (Universidad de Navarra)
CEIBS (China Europe International Business School).
Beijing, Shanghai and Shenzhen
Ph.D. in Mathematics
University of Barcelona
BA in Mathematics (Licenciatura)
University of Barcelona
Philip G. Moscoso
Technology and Operations Management
IESE Business School, University of Navarra
Ph.D in Industrial Engineering and Management, ETH Zurich
M.Sc. in Chemical Engineering, ETH Zurich

Dr. Sanjay Dixit, M.D.
Director, EP Laboratories, Philadelphia VA Medical Center
Cardiovascular Medicine - Cardiac Arrhythmia
Univ of Penn School of Medicine

Dr. Han-Xiang Deng
MD., Ph.D
Associate Professor and Research Department
Division of Neuromuscular Medicine
Davee Department of Neurology and Clinical Neurosciences
Northwestern University Feinberg School of Medicine

Chief Author

Dr. R.K. Dixit (HON.)
M.Sc., Ph.D., FICCT
Chief Author, India
Email: cheifauthor@globaljournals.org

Dean & Editor-in-Chief (HON.)

Vivek Dubey(HON.)
MS (Industrial Engineering),
MS (Mechanical Engineering)
University of Wisconsin
FICCT
Editor-in-Chief, USA
editorusa@computerresearch.org

Sangita Dixit
M.Sc., FICCT
Dean and Publisher, India
deanind@computerresearch.org

Er. Suyog Dixit
BE (HONS. in Computer Science), FICCT
SAP Certified Consultant
Technical Dean, India
Website: www.suyogdixit.com
Email:suyog@suyogdixit.com,
dean@computerresearch.org

Contents of the Volume

From the Chief Author's Desk

The research activities among different disciplines of natural science are backbone of system. The deep and strong affords are the demands of today. Sincere afford must be exposed worldwide. Which, in turns, require international platform for rapid and proper communication among similar and interdisciplinary research groups.

The Global Journal of Human Social Science is to fulfill all such demands and requirements, and functions also as an international platform. Of course, the publication of research work must be reviewed to establish its authenticity. This helps to promote research activity also. We know, great scientific research have been worked out by philosopher seeking to verify quite erroneous theories about the nature of things.

The research activities are increasing exponentially. These great increments require rapid communication, also to link up with others. The balanced communication among same and interdisciplinary research groups is major hurdle to aware with status of any research field.

The Global Journals is proving as milestone of research publication. In view of whole spectrum of Knowledge, the research work of different streams may be considered as branches of big tree. Every branch is of great importance. Thus, we look after the complete spectrum as whole. Global Journals let play all the instruments simultaneously. We hope, affords of Global Journals will sincerely help to build the world in new shape.

Dr. R. K. Dixit
Chief Author
chiefauthor@globaljournals.org

A Multivariate Analysis of Financial Development and Growth in Mauritius: New Evidence

Dr Baboo M Nowbutsing[α,]
Sonalisingh Ramsohok[Ω]
Miss Kheerty Ramsohok[£]

GJHSS Classification (FOR)
140202, 140302, 140303 & 140305

Abstract :**This paper tries to shed light on the impact of financial development on the Mauritian economic growth focusing on the banking component of the financial sector. To attain our objectives we adopt a multivariate analysis. The sample period is 1970-2009. We used two measures of financial development namely M2 as a percentage and claims of private sector. While we found that financial development has a positive impact on growth, its effect is fairly minimal. The impulse response reveals that a shock in financial development has a positive response on growth. However, the impulse dies out after 6/7 years. Further, between 5.3 per cent to 9.2 per cent variation is growth is explained by innovation in financial development. This paper brings new evidence on the importance of the financial sector in Mauritius. While we recognize that financial development is an important ingredient for growth in Mauritius, there is a need to invoke policies that increase the impact of financial sector. Such policies may include promotion of competition in the banking sector and removal of entry restrictions of foreign banks and institutions.**

I. INTRODUCTION

The Financial System is comprised of a network of financial markets, institutions, businesses, households and governments that participate in that system and regulates its operations. The basic function of a financial system is to transfer loan able funds from lenders (or saving-surplus units) to borrowers (or saving- deficits units). This can be achieved by either by direct market based financing or by indirect bank-based finance. In 1858, the former British Prime Minister William Gladstone expressed the importance of finance for the economy as follows: ―*Finance is as it were, the stomach of the country, from which all the other organs take their tone* (ECB.int, 2001).

Several studies have attempted to establish whether financial development leads to improved growth performance and thus have endeavored to investigate the strength of this relationship. Hence, pioneer contributors in this field, as Goldsmith (1969), McKinnon (1973) and Shaw (1973) have focused on identifying the channels of transmission from financial intermediaries to growth. In Mauritius, sustained economic growth has been one of the top priorities of the government. Since its independence in 1968, the economy has undergone major structural transformation. On the economic front, the island has moved from a traditional sugar sector to a more diversified one to include manufacturing, tourism and financial services sectors. Since the 1990's, financial policy has shifted to develop the financial system not only to serve other sectors of the economy, but also to transform Mauritius into a regional financial centre.

This paper attempts to shed light on the impact of financial development on economic growth. To attain our objectives, we adopt a multivariate analysis for the time period 1970-2009. We adopt two measures of financial development namely M2 as a percentage of GDP and claims on private sector. The structure of the paper is as follows: we provides a brief literature review of financial development and economic growth in section 2; section 3 presents an overview of the financial system in Mauritius; section 4 is a description of the econometric methodology followed to attain our objectives; the results and analysis is presented in section 5 and we conclude in section 6.

II. ABRIEF LITERATURE REVIEW

It has been centuries that economists are debating on the role of the financial sector in the process of economic development. Schumpeter (1911) is generally acknowledged as being the first proponent of the view that financial institutions are a necessary condition for economic growth. He laid emphasis on the fact that the services that financial intermediaries offer are necessary for the technological innovation and economic development. He further highlighted that there is an impact on the rate of growth of a country's capita per income by the development of its financial sector. Goldsmith (1969) stated that the financial structure of an economy 'accelerates economic growth and improves economic performance to the extent that it facilitates the migration of funds to the best user, i.e., to the place of the economic system where the funds will yield the highest social return'. His study involves both cross section analysis and time-series data.

More theoretical and empirical literatures have emerged since then. In accordance to Schumpeter work, King and Levine (1993) emphasized on the role of innovation. Financial systems channel savings to their most productive uses and diversify the risks associated with these activities. By so doing, technological progress is increased as well as the probability of successful innovation.

In order to analyse the effects of financial markets on technological choice and the division of labour, Saint- Paul (1992) used a model where agents can choose between two technologies. The first technology is flexible and allows productive diversification, but has low productivity. The

[α] *University of Mauritius*
[Ω]. *University of London, UK*
[£]*University of Kingston, UK*

second technology is rigid, more specialized and productive. In the presence of shocks to consumer preferences (possibly leading to lack of demand for certain products) and without financial institutions, risk-averse individuals may prefer technological flexibility instead of high productivity. In such circumstances, he concludes that the second technology leads a better improvement in the economy.

The impact the financial sector has on economic growth and came out with two relationships that exist between them namely the 'supply- leading' and the 'demand – following' strategies (Patrick, 1966). According to Patrick (1966), a well- structured financial system will increase the demand of services and hence, promoting economic development. As a result, there is an interactive mechanism between the financial sector and the economic growth subject to Schumpeter (1934) work. The questions to ponder upon however, is (a) whether the financial sector have an impact on economic growth ,known as supply-leading or (b) whether it is economic growth that drives the growth of the financial sector, known as demand following.

The first hypothesis 'supply-leading' asserts that financial development is important for economic growth, implying that economic growth is led by finance. Proponents of this hypothesis contend that economic growth is induced since savings in the form of financial assets are increased by the quantity and the composition of financial variables. The second hypothesis 'demand- following' contends that economic growth leads and causality runs from economic growth to financial development. Here, finance plays a small role in economic growth and that it is considered as only a by-product or an outcome of growth in the real side of the economy.

Greenwood and Jovanovic (1990) developed a single model in which financial intermediation and growth are both endogenous. The model is considered as a genuine endogenous growth model, implying there are no diminishing returns to capital as a result of financial intermediation. The authors assume a positive two-way causal relationship between financial development and growth. The two theses he brought forward was the connection between economic growth and the distribution of income, and the link between financial structure and economic development. Growth supplied the funds to develop financial structure and in turn, financial structure induced greater growth 'as investment could be more efficiently undertaken'. Therefore, financial institutions collect and analyse information in order to find the investment opportunities with the highest return. They channel funds to the most productive uses, thereby increasing the efficiency of investment and growth. But the effect of financial institutions is twofold: The return individuals get is high and safe, because the financial system insures investors against individual risk. However, Robinson (1952) goes against the fact that financial development follows economic growth.

Goldsmith (1969) conducted a pioneering study to assess whether finance exerts a causal influence on growth. He conducted his studies for 35 countries for the time period 1860-1963. He used value of financial intermediary assets divided by GNP. He found that financial intermediary size increases as countries develop. He also documented a positive correlation between financial development and economic development. King and Levine (1993) conducted their studies on 77 countries for the period 1960-1989. In their regression, they controlled for other factors affecting growth. They used three growth indicators namely real per capita GDP growth, growth in capital stock per person and total productivity growth. They constructed the following measures of financial development namely liquid liabilities of financial system divided by GDP (which measures the size of financial intermediaries), bank credit divided by bank credit plus central bank domestic assets (which measures the degree to which the central bank versus the commercial bank are allocating credit) and credit to private sector divided by GDP. They found a strong positive relationship between each of the financial development indicators and the three growth indicators. King and Levine (1993) confirm these findings using alternative econometric methods and robustness check. They argued that the financial depth in 1960 is a good predictor of subsequent rates of growth, capital accumulation and productivity growth. However, while they found that finance predicts growth, King and Levine (1993) do not address the issue of causality. Also, they concentrated only one segment of the financial sector namely banks. Levine and Zervos (1998) focused on the stock market. They conducted their study for a sample of 42 countries over the time period 1976 to 1993. They found that initial levels of stock liquidity and banking development are positively and significantly correlated with future rates of economic growth, capital accumulation and productivity growth. They argued that link between stock markets, banks and growth runs robustly through productivity growth rather than physical capital accumulation.

Authors have used different econometric approaches to analyse the effect of financial intermediary development on economic growth. Beck *et al* (2000) considered data for a subset of 74 countries. They invoked both cross section regressions and GMM dynamic panel estimators. They concluded that the panel and cross-sectional results are the same, that is, the exogenous element of financial intermediary development is positively linked with economic growth. The authors used two measures of financial intermediary development. First, the deposit money bank credit to the private sector divided by GDP compared to private credit. Second, the ratio of deposit money bank domestic assets to GDP. These measures proved that the exogenous part of financial intermediary development is positively and strongly linked to economic growth. Further, Beck *et al* (2000) that the cross-country differences in the creditors' legal rights, the usefulness of contract enforcement, and accounting practices can enhance financial intermediary development and thereby boosting economic growth.

While the above authors proved that financial development lead to economic growth, they did not address the issue of causality. Using a sample of 71 countries for the period 1960-2005, Levine, Loyaza and Beck (2000) showed that a very strong connection between the exogenous components

of exogenous components of financial development and growth. Jung (1986) invoked the Granger – Causality test for 56 countries (including both developed and developing countries). Two measures of financial development was used the ratio of currency to M1 and the ratio of M2 to GDP. They showed that financial development causes growth. Darrat (1999) conducted a Granger causality tests for the period 1964-1993 in Saudi Arabia, Turkey and United Arab Emirates by using M1 ratio and M2 to GDP as measures for financial development. In his analysis, he supported the supply-leading hypothesis as shown by Pagano (1993) and proved that higher benefits of advanced levels of financial development could be realized in the short-run. On the other hand, Ghali (1999) applied the Granger causality test between financial development and economic growth. He used two financial development measures namely bank deposit liabilities\GDP and private credit to GDP ratios and concluded that financial development causes economic growth. The analysis was carried out in Tunisia over the period 1963-1993).

Abu-Qarn and Abu-Bader (2005) conducted a research in Egypt on the relationship between financial development and economic growth for the period 1960-2001. They did the Granger causality tests by using the cointegraton and vector correction model. They used four different measures of financial development (M2Y, ratio of money stock to GDP; QMY, the ratio of M2 minus currency to GDP; PRIVY, the ratio of bank credit to the private sector to nominal GDP and PRIVATE, the ratio of credit issued to nonfinancial private firms to domestic credit) and long time series. They conclude that the financial sector is important to improve economic development.

III. Financial System in Mauritius

Mauritius is a small island which has witnessed a relentless struggle to achieve an 'outward looking strategy' in the course of its economic development. Its economic history reflects different levels of progression (ThinkQuest, 2001). Mauritius is considered as one of the most competitive economies, ranked first in Africa, and 23rd worldwide for its business activity facility. Mauritius is now a middle-income country as a result of good economic performance, and ranks 65th in the world and second in Africa (after the Seychelles) on the 2005 Human Development Index (OECD, 2006).

Since independence the Mauritian economy has experienced outstanding transformations. Moving from a mono-agricultural industry (sugar) to a service industry; from high unemployment to low unemployment, Mauritius enjoyed a rapid growth and a substantial diversification. The financial system of the economy has evolved considerably over time. Initially the financial system consisted mainly of banking sector with two main banks namely Mauritius Commercial Bank and State Bank of Mauritius. However, as pointed out by Thinkquest (2001), the need for non-bank financial institutions was being felt and in the late 1970s and early 1980s, there was an increase in the number of insurance companies and other financial institutions. Thus, the structure of the financial system started to experience some changes; the economy was witnessing a real boom with the setting up of non-bank financial institutions.

According to FSC (2008) and BOM, since the mid 1980's, financial activities in Mauritius have experienced a gradual shift away from the dominance of banks and insurance companies. A number of non-bank financial institutions have emerged to play a vital role in mobilizing savings, stimulating investments and providing financial support to other productive economic sectors. The responsibility to regulate bank and non-bank activities falls on different regulators. In this regard, the regulatory approach has been product based, such as for banking and insurance. As from the beginning of the 1990's, the economy began to face new challenges: in particular, increased wage and price pressures threatened the economy's competitiveness in export markets. With the economy at near full employment, the strategy was to regain the competitive edge through enhanced labour productivity and export diversification. In this respect, new investments was required to substitute existing technologies for more capital intensive ones, as well as investments in new product lines.

Ultimately, the then –Government decided to transform the economy into a 'center for offshore banking and financial services'. The Banking Act was revised in 1988, providing inter alia for the licensing of offshore banks and the Stock Exchange was set up in 1989. Steps were also taken to prepare legislation for the authorization of non-bank offshore companies .Hence, it was of utmost importance that the level of domestic savings is increased and the allocation of investable funds be further improved (BOM, annual report).

Between 1990 and 2000, the combined contribution of the three main sectors of the economy, namely Agriculture, Manufacturing and Tourism to GDP went down from 38.9% to 35.9%. It was expected that their share would continue to decline whereas that of the other services sector would increase. The need for diversification was thus felt. Thus, proper macroeconomic policies was put in place to diversify the economy's export and productive bases. The offshore financial services were developed as the fourth pillar of the economy contributing to the creating of high value-added jobs (IMF, 2003). With the aim to diversify the economy, the Mauritius Offshore Business Activities Authority {MOBAA} Act was endorsed in 1992 and the Freeport was established in the same year, thereby emphasizing the external sources on which further financial sector development would be based, in the context of global financial sector liberalization.

Consequently, overall, Mauritius was ranked first in Africa and 23rd worldwide for its business activity facility. It ranked 65th in the world and second in Africa (after the Seychelles) on the 2005 Human Development Index. Due to its competitive economy and good economic performance, the island can be classified as a middle-income country. The current financial services include payment services,

credit services, asset accumulation, protection and real estate. In addition, corporate finance, risk management and financial data processing are other types of financial services being provided to the business sector. It is foreseen on present trends that these services could potentially be provided by new entrants on the market in competition with the existing ones. For instance, payment services could in future be provided not only by banks, but also by software companies, telecom companies and money-changers.

The range of services provided by financial institutions has also been growing in past years. In the insurance sector, in addition to the traditional life and non-life insurance products, companies also provide asset accumulation, re-insurance, consultancy services, risk assessment and claim settlement services. In the banking sector, the scope of services has widened to include asset accumulation , participation in issues of securities, settlement and clearing services, provision and transfer of financial information, custodial services and financial data processing (FSC, 2008; BOM, Thinkquest, 2001).

Hence, according to the IMF report 2008, Mauritius had a 'relatively large and well-developed financial system'. The basic financial sector infrastructure was modern and efficient, and the financial services were easily accessible with more than one bank account per capita. However, despite after the two decades of solid growth, Mauritius's economy has slowed down as a result of 'a terms of trade (TOT) deterioration' (p.7). This may be due to the expiration of the Multi-fibre Agreement[1], and the decrease in price of sugar export for the period 2006-2010 to the European Union's, and rise in oil prices. They, along with high fiscal deficits and slow changes in consumption, have increased the current account deficit and external vulnerability.

In 2001, Mauritius established a steering committee which recognized that the Mauritian financial services industry has the potential to develop into a viable and dynamic sector capable of generating a large number of high value-added jobs. As a means to unlock this potential, the Committee recommended a unified approach to the regulation and the supervision of the financial services industry. It therefore recommended the setting up of a Financial Services Commission, of which the Bank of Mauritius shall be the anchor, to which will be entrusted the task of bringing under a common roof the supervision of the insurance, securities market and offshore sector activities in a bid to bring about integrated financial services supervision in a phased manner.

The Financial Services Commission (FSC) operates under the Financial Services Act 2007. It was established as the supervisory body for the global business and the non-bank financial services sector. Its main duties are to license, regulate, monitor and supervise the conduct of business activities. The FSC's remit includes those of the earlier regulatory bodies namely: securities (Stock Exchange Commission), insurance (Insurance Division of the Ministry of Economic Development, Financial Services and CorporateAffairs) and global business (Mauritius Offshore Business Activities Authority'. Te main aim of the FSC is to foster the development of the economic environment, ensure the stability, fairness, efficiency and transparency of financial institutions and capital markets in Mauritius. This will help to maintain the integrity of the island as a sound and competitive International Financial Centre of repute.

The non-bank financial institutions focus in using specialize financial agreement such as 'financial leasing, securitised lending, and financial derivatives' and providing loans to particular types of borrowers. Hence, their tasks are to channel funds from lenders to borrowers. To achieve this, they accept long-term or specialized types of deposits and by gaining liabilities on their own account 'through the issuing of bills, bonds or other securities'. With a view to ensuring that FSC operates efficiently and effectively, emphasis is laid on the flexibility of its internal organizational structure. A project-based approach to all major initiatives has been adopted. In order to ensure the effective and timely implementation of these initiatives, cross-functional teams have been constituted to work on the projects. The FSC is committed to giving all members of staff opportunities to contribute and add value to the various initiatives (FSC).

IV. Econometric Methodology

It is crucial to test for stationarity of variables when dealing with time series data. Time series data are rarely stationary in level forms. Regression involving nonstationary time series often lead to the problem of spurious regression, i.e. the researcher will tend to find a relationship among variables when none in fact exist. To test for stationarity we use the Phillips-Perron tests. The tests are similar to the ADF tests but they incorporate an automatic correction to the ADF procedure to allow for autocorrelated residuals

Economically speaking, two variables are cointegrated if they have a long-term, or equilibrium relationship between them (example, financial development and growth). The valuable contribution of the concepts of unit root, cointegration etc. is to force us to find out if the regression residuals are stationary. Granger (1986) notes that 'a test for cointegration can be thought of as a pre-test to avoid spurious regression' situations.

The Johansen technique has become a fast essential tool for applied economists wishing to estimate time series models. The implication that non-stationary variables can lead to spurious regression unless at least on cointegrating vector is present means that some form of testing for cointegration is almost mandatory. To test for cointegration, we adopt the methodology suggested by Johansen (1990 and 1991). Unlike the Engle and Granger static approach, the Johansen approach test for cointegration a multivariate framework.

Suppose that a set of g variables ($g \geq 2$) under consideration that are I (1) and which are thought may be cointegrated. A VAR with *k* lags containing these variables could be set up:

[1] The MFA was established in the 1970s to give some protection to the textile industries of industrialised countries facing competition from countries with lower manufacturing costs. The WTO ended its Multi-Fibre Agreement on 31 December 2004.

$$y_t = \beta_1 \quad y_{t-1} + \beta_2 \quad y_{t-2} + ... + \beta_k \quad y_{t-k} + u_t$$

y_t is g x 1, each of the β_i is an g x g matrix of parameters. Sims (1980) support the use of this type of VAR. He argued that it enable estimation of dynamic relationships among jointly endogenous variables without imposing strong *a priori* restrictions. As noted in previous topic such VAR can be easily estimated by OLS.

In order to use the Johansen test, the VAR above must be reformulated into a Vector Error Correction Model (VECM) of the form

$$\Delta y_t = \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + ...\Gamma_{k-1} \Delta y_{t-k+1} + \Pi y_{t-k} + u_t$$

Where $\Gamma_i = -(I - \beta_1 - ..... - \beta_i)$, $i = 1,.....k-1$

and $\Pi = -(I - \beta_1 - .....\beta_k)$

This way of specifying the system contains information on both the short and long – run adjustment to changes in y_t via the estimates of Γ and Π respectively.

This VAR contains g variables in the first differenced form on the LHS and *k-1* lags of the dependent variables (differences) on the RHS, each with a Γ coefficient matrix attached to it. In fact, the Johansen test can be affected by the lag length employed in the VECM, and so it is useful to attempt to select the lag length optimally.

The Johansen test centres around an examination of the Π matrix. It can be interpreted as the long run coefficient matrix, since in equilibrium, all the Δy_{t-i} will be zero, and setting the error terms, u_t, to their expected value of zero will leave $\Pi\, y_{t-k} = 0$. Notice the comparability between this set of equations and the testing equation for an ADF test, which has a first differenced term as the dependent variable, together with lagged differences on the RHS.
As we will see, $\Pi = \alpha\beta'$, where α represents the speed of adjustment to disequilibrium, while β is a matrix of long run coefficients such that the term $\beta' y_{t-k}$ embedded in the VECM represents up to (n -1) cointegrating relationships in the multivariate model which ensure that the y_t converge to their long run steady solutions.

Assuming y_t is non stationary, than all the terms in the VECM which involve Δy_{t-i} are I (0) while $\Pi\, y_{t-k}$ must also be stationary for u_t to be I (0). There are three instances when this requirement that $\Pi\, y_{t-k} \sim$ I (0) is satisfied:

1.When all the variables in y_t are in fact stationary. This is an uninteresting case in the present context since it implies that there is no problem of spurious regression and the appropriate model to be estimated is simply a VAR.
2.The second instance is when there is no cointegration at all, implying that there are no linear combinations of the y_t that is I (0). In this case the appropriate model is a VAR in first differences involving no long run elements.
3.The third way for $\Pi\, y_{t-k}$ to be I (0) is when there exists up to (n – 1) cointegrating relationships: $\beta' y_{t-k} \sim$ I (0). In this instance $r \leq (n-1)$ cointegrating vectors exist inβ, together with $(n - r)$ non stationary vectors. Only the cointegrating vector in β enter the VECM, otherwise $\Pi\, y_{t-k}$ would not be I (0), which implies that the last $(n-r)$ are effectively zero.

Thus, the typical problem faced, of determining how many r ≤ (n-1) cointegrating vector exist in β, amount to testing which column of the α is zero. Consequently testing for cointegration amounts to a consideration of the rank of Π, i.e. finding the number of linearly dependent columns in Π.

To summarise, if Π has full rank (i.e. there are r = n linearly independent columns) then the variable in y_t are I (0), while if the rank of Π is zero than there is no cointegrating relationship. Nether of this case is interesting. More usually, Π has a reduced rank, i.e. there are r ≤ (n-1) cointegrating vectors
Before applying the Johansen procedure, it is necessary to determine the lag length of the VECM which should be small enough to allow estimation and high enough to ensure that the errors are approximately white noise. An insufficient lag length can lead to rejection of the null hypothesis of no cointegration, whereas over-parameterization of the lag length of the dynamic structure may lead to loss of power. There are ways to identify the optimal lag of a VAR, first cross-equation restrictions (*LR*–test statistics) and second information criteria. Suppose we have that a bivariate VAR estimated using annual data has 9 lags of the two variables in each equation, and we want to examine a restriction that the coefficients on lags 5 through 9 are jointly zero. This can be done using a likelihood ratio test

Denote the variance-covariance matrix of residuals (given by $\hat{u}\hat{u}'/T$), as $\hat{\Sigma}$.The likelihood ratio test for this joint hypothesis is given by:

$$LR = T\left[\log\left|\hat{\Sigma}_r\right| - \log\left|\hat{\Sigma}_u\right|\right]$$

where $\hat{\Sigma}_r$ is the variance-covariance matrix of the residuals for the restricted model (with 5 lags), $\hat{\Sigma}_u$ is the variance-covariance matrix of residuals for the unrestricted VAR (with 9 lags), and T is the sample size. The test statistic is asymptotically distributed as a χ^2 with degrees of freedom equal to the total number of restrictions. In the VAR case above, we are restricting 5 lags of two variables in each of the two equations = a total of 5 * 2 * 2 = 20 restrictions.
In the general case where we have a VAR with p equations, and we want to impose the restriction that the last q lags

have zero coefficients, there would be p^2q restrictions altogether. The above approach is valid only if the error term is assumed to be normally distributed asymptotically. However, the assumption of normality is unlikely to hold in financial data. In this respect, an alternative approach in selecting the lag length is to use the information criteria. There are several versions of the information criteria. These are multivariate Akaike Information Criteria (AIC), Schwarz Bayesian Criteria (SBC) and Hannan Quinn Information Criteria (HQIC).

The main weaknesses of VAR modeling is first, it's a-theoretical nature and the large number of parameters involved which make interpretation cumbersome. There is the possibility that the some coefficients that changes sign across the lags. This together with the interconnectivity of the equations could make it difficult to see what effect a given change in a variable would have upon the future values of the variables in the system. To alleviate this problem, we invoke two set of statistics namely impulse response and forecast error variance decompositions

Impulse response functions and variance decompositions are techniques that are used by econometrician analyse problems such as the effect of a shock in financial development on growth. In applied work, it is often of interest to know the response of one variable to an impulse in another in a system that involves a number of variables as well. The impulse response function refers to the reaction of any dynamic system in response to external change. The impulse response describes the reaction of the system as a function of time. The variance decompositions offer a slightly different method for examining VAR systems dynamics. They give the proportion of the movements in the dependent variable that are due to their own shocks versus shocks to other variables. A shock in a variable will affect that variable, but it will also be transmitted to all of the other variables in the system through the dynamic structure of the VAR. Variance decompositions determine how much of the *s*-step ahead forecast error variance of a given variable is explained by innovations in each variable by explained by innovations to each explanatory variable for s = 1, 2,..

V. Econometric Estimation and Analysis

We adopt the multivariate time series procedure to identify the impact of financial development on economic growth. The following procedures are followed: (1) test for stationary (2) testing for cointegration (3) estimating the VECM (4) granger causality test (5) impulse response and variance decomposition.

Following Odedokun (1996), the model can be written as:

$$RGDP = f(FD, X)$$

Where *RGDP* denotes real gross domestic product, *FD* denotes financial development indicator and X denotes other variables that can affect growth (controlled variables). We used two indicators of financial development namely M2 as a percentage of GDP and claims on private sector. Consequently two econometric models will be produced.

$$RGDP = f(OPEN, HUMAN, INV, M2/GDP)$$

$$RGDP = f(OPEN, HUMAN, INV, CPS)$$

Where *OPEN* denotes openness measured as imports plus exports as a percentage of GDP, *HUMAN* denotes human capital proxied by secondary enrollment ratio, *M2/GDP* is self explanatory, *INV* denotes investment as a percentage of GDP and *CPS* denotes claims on private sector. We conducted a check of the functional forms of the models and the appropriate model is log-log. The log-log model helps to capture the proportional effects of each independent variable.

1. *Testing for Stationarity*

Table 1 shows the results from the Phillips-Perron test. None of the variables are stationary in level form. The variables become stationary in first difference. As such all variables are integrated of order 1.

Table 1: Stationarity Test

Variables	t- statistics	p-value	Variables	t-staistics	p-value	Order of Integration
LGDP	-2.476	0.2457	$\Delta LGDP$	-6.156	0.0000	I(1)
LHUMAN	-2.167	0.2184	$\Delta LHUMAN$	-3.118	0.0252	I(1)
LOPEN	-2.215	0.2010	$\Delta LOPEN$	-7.688	0.0000	I(1)
$L\left(\frac{M_2}{GDP}\right)$	-1.979	0.2958	$\Delta L\left(\frac{M_2}{GDP}\right)$	-5.833	0.0000	I(1)
LINV	-2.293	0.2132	$\Delta LINV$	-6.918	0.0000	
LCPS	-1.857	0.2856	$\Delta LCPS$	-19.254	0.0000	I(1)

2. Testing for Cointegration – The Johansen Techniques

The Johansen technique has become a fast essential tool for applied economists wishing to estimate time series models. The implication that non-stationary variables can lead to spurious regression unless at least on cointegrating vector is present means that some form of testing for cointegration is almost mandatory. The Engle and Granger approach of cointegration assume that there is only one cointegrating relationship among variables. However, there are many instances when there is more than one cointegrating relationship among variables. In this case the appropriate technique to use is the Johansen techniques of cointegration. Results from the Johansen test are presented in table 3 (M2 as a percentage of GDP and table 4 (claims of private sector). The optimal lag number is 4 (CPS) and 3 (M2/GDP).

Table 2: Johansen Cointegration Test (M2 as percentage of GDP)

	In Level		In First Difference	
Rank	***Trace Statistics***	***Critical Value***	***Trace Statistics***	***Critical Value***
0	83.2878	68.52	91.1734	68.52
1	42.4561	47.21	45.2146	47.21
2	34.8796	29.68	30.7887	29.68
3	14.8950	15.41	12.4490	15.41
4	4.22180	3.76	4.7711	3.76

Table 3: Johansen Cointegration Test (Claims of Private Sector)

	In Level		In First Difference	
Rank	***Trace Statistics***	***Critical Value***	***Trace Statistics***	***Critical Value***
0	131.9092	68.52	104.5877	68.52
1	81.6770	47.21	74.8567	47.21
2	28.8796	29.68	26.5374	29.68
3	13.0160	15.41	11.8965	15.41
4	0.0089	3.76	0.9596	3.76

The Johansen test reveals the presence of one cointegrating relationship when M2 as a percentage of GDP is used as proxy for financial development while there are two cointegration relationship when claims of private sector is used as proxy for financial development. .

3. Vector Error Correction Models

The existence of cointegration implies Granger causality. Granger causality examines whether the past changes in growth help to explain current changes in education. Recently, it has been suggested that a VAR model specified in differences is only valid if they variables under investigation are not cointegrated. Granger (1988) argued that if variables are cointegrated then a VECM should be estimated rather than a VAR in standard Granger causality test. Since financial development and growth are cointegrated, a percentage of current change in growth is the result of growth moving into alignment with the trend value of financial development. Thus, having established that the variables are integrated of order 1 and there is the presence of cointegration in both models, we proceed in estimating the VECM. Results from the VECM are presented in Table 3 and Table 6. The VECM passes the required diagnostic tests namely Jarque-Bera normality test, serial correlation, Ramsey Rest test etc

Table 3: Vector Error Correction Model Estimates (Claims on private sector)

Variables	Coefficient	p-value
CointEq1	-1.1326	0.009
CointEq2	-1.3723	0.004
$\Delta LRGDP_{t-1}$	0.4251	0.013
$\Delta LRGDP_{t-2}$	0.2813	0.074
$\Delta LRGDP_{t-3}$	0.1169	0.189
$\Delta LOPEN_{t-1}$	0.0923	0.100
$\Delta LOPEN_{t-2}$	0.1669	0.007
$\Delta LOPEN_{t-3}$	0.0959	0.005
$\Delta LHUMAN_{t-1}$	0.3768	0.109
$\Delta LHUMAN_{t-2}$	0.6226	0.055
$\Delta LHUMAN_{t-3}$	0.7272	0.076
$\Delta LCPS_{t-1}$	0.0409	0.011
$\Delta LCPS_{t-2}$	0.0318	0.100
$\Delta LCPS_{t-2}$	0.0157	0.000
$\Delta LINV_{t-3}$	0.3472	0.020
$\Delta LINV_{t-2}$	0.3915	0.016
$\Delta LINV_{t-3}$	0.4955	0.000
R^2	0.9234	
Log-Likelihood	135.058	

Table 4: Johansen Cointegrating Vector 1 (Claims on private sector)

Variables	*Coefficient*	*p-value*
LRGDP	1	
LOPEN	1.04581	0.0000
LCPS	0.19621	0.0000
LINV	0.98671	0.0001
Constant	11.2781	

Table 5: Johansen Cointegrating Vector 1 (Claims on private sector)

Variables	*Coefficient*	*p-value*
LHUMAN	1	
LOPEN	0.9678	0.004
LCPS	0.1467	0.000
LINV	0.7689	0.005
Constant	4.3451	

Table 6: Vector Error Correction Model Estimates (M2/GDP)

Variables	Coefficient	p-value
CointEq	-1.8207	0.025
$\Delta LRGDP_{t-1}$	0.5178	0.005
$\Delta LRGDP_{t-2}$	0.2617	0.008
$\Delta LOPEN_{t-1}$	0.0999	0.009
$\Delta LOPEN_{t-2}$	0.2954	0.040
$\Delta LHUMAN_{t-1}$	0.1518	0.005
$\Delta LHUMAN_{t-2}$	0.7914	0.009
$\Delta L\left(\frac{M_2}{GDP}\right)_{t-1}$	0.1623	0.005
$\Delta L\left(\frac{M_2}{GDP}\right)_{t-2}$	0.1739	0.001
$\Delta LINV_{t-3}$	0.2934	0.000
$\Delta LINV_{t-2}$	0.2613	0.000
R^2	0.9346	
Log-Likelihood	72.113	

Table 7: Johansen Cointegrating Vector (M2/GDP)

Variables	*Coefficient*	*p-value*
LRGDP	1	
LOPEN	1.3296	0.051
LHUMAN	0.7563	0.000
$L\left(\frac{M_2}{GDP}\right)_{t-1}$	0.2556	0.000
LINV	0.6523	0.000
Constant	19.952	

Table 3 shows the VECM estimates when financial development is measured by claims on private sector. All variables are significant and have the required sign except LRGDP at lag 4. As can be seen from Table 3, financial development has a positive effect on growth. Further, it can be seen that as the positive effect of financial development on growth is smaller when the number of lags is increased. The speed of adjustment coefficient is significant in the model as well. This implies that the rate at which the rate of variation of real GDP at time *t*, the dependent variable in the VECM system, adjusts to the single long relationship is different from zero. From the first cointegrating vector estimates it can be deducted that a short run real GDP is corrected to a speed of 1.1 per cent per annum. In the first LR estimates (Table 4) a 1 per cent increase of financial development while keeping the other variables lead to approximately 0.19 per cent increase in growth. From the second cointegrating vector estimates it can be deducted that a short run real GDP is corrected to a speed of 0.14 per cent per annum. In the second LR estimates (Table 5) a 1 per cent increase of financial development while keeping the

other variables lead to approximately 0.14 per cent increase in growth. In addition, openness and investment have positive effect on growth.

The above are replicated when M2 as a percentage of GDP is used to measure financial development (Table 6). All variables are significant and have the required positive sign. M2 as a percentage of GDP seems to have a significant positive on economic growth. Unlike claims on private sector the effect of M2 as a percentage of GDP is higher when the number of lag is increased by one. From the cointegrating vector estimates it can be deducted that a short run real GDP is corrected to a speed of 1.8 per cent per annum In addition, openness and investment have positive effect on growth. The LR estimates of the 1 per cent increase of financial development while keeping the other variable constant is approximately 0.25 per cent (Table 7). Thus, these results indicate that lags of real GDP, lags of human capital and lags of openness and lags of investment and lags of financial development have significant impact on growth.

1. *Impulse Response Function and Variance Decomposition*

The impulse response function is the path that LRGDP follows if it is kicked by a single unit shock. This function is interesting for two main reasons. First, it is another characterization of the behaviour of our model. Second, it allows us to start thinking about 'causes' and effects. For example, we will compute the response of *LRGDP* to a shock in *M2/GDP* and interpret the results as the 'effect' on *LRGDP* of financial development. We also compute the forecast variance decomposition to analyse what percent of the *k*-step ahead forecast is due

to financial development. Variance decomposition may be termed an out-of sample causality test. Thus, and impulse response figures can trace out the dynamic responses of the variables to these shocks while forecast error variance decomposition identifies the relative importance of these affects, Both analyses can be conducted using the moving average representation of the original VAR.

Figure 1: Response of LGDP to an impulse in $L\left(\frac{M_2}{GDP}\right)$

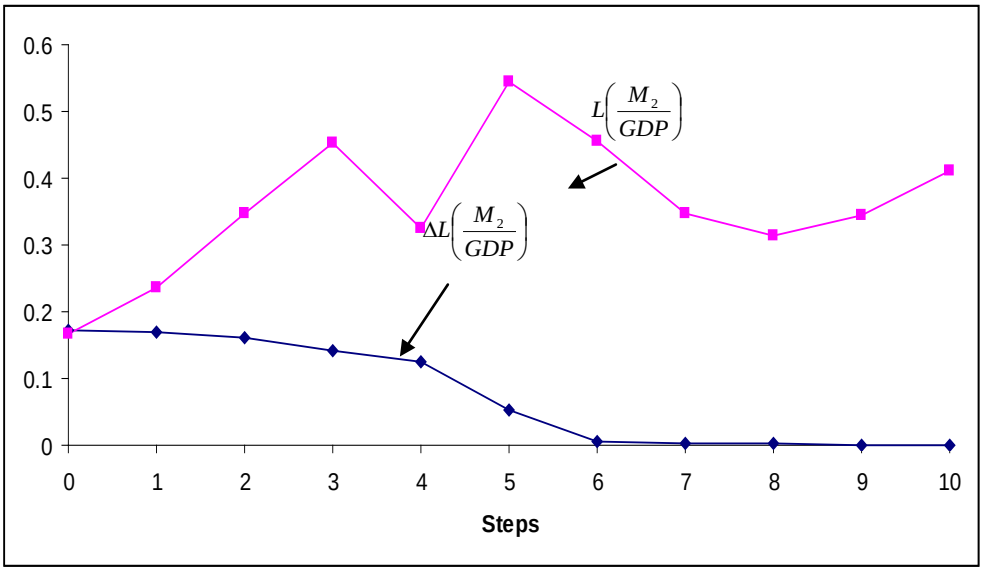


Figure 2: Response of LGDP to an impulse in claims on private sector

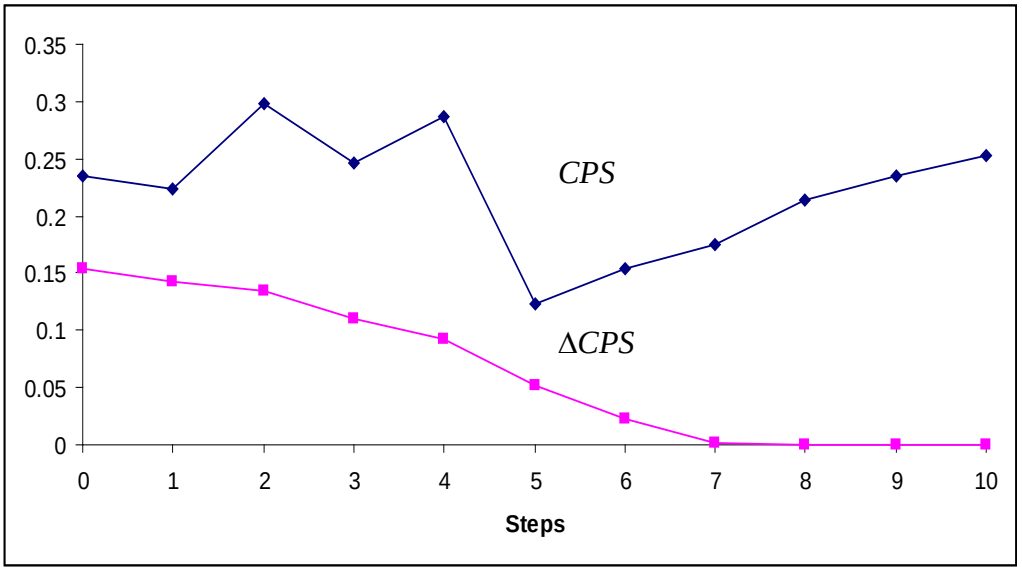


Figure 1 and 2 shows the impulse response function for a shock in $L\left(\frac{M_2}{GDP}\right)$ and LCPS on growth respectively. We adopt the generalized impulse response techniques of Koop et al (1996) and Pesaran and Shin (1998). It is argued that the results of orthogonalised methodology of Sims (1980) are sensitive to the order in which the variables enter the

VAR. However, the generalized methodology is robust regardless of the order. Decker et al (2001) imply that the generalized methodology provides superior and more realistic results compare to the orthogonalised methodology. From figure 1, we deduct that the impulse for $L\left(\frac{M_2}{GDP}\right)$ does not dies not but rather increase as the number of steps is increased while that $L\left(\frac{M_2}{GDP}\right)$ dies out after some steps**.** This result is consistent with the fact that $L\left(\frac{M_2}{GDP}\right)$ is integrated of order one. The initial impact of a shock of to $\Delta L\left(\frac{M_2}{GDP}\right)$ on LGDP is positive. However, the impact of an increase tends to decrease over the years. The response persists up to the six horizons and dies out afterwards. Similar results are obtained to an impulse in LCPS. The initial impact is positive and the response persists up to the seven horizons and dies out afterwards.

Table 8: Variance Decomposition of LRGDP to Impulse in $L\left(\frac{M_2}{GDP}\right)$ and LCPS

Steps	$L\left(\frac{M_2}{GDP}\right)$	LCPS
0	0	0
1	0.05342	0.06123
2	0.05756	0.07211
3	0.06432	0.07234
4	0.06456	0.07626
5	0.06981	0.08877
6	0.07234	0.09199
7	0.07234	0.09234
8	0.07234	0.09234
9	0.07234	0.09234
10	0.07234	0.09234

Table 8 reports the estimated variance decompositions. The order of the lagged is determined by LR as explained earlier. Between 5.3 and 7.2% of the variation in LRGDP seems to be due to the innovations in money supply as a percentage of real GDP. Note that the change between the 6 and 10 steps is the same. Further between 6.1 and 9.2% in the variation in LRGDP is explained by innovations in claims on private sector. The change between the 7 and 10 steps are the same. These results are consistent with the results from the impulse response functions.

VI. Conclusion

This paper focuses on the impact of financial services sector on economic growth in Mauritius over the time period 1980 – 2004. To attain our objectives, we adopt the Multivariate analysis. The procedures we followed are as follows namely test for stationary, Johansen cointegration test, estimation of a VECM, impulse response function and variance decomposition to attain the main objective of the dissertation.

Over the years the Mauritian economy has indulged in diversification to maintain sustained growth. Financial services sector has become an important pillar of our economy as they are one of the main contributors to economic growth since the contribution of traditional sectors such as sugar and textile have decreased. This paper uses the broadest possible selection of existing measures of the financial system to document their relationship with growth and to test the robustness of its results. A growing body of empirical literature, including industry level studies, individual country –studies, and broad cross country comparisons, demonstrate a strong positive link between the functioning of the financial system and long-run economic growth. Theory and evidence make it difficult to conclude that financial development is an inconsequential addendum to the process of economic growth.

Two measures of financial development was used namely M2 as a percentage of GDP and claims on private sector. A number of findings were presented in our study. Financial development seems to have a positive effect on growth both in the short run and long run. Other controlled variables have positive effects on growth namely human capital, investment as a percentage of GDP and openness. To end, despite that Mauritius has inadequate resources and is geographically isolated, the island is still growing rapidly. The vital consideration here is that scarce resources are efficiently distributed to different channels. Thus, financial services do really matter for economic growth in Mauritius.

While the findings in this dissertation tend to show a positive relationship between measures of financial development and growth, the size of this relationship is quite minimal, for example, when claims on private sector changes by 1 per cent in the LR, growth changes by 0.14 per cent. This figure is 0.25 per cent when M2 as a percentage GDP is used. Thus, the Mauritian government should adopt appropriate policies in order to boost the impact of the

financial sector given that the aim of the government is to make this sector a major pillar of the economy. (1) Competition is of paramount importance for the efficient allocation of resources. Hence, more competition should be encouraged in the main sectors such as banking and insurance. For example, the banking sector is controlled by mainly two giant banks namely Mauritius Commercial Bank and State Bank of Mauritius. Investment in Information Technology should be further encouraged which is unavoidable for the sophistication of the financial system. Further, the government should remove existing entry restriction on foreign banks and financial institutions to improve the offshore banking status.

VII. References

1) Abu-Bader, S & Abu-Qarn, SA 2005 'Financial development and economic growth: time series evidence from Egypt', Discussion Paper No.05-14, July 2005, pp.1- 35.

2) Beck, T, Levine, R & Loayza, N 2000 'Financial intermediation and growth: causality and causes', *Journal of Monetary Economics*, vol 46, 31–47.

3) Darrat, AF 1999 Are financial deepening and Economic growth causally related? Another look at the evidence?', *International Economic Journal*, vol.3, pp.19-35.

4) Financial Services Commission, Mauritius, Annual Report 2008, available from: http://www.gov.mu/portal/sites/ncb/fsc/download/ar2008.pdf, accessed June 2009.

5) Goldsmith, RW 1969 *Financial Structure and Development*, Yale University Press, Haven CT.

6) Greenwood, J & Jovanovic, B 1990 'Financial development, growth and the distribution of income', *Journal of Political Economy*, vol. 98, no.5, pp.1076 -1107.

7) King, RG & Levine, R 1993 'Finance and growth: Schumpeter might be right', *Quarterly Journal of Economics*, vol, no. 108(3), pp. 717-737.

8) King, RG. & Levine R. 1993 'Finance, entrepreneurship, and growth: theory and evidence', *Journal of Monetary Economics*, vol. 32, no.3, pp. 513–542.

9) Levine, R & Zervos, S 1998 'Stock market, banks, and economic growth', *American Economic Review*, vol.88, no.3, pp. 537-558.

10) Odedokun, MO 1996 'Alternative econometric approaches for analyzing the role of the financial sector in economic growth: time series evidence from LDCs', *Journal of Development Economics*, vol. 50, no. 1, pp. 119-146.

11) Pagano, M 1993 'Financial market and growth: an overview', *European Economic Review*, vol 37, pp. 613– 622.

12) Quartey, P & Prah, F 2008 'Financial development and economic growth in Ghana: is there a causal link?' *African Finance Journal*, vol 10, pp.28–54.

13) Saint-Paul, G 1992 'Technological choice, financial markets and economic development', *European Economic Review*, vol. 36, pp. 763–781.

14) Schumpeter, JA 1911, *The Theory of Economic Development*, Harvard University Press, Cambridge MA.

15) ThinkQuest, 2001 'Economic History and Structure', available from: http://library.thinkquest.org/C0110237/Economy_/Economic_History/economic_history.html, accessed August 2009.

Decision Analysis Approach for Quality in Technical Education

Rupesh Gupta[α] T.K.Garg[£]
Sheifali Gupta[Ω]
Ajay Goel [€]

GJHSS Classification (FOR)
130103, 130103, 130313 & 160511

Abstract- **The Analytical Hierarchy Process (AHP) provides a methodology for multi-criteria analysis and decision making. It allows critical examination of the underlying assumptions, consistency of the judgments, and facilitates the incorporation of qualitative and subjective considerations into quantitative factors for decision making. Here an Analytic Hierarchy Process (AHP) approach is used for the analysis and comparison of the quality of several technical institutes The AHP method uses paired comparison to weight the importance degrees that affect the quality of education/service in a hierarchical structure. A particular formulation is presented and discussed extensively. The present study makes an attempt to enlist various factors that affect Technical Education and further develops a mathematical model to measure its effectiveness.**

Keywords- Decision analysis; Multi-criteria decision making; Analytical Hierarchy Process; Technical education;

I. INTRODUCTION

We live in the information age where technical education plays an important part in our career. The Technical education field today is a much more competitive market and students/customers have a variety of services, courses and institutes/universities to choose from. Students/Customers of technical education demand a high quality education and services (like job placement etc.) from their institutes/universities. They have the opportunity to determine quality of educational services that they need, balancing their cost and course/value. It is therefore essential that institutes/universities provide the best quality of educational service available. In this paper, we focus on a specific problem namely; the dilemma faced by a student/customer in choosing a technical institute/university that best satisfies his needs. We illustrate how a student can utilize the Analytic Hierarchy Process to scientifically choose an institute/university that best satisfies his needs for quality education and service. As an example, three institutes/universities are being compared in terms of the quality of services offered. Certain factors which have a significant impact on the quality of educational services have been considered in this study. The relative importance of each of these factors and their effect on the quality of education are determined by performing pair wise comparisons between them. This enables us to prioritize

Department of Computer Science & Engineering, Singhania University, Rajasthan

them in order of importance. The next step is to determine the importance that each institute/university assigns to these factors in its quality improvement program. The decision making process in this case is greatly 'simplified by solving the problem in a numerical manner. It is, therefore, attempted here: 1. Identify various factors affecting the effectiveness of technical institution 2. Study and critically evaluate the influence of each factor and improve the condition of these factors so that they have positive effect in improving the effectiveness by using mathematical model.

Criteria affecting the quality of technical education

In order to achieve the esteemed goal of producing well qualified and trained technocrats an institution has to work efficiently and effectively. Every technical institution strives towards imparting technical competence to the student by creating a healthy environment for their personality development and finally enabling them to achieve higher grades in their respective fields. Various input factors responsible for quality enhancement in technical education are summarized here.

The literature [1] clearly indicates that there are various factors which directly or indirectly influence the effectiveness (Quality) in technical education. Here we group these factors under six broad heads as discussed below

[A] Administration
[B] Infrastructure
[C] Teaching Effectiveness
[D] Students
[E] Interaction with Industry and Society
[F] Research and Development

A. *Administration*

The administration of technical institution play vital role in its functioning and its responsibilities includes-

1. Setting objectives for the functioning of the institution.
2. Formulating policies and programs to achieve it.
3. Controlling all the functions which directly or indirectly affect the efficiency.

B. *Infrastructure*

"We shape our institution and our institution shapes us", Winston Churchill. An institution must have adequate land,

About [α]-Department of Mechanical Engineering, Singhania University, Rajasthan, I
About [£]-Department of Mechanical Engineering, N.I.T. Kurukshetra,, india
About [Ω] Department of Electronics & Communication Engineering, Singhania University, Rajasthan,

necessary buildings, hostels, supporting facilities, canteen, transport, library, well equipped laboratories and workshop availabilities of teaching aids like OHP, LCD projector, seminar halls conference room and last but not lest advance computing facilities. These facilities are initial prerequisite for any technical institution which must be present to ensure proper functioning of Technical Institution.

C. *Teaching Effectiveness*

The quality of students coming out of the universities and colleges largely depends upon the quality of the teaching staff employed. The frontier of science and technology are doubling by leaps and bounds to cope with it its necessary, for the faculty to be constantly in touch with the same and try to update themselves through enhancing their qualifications attend various quality improvement programs like workshops, seminars, conference, summer and winter school etc. is the responsibility of the institution to provide a proper and conductive atmosphere for the teacher.

D. *Students*

The students constitute the input of the whole system. The accomplishment of the process of imparting knowledge is greatly affected by environment in which the students are put and also on their self zeal to learn and excel. A student's own awareness and interest for learning and the inherent aptitude to grasp together with his sincerity, regularity and honesty is key to his successful accomplishment of his course. It is also necessary to boost the moral of the students by motivating the students. All these aspects when carefully implemented and nurtured bring about a total turn around in the quality of education.

E. *Interaction with Industry and Society*

The fresh engineers from technical institution need to be offered training in industries to give them first hand practical exposure. There is a need for general recasting of curriculum, with industry oriented programs and to establish a close link between an educational program and social needs.

F. *Research and Development*

Research and development activity is very much essential to survive in this competitive world. The institution must have proper infrastructure to carry out research and development activities. The students must have access to scientific Journals and other modern library facilities. There must be availability of qualified and experienced research oriented and motivated faculty. Adequate financial provision must be present to carry out research activities.

II. The Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a technique used for dealing with problems which involve the consideration of multiple criteria simultaneously. It is unique in its ability to deal with intangible attributes and to monitor the consistency with which a decision maker makes his decisions. Some of its applications include Transport Planning in the Sudan [2], choosing a Modern Computer System [3] and Political Candidacy [4]. The steps to be followed while implementing the AHP process are illustrated below [5].

Step 1 - Set up a decision hierarchy by breaking down the problem into a hierarchy of interrelated decision elements. The overall goal is placed at the top, with the main attributes on a level below.

Step 2 - Collect input data by pair-wise comparisons of decision elements. Every attribute on each level is compared with adjacent attributes in respect of their importance to the parent.

Step 3 - Use the "eigen value" method to estimate the relative weights of decision elements. The options available to the decision maker are now scored with respect to the lowest level attributes. Step 4 - Aggregate the relative weights of decision elements to arrive at a set of ratings for the decision alternatives. The scores reflecting the weight given to each attribute are adjusted and then summed to yield a final score for each option.

The decision schema of the analytic hierarchy process is shown below in figure 1.

A distinction is made between local and global priorities. A local priority reflects the importance (priority) of an element in a certain level with respect to an element immediately above it. A global priority reflects the importance of an element with respect to the focus of the problem. The derivation of local priorities is carried out through the use of a comparison scale and a pair wise comparison matrix [6]. A comparison matrix for deriving the priority vector $w = [w_1, w_2, w_3]$, is associated with 3 elements in a specific level with respect to a single element in a level immediately above it. Such a matrix is de-noted by A.

$$A = \begin{bmatrix} w_1/w_1 & w_1/w_2 & w_1/w_3 \\ w_2/w_1 & w_2/w_2 & w_2/w_3 \\ w_3/w_1 & w_3/w_2 & w_3/w_3 \end{bmatrix}$$

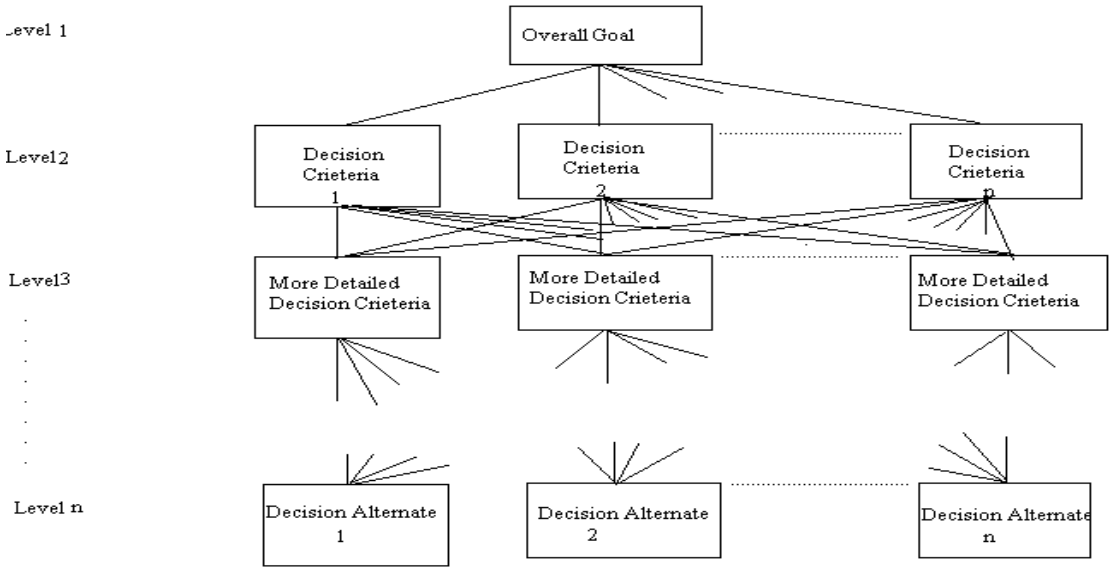


Figure 1

In this matrix, every element a_{ij} is the result of a pair wise comparison denoting the dominance of element i relative to element j. A comparison is also being made of the jth element with the ith element. This results in the comparison matrix being a reciprocal matrix satisfying $a_{ij} = 1 / a_{ji}$. The pair wise comparison is performed using the 1-9 scale suggested by Saaty [1]. It is observed that for the matrix given above the following relation holds: Aw = nw, where w is the priority vectorand n is the number of elements being compared. This is the case for a perfectly consistent comparison matrix whose elements satisfy $a_{ik} = a_{ij} * a_{jk}$ for all (i , j , k). In this consistent case the matrix A is written as:

$$A = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix} \quad [1/w_1 \quad 1/w_2 \quad 1/w_3]$$

In this special case every column of this perfectly consistent matrix provides the solution to the eigen vector problem associated with the largest eigen value. In general we have $w = \lambda_{max} w$, where λ_{max} is the largest or principal eigen value of the comparison matrix, which can be shown to satisfy $\lambda_{max} \geq n$, (n is the order of the matrix) with equality holding true only in the perfectly consistent case. The consistency index (CI) is an indication of the accuracy of the method and is defined as:

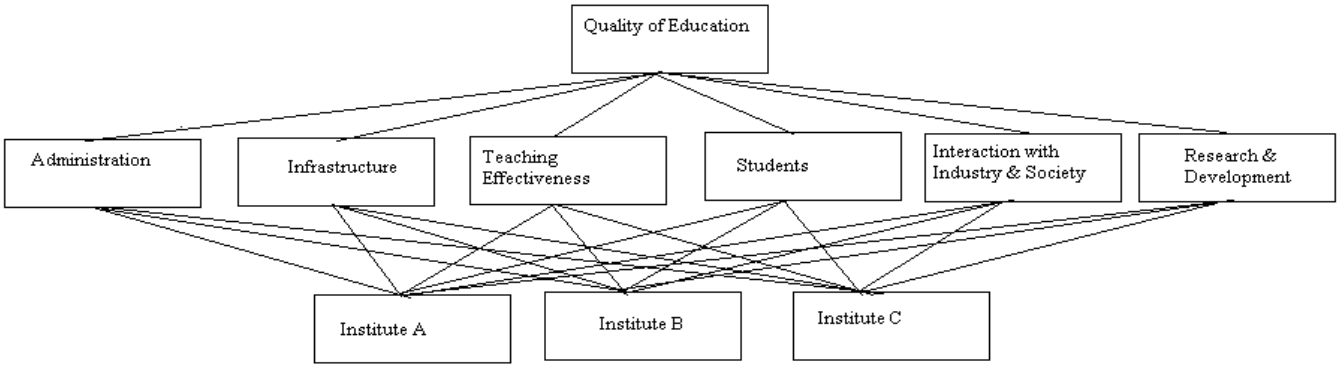
$$CI = (\lambda_{max} - n)/(n-1)$$

This consistency index will assume the value zero only in the perfectly consistent case and will be positive otherwise. Several properties of the AHP method are presented in [7]

III. Application of the AHP Method

The decision scheme required for our specific problem is illustrated below in figure2. The overall goal and the factors which affect this goal are defined. The relative weights assigned to these factors by each of the institute under consideration have to be determined.

Figure2 – The Decision Scheme



It is first necessary to prepare a global matrix comprising the factors affecting quality. Pair wise comparisons between elements of this matrix yield certain numerical values.

A. *Global Matrix*

A glance at this global matrix tells us how important a certain factor is in comparison to the other factors (Figure 3). For this global matrix, the principal eigen value λ_{max}, the consistency index (Cl) and the consistency ratio are calculated. The random index (RI) for n =6 order matrix is 1.24. These values indicate the consistency of the method used. The priorities assigned to elements of the matrix reflect the order of their importance in the decision making process.

	Administratio	Infrastructure	Teach. Effec.	Students	Inter. with Ind.& Society	R& D
Administration	1					
Infrastructure		1				
Teach. Effec.			1			
Students				1		
Inter. with Ind.& Society					1	
R& D						1

Figure 3 – Global Matrix

IV. Comparison Between Three Institutes

The next step is to compare the importance that each institute assigns to these factors. Six matrices are constructed (Figure 4) and pair wise comparisons are performed between the elements.

Administration

	A	B	C
A	1		
B		1	
C			1

Students

	A	B	C
A	1		
B		1	
C			1

Infrastructure

	A	B	C
A	1		
B		1	
C			1

Interaction with Industry & Society

	A	B	C
A	1		
B		1	
C			1

Teaching Effectiveness

	A	B	C
A	1		
B		1	
C			1

Research & Development

	A	B	C
A	1		
B		1	
C			1

Figure 4 - Comparison Matrices

The objective is to determine the relative priority that each institute assigns to a given factor.

The overall weight of an institute indicates the emphasis that the institute gives to these factors and is arrived at in the following manner.

We tabulate the priorities obtained by these pair wise comparisons. This matrix is multiplied with the matrix of the relative priorities of the six factors as obtained earlier.

$$\begin{bmatrix} a_A a_I & a_T a_S & a_{IS} a_R \\ b_A b_I & b_T b_S & b_{IS} b_R \\ c_A c_I & c_T c_S & c_{IS} c_R \end{bmatrix} \begin{bmatrix} A \\ I \\ T \\ S \\ IS \\ R \end{bmatrix}$$

The two matrices are multiplied to obtain the overall weight of each company as shown below.

Overall weight of Institute A =

$$a_A A + a_I I + a_T T + a_S S + a_{IS} IS + a_R R$$

Overall weight of Institute B=

$$b_A A + b_I I + b_T T + b_S S + b_{IS} IS + b_R R$$

Overall weight of Institute C=

$$c_A A + c_I I + c_T T + c_S S + c_{IS} IS + c_R R$$

The order of priority assigned to the different factors by an institute is compared with the priority assigned to the factors by a competent student. Based on a careful observation of the tabulations, the competent student can arrive at a decision to choose a particular institute/university. The institute/university with the largest overall weight is usually chosen, provided however that the institute/university offers its courses at a reasonable cost. If the cost of course offered by this institute/university is not reasonable then the student must arrive at a trade off between the overall weight and the cost of course provided.

V. Conclusion

The research effort of this paper is to integrate AHP and Quality factors into the Institutes driven course design process. In this paper, we have briefly examined the various factors which affect the effectiveness of technical education and have categorized them into six major heads. A mathematical model has been evolved for assessing the effectiveness in terms of these factors. The proposed model can be used to quantify the effectiveness of a technical institution with very good accuracy. Student's views on these criteria are determined by having them fill out suitably prepared questionnaires. Students could use this framework to specify the technical education quality attributes they require. They could compare course and service offerings available from various institutes to quantitatively determine the impact on their career of available infrastructure and quality alternatives. A search strategy is also

employed to establish target values of institute .characteristics for the recommended course alternative

VI. References

1. Anil R. Sahu , Dr R. L. Shrivastava, Dr R. R. Shrivastava "Key Factors Affecting the Effectiveness of Technical Education– An Indian Perspective" Proceedings of the World Congress on Engineering 2008 Vol II WCE 2008, July 2 - 4, 2008, London, U.K.
2. [Saaty T.L., "A Theory of Analytical Hierarchies applied to Political Candidacy", Behavioral Science, Volume22, pp. 237-245, 1977.
3. Arbel A. and Seidmann A**.,** "Capacity planning, benchmarking and evaluation of small computer systems", European Journal of Operational Research 22, pp. 347- 358,1985.
4. Saaty T.L., "Scenarios and Priorities in Transport Planning: Application to the Sudan**",** Transportation Research,Volume 11, pp. 343-350, 1977.
5. Zahedi E, "The Analytic Hierarchy Process-A Survey of the Method and its Applications", Interfaces, Vol. 16 No.4,, pp. 96-108, July-August 1986
6. Arbel A., "Approximate articulation of preference and priority derivation", European Journal of Operational Research 43, pp. 317-326, 1989.
7. Saaty T.L., "The Analytic Hierarchy Process", McGraw- Hill, New York, 1980.

Analysis of Urban Surface Biophysical Descriptors and Land Surface Temperature Variations in Jimeta City, Nigeria

Ambrose A. Zemba

GJHSS Classification (FOR)
040302, 040307, 040606 & 040608

Abstract: **Land-use and land-cover (LULC) data are often employed for simple correlation analyses between LULC types and their thermal signatures in the studies of land surface temperature (LST) using remote sensing. This tends to slow down the development of remote sensing of land surface temperature. Hence, there is need for methodological shift to quantitative surface descriptors. Development of quantitative surface descriptors could improve our capabilities for modeling urban thermal landscapes and advance urban climate research. This study therefore adopted an analytical procedure based on a spectral derivation model for characterizing and quantifying the urban landscape in Jimeta, Nigeria. A Landsat Enhanced Thematic Mapper Plus (ETM+) image of the study area, acquired on 16 November 2008, was spectrally modeled into three fraction endmembers namely, green vegetation, soil, and impervious surface. A hybrid classification procedure was developed to classify the fraction images into six land-use and land-cover classes. Next, pixel-based LST measurements were related to urban surface biophysical descriptors derived from spectral mixture analysis (SMA). Correlation analyses were conducted to investigate land-cover based relationships between LST and impervious surface and green vegetation fractions for an analysis of the causes of LST variations. Results indicate that fraction images derived from SMA were effective for quantifying the urban morphology and for providing reliable measurements of biophysical variables such as vegetation abundance, soil and impervious surface. An examination of LST variations within the city and their relations with the composition of LULC types, biophysical descriptors, and other relevant spatial data shows that LST possessed a weak relation with the LULC compositions than with other variables (including urban biophysical descriptors, remote sensing biophysical variables, GIS-based impervious surface variables, and population density).**

Key words: Land surface temperature, urban surface biophysical descriptors, Land use, Land cover

I. Introduction

Because the receipt and loss of radiation of urban surfaces correspond closely to the distribution of land-use and land-cover (LULC) characteristics, there has always been a tendency to use thematic LULC data, not quantitative surface descriptors, to describe urban thermal landscape. This has slowed down the development of remote sensing of land surface temperatures (LST) and thus surface temperature heat islands (Voogt and Oke, 2003). However, Clapham (2003) suggested using of a continuum-based classification for satellite imagery, which aims to provide continous data for the functional classes. The idea of continuum-based classification has long been pursued in urban landscape analysis. One of the major contributions is Ridd's (1995) vegetation-impervious surface-soil (V-I-S) model for characterizing urban environments. This model assumes that urban land-cover is a linear combination of three biophysical components: vegetation, impervious surface, and soil and has recently been successfully implemented by using the technique of spectral mixture analysis (Madhavan et al, 2001; Rasheed et al, 2001; Small, 2001; Phinn et al, 2002; Wu and Murray, 2003; and Lu and Weng, 2004). The Ridd model provides the potential for a link between remote sensing-derived urban biophysical components and LST, and may be applied to establish parameters for describing urban construction materials and fabrics to improve our understanding of urban surface energy budget and heat islands.

The focus of this research is placed on the application of a methodology to examine the interplay between LST and urban morphology. A Landsat ETM+ image of 2008 that covers the City of Jimeta, Nigeria was used in conjunction with other types of spatial data for the analysis. The specific objectives were twofold: First, to employ spectral mixture modeling to derive urban surface biophysical attributes, and to apply spectrally unmixed results to characterize the urban landscape and secondly, to analyze the causes of LST variations, which were derived from Landsat thermal infrared data by linking LST with remotely sensed urban surface biophysical descriptors.

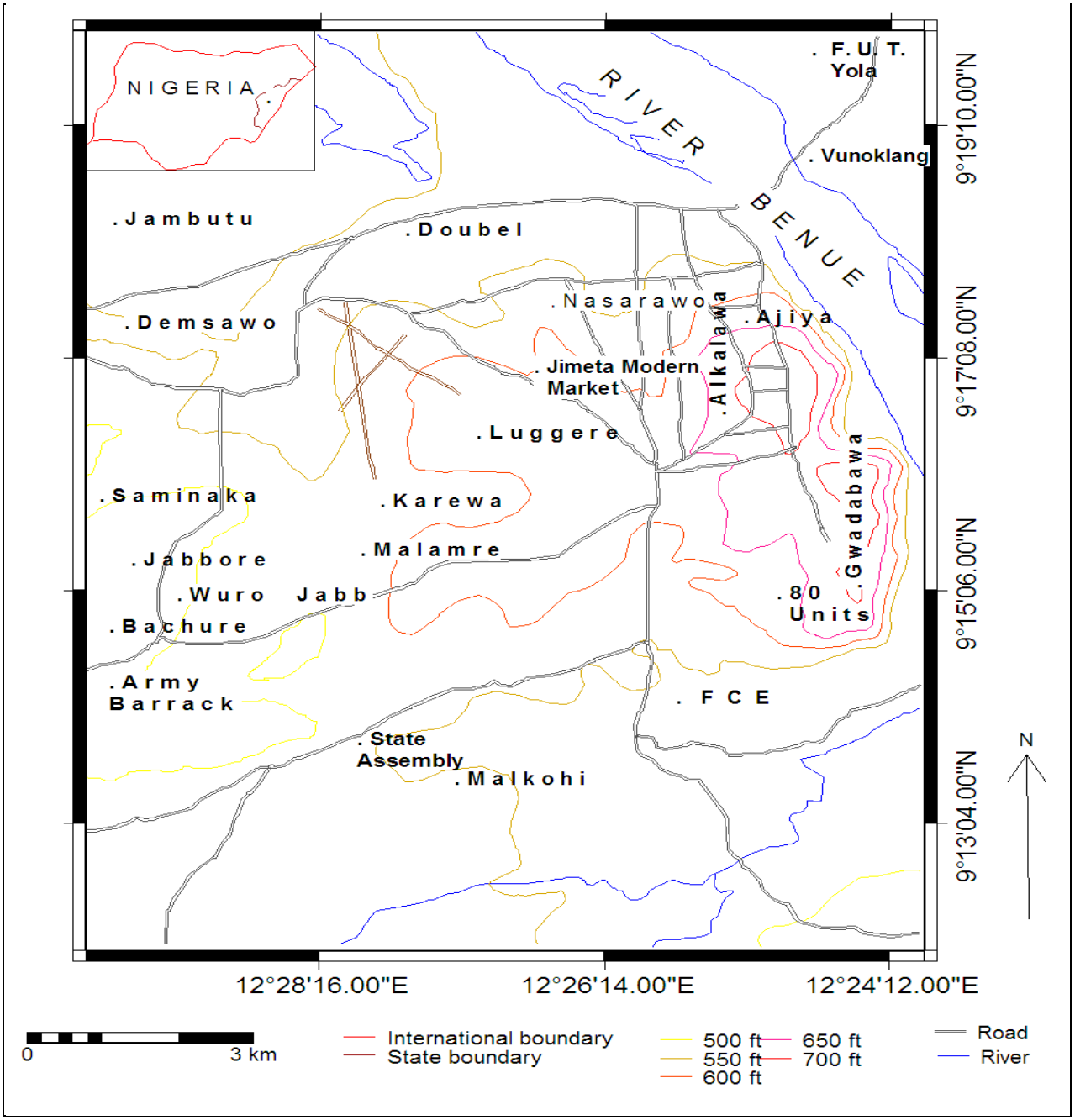
II. Study Area

Jimeta, a twin city to Yola town, is the capital of Yola North Local Government and Adamawa State of Nigeria. The city is located at the bank of River Benue, between latitude 9^0 10' to 9^0 15'N and longitude 12^0 11' to 12^0 17'E. The area has a Sudan type of vegetation and a tropical climate marked by wet and dry seasons. The minimum temperature recorded is about 15 ^{0}C and a maximum of about 40 ^{0}C.

The city has been experiencing an increasing population explosion since it assumed a status of Adamawa State capital in 1976. Like any other Nigerian cities, Jimeta comprises of so many land use types ranging from institutional, commercial, and residential. The city is clearly stratified in terms of population densities (Ilesanmi, 1999).

About- Geography Department, Federal University of Technology, P.M.B. 2076, YolaContact no:+234 806 913 7174, +234 808 181 4644 Email:aazemba@yahoo.com

These are low, medium and high density areas. The low density areas are well planned units where government officials reside while medium and high density areas are made up of common people with little or unplanned streets and buildings.



In recent times, Jimeta has risen as the premier commercial, industrial and transportation urban area of the northeastern Nigeria. The rapid growth of Jimeta, particularly within the past 30 years, has made it one of the fastest growing metropolitan areas in Nigeria. For instance, the population of Jimeta increased significantly by 69% between 1973 and 1991 and 58% between 1991 and 2006 (NPC 2006). Concomitant with this high rate of population growth has been an explosive growth in retail, educational, commercial and administrative services within the area. This has resulted

in tremendous land cover change dynamics within the metropolitan region, wherein urbanization has consumed vast acreages of land adjacent to the city proper and has pushed the urban fringe farther away from the original Jimeta urban core. An enormous transition of land from forest and agriculture to urban land uses has occurred in the area, the extent of which needs to be investigated for the sake of planning for the ever growing population.

III. Methods

1. *Pre-processing of image*

Landsat 7-Enhanced Thematic Mapper Plus (ETM+) image with path/row of 185/54 dated 16 November 2008 was used in this research. The acquisition date has a highly clear atmospheric condition, and the image was acquired through the USGS Earth Resources Observation Systems Data Center, which has corrected radiometric and geometrical distortions of the image to a quality level of 1G before delivery. The major pre-processing on the image had to do with scan-line-off correction. The image was further rectified to a common Universal Traverse Mercator coordinate system based on 1:50, 000 scale topographic maps, and was resampled using the nearest neighbor algorithm with a pixel size of 30 m by 30 m for all bands including the thermal band.

2. *Spectral mixture analysis*

Spectral mixture analysis was employed to estimate endmember fractions in the images. Endmembers are recognizable land-cover materials that have homogeneous spectral properties all over the image. Spectral mixture analysis assumes that the spectrum measured by a sensor is a linear combination of the spectra of all components within the pixel (Adams et al, 1995). The mathematical model of linear spectral mixture analysis is expressed as

$$R_i = \sum_{k=}^{n} f_k R_{ik} + ER_i \text{ Where,} \qquad (1)$$

i = 1, ... m (number of spectral bands),
k = 1, ... n (number of end members)
R_i = Spectral reflectance of band i of a pixel which contains one or more endmembers;
f_k = Proportion or fraction of end member k within the pixel;
R_{ik} = Known spectral reflectance of end member k within the pixel on band i; and
ER_i = Error for band i or remainder between measured and modeled DN (band residuals).

Estimation of endmembers was done using reference endmember fractions i.e. the laboratory spectra of the target materials in Erdas imagine software.

3. *Estimation of impervious surface*

In this research, reference endmembers was applied. ERDAS Imagine GIS software has a collection of spectra libraries, from where the spectra that represent the materials used as endmembers (soil, vegetation and impervious surface) were selected.

4. *Land-use and Land-cover classification*

The maximum likelihood classification algorithm was applied to classify the fraction image into ten classes. A distance threshold was selected for each class and was determined by examining interactively the histogram of each class in the distance image. Pixels with a distance value greater than the threshold were assigned a class value of zero in thematic image. A distance tree classifier was then applied to reclassify these pixels. The parameters required by the distance tree classifier were identified based on the mean and standard deviation from the sample points of each class. Finally, the accuracy of the classified image was checked with a stratified random sampling method against the reference data of 50 samples collected from a large-scale 2006 aerial photograph of the study area. Six land use/cover types were identified, including (i) built-up land (ii) bare surface (iii) natural vegetation or forest (iv) Marshy land (v) croplands and (vi) water bodies. An overall accuracy of 88% and a Kappa index of 0.84 were determined.

2. *Estimation of Land Surface Temperature (LST)*

The Landsat TM and ETM+ thermal bands have different gain and offset values. Therefore, for the calculation of their radiance values, different formulas are used. In this study, for the calculation of radiance the formula in equation (2) was used:

$$\text{Radiance} = ((L_{MAX} - L_{MIN}) / (DN_{MAX} - DN_{MIN})) * (DN - DN_{MIN}) + L_{MIN} \quad \text{where:} \qquad (2)$$

For band 6L	and	For band 6H
L_{MAX} = 17.04		L_{MAX} = 12.65
L_{MIN} = 0.0		L_{MIN} = 3.2
DN_{MAX} = 255		DN_{MAX} = 255
DN_{MIN} = 1		DN_{MIN} = 1

The values for all these parameters were obtained from the data header files.

After the calculation of the radiance values, the temperature values were derived using the inverse of Planck function (equation 3), thus:

$$T_{(^0C)} = \left[\frac{K_2}{Ln\{K_1 / CV_R + 1\}} \right] - 273, \quad \text{Where:} \quad (3)$$

$T_{(^0C)}$ = *Temperature in Degrees Celsius*
CV_R = *Cell (pixel) value as radiance*
K_1 = *607.76 (for TM) or 666.09 (for ETM and ETM+) in* $mW\ cm^{-2}\ sr^{-1}\ \mu m^{-1}$
K_2 = *1260.56 (for TM) or 1282.71 (forETM and ETM+) in Kelvin*

All the temperature derivations were modeled using a Model Maker in Erdas Imagine software. In examining the spatial relationship between land use/cover types and the surface energy response as measured by surface temperature, a classified image was overlaid to the surface temperature images.

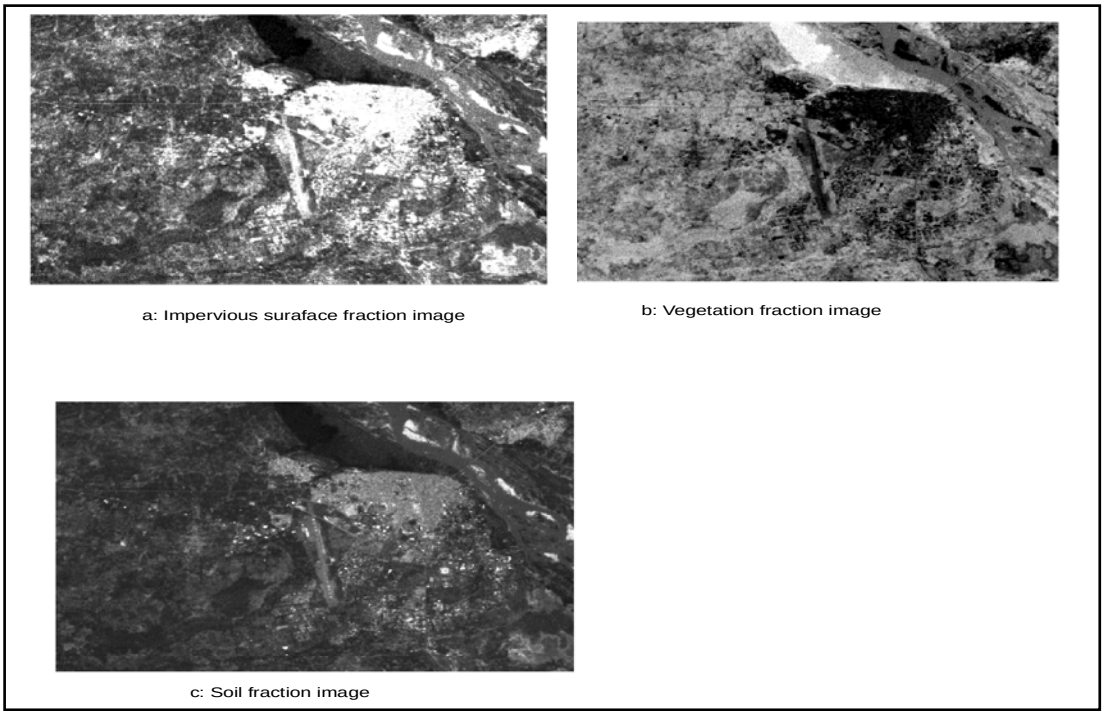
IV. Results

Urban Surface Biophysical Descriptors

Fig 2 shows the three fraction images derived. This consists of Green vegetation, soil, and impervious surface fractions. Pixel values of these fraction images represent areal proportions of each biophysical descriptor within a pixel. Green vegetation fraction image showed a large dark area (low values) at the centre of the study area that corresponds to the central business district of the city. Bright areas of high green vegetation values are found in the surrounding areas. Though, various types of crops were at their maturity stage, the green vegetation fraction images in the northwestern to southwestern parts of the city were still conspicuous as evidenced by medium gray to dark tone. Column 3 of Table 1 displays green vegetation fraction values by land cover types. Forest/sparse trees (including natural/planted trees, bushes and grasses) apparently had the highest green vegetation fraction values (0.715). In contrast, built-up lands displayed the lowest green vegetation values (0.119).

Little vegetation amount was also found in water bodies as indicated by the green vegetation fraction value (0.161). Bare surfaces or exposed soils, natural vegetated lands and cultivated or croplands put together yielded an intermediate green vegetation fraction values around 0.25. Bare surfaces green vegetation standard deviation was slightly lower in value than that of cultivated land. Cultivated land standard deviation was the highest (0.33), suggesting that cultivated land may be characterized by various amounts of vegetation coverage. The least value of standard deviation for green vegetation was recorded in forest areas indicating that a variation in the amount of vegetation cover is minimal.

The percentage of land covered by impervious surfaces may vary significantly with land use-land cover categories and sub-categories. This study reveals a substantially different estimate for each land use-land cover types. For example, a negative impervious



a: Impervious suraface fraction image

b: Vegetation fraction image

c: Soil fraction image

Fig 2: Fraction images derived from spectral mixture analysis of the landsat ETM+ 2008 image

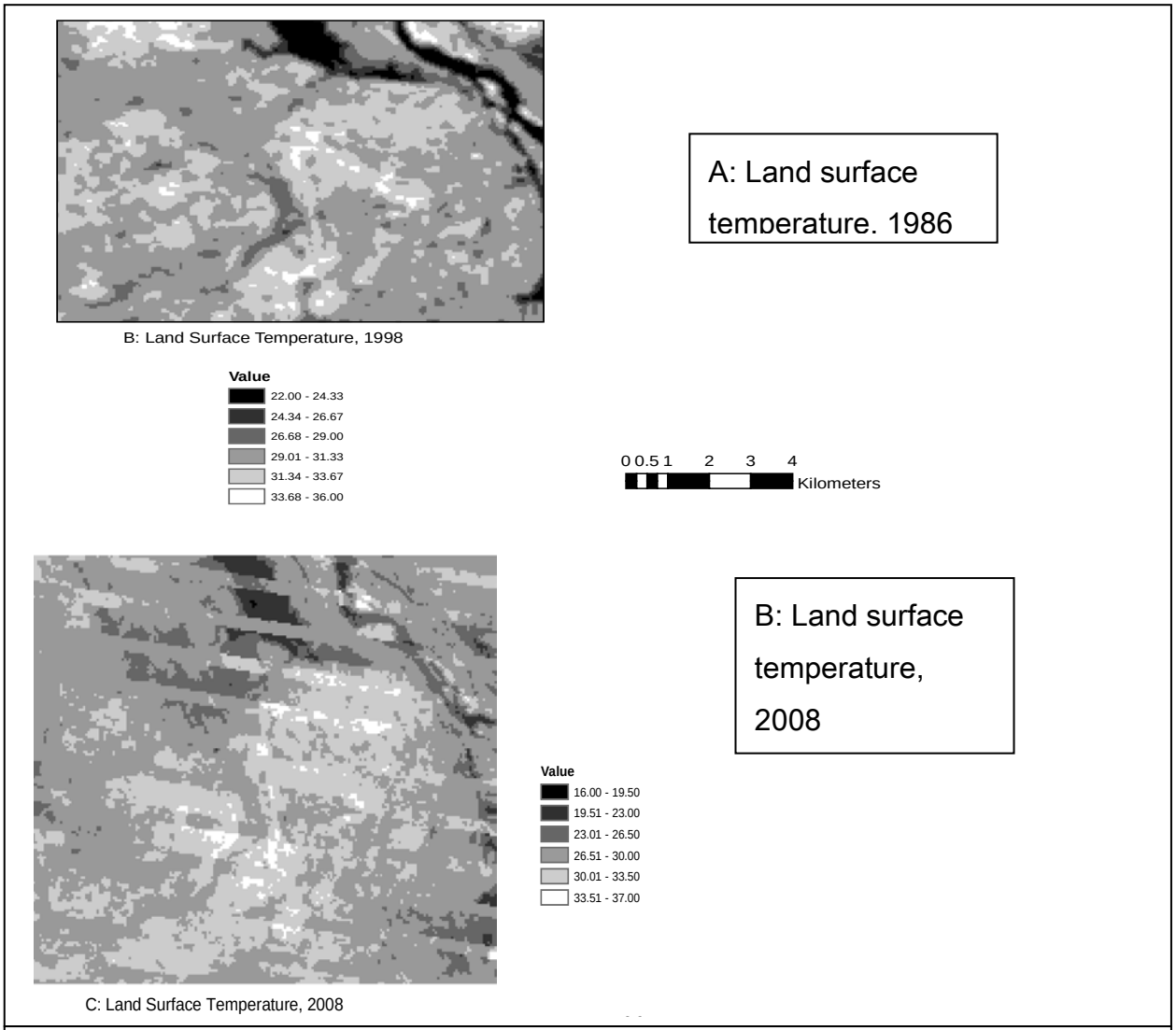


Fig 3: Land surface temperature variation in Jimeta in 1986 and 2008

Table 1: Descriptive Statistics of Biophysical Parameters of the Land Cover Types

Land Use & land cover	Mean LST in 2008 (^{0}C)	Mean Vegetation	Mean Impervious surface	Mean soil fraction
Built-up lands	36.85 (3.10)	0.119 (0.140)	0.491 (0.226)	0.101 (0.234)
Bare soils	32.85 (1.94)	0.276 (0.155)	0.254 (0.098)	0.147 (0.144)
Croplands	28.85 (1.56)	0.248 (0.333)	0.129 (0.045)	0.333 (0.252)
Marshy lands	27.85 (1.83)	0.258 (0.151)	0.138 (0.097)	0.373 (0.184)
Forest/bushy lands	26.85 (1.37)	0.715 (0.104)	0.057 (0.030)	0.01 (0.077)
Water	23.85 (0.43)	0.161 (0.178)	-0.029 (0.090)	-0.109 (0.156)

Source: Derived from Landsat ETM+ Image. Values in brackets refer to standard deviations

Results are displayed in the last two columns of Table 2. For all land use and land cover types, land surface temperature values were negatively correlated with green vegetation fraction values, but were positively correlated with impervious fraction values. The strongest negative correlation existed between land surface temperature and green vegetation fraction values in croplands (-0.7538) and forest (natural vegetation) (-0.7343). The correlation coefficient values dropped slightly for bare surface (-0.6763) and residential lands (-0.6559), with a sharp decrease for marshy lands. The least correlation was found in water (-0.2416). On the other hand, the strongest positive correlation between land surface temperature and impervious fraction values was found in crop lands (0.5558), followed by bare surfaces (0.5373). The weakest correlations (0.3267 and 0.3538) were observed in thick vegetation areas and water respectively.

Table 2: Statistics of the Biophysical Descriptors by Land use-land cover types, and their Correlations with land surface temperature (significant at 0.05 level)

Land Use-land cover Type	Mean LST	Mean Vegetation	Mean Impervious surface	LST/Vegetation Fraction	LST/Impervious surface
Built-up lands	39.85 (3.10)	0.119 (0.140)	0.491 (0.226)	- 0.6559	0.5254
Bare surface	32.85 (1.94)	0.276 (0.155)	0.254 (0.098)	- 0.6763	0.5373
Croplands	28.85 (1.56)	0.248 (0.333)	0.129 (0.045)	- 0.7538	0.5558
Marshy lands	27.85 (1.83)	0.258 (0.151)	0.138 (0.097)	- 0.4105	0.5290
Natural vegetation	26.85 (1.37)	0.715 (0.104)	0.057 (0.030)	- 0.7343	0.3267
Water	23.85 (0.43)	0.161 (0.178)	-0.029 (0.090)	- 0.2416	0.3538

Source: Derived from Landsat ETM+ Image (2008). Values in brackets are standard deviation

V. Conclusion

The use of thermal land use-land cover data is reported to have slowed down the development of remote sensing of land surface temperature and thus surface temperature heat island (Voogt and Oke, 2003). Hence, there has been a call to develop and apply quantitative surface descriptors to describe urban thermal landscapes in remote sensing studies. To make this happen, remote sensing techniques must enable parsimonious separation of urban land use/cover types into values directly related to their scale and signature (Phinn et al, 2002). This study has demonstrated that spectral mixture analysis (SMA), based on the V-I-S model, can provide a physically based solution for characterizing and quantifying urban landscape compositions, and that SMA-derived fraction estimates can be used as reliable urban surface biophysical descriptors. As a comparison, the study has examined the relationship between land surface temperature (LST) values and the compositions of LULC types within the city, as well as the relationships between LST and the urban biophysical descriptors derived from SMA, and other relevant spatial data. Results indicate that LST possessed a stronger relationship with these variables than the LULC compositions.

The study also revealed that SMA provides a suitable model to decompose the spectral mixtures of L-resolution data such as Landsat TM/ETM+. The scene elements in the L-resolution data are smaller than the resolution cell of the sensor, and are therefore not detectable. Thus, a more realistic representation and quantification of urban surfaces are possible, in comparison to that provided by assignment of a single dominant class to every pixel by statistical models. With the availability of multi-temporal satellite images, stable and reliable fraction estimates derived from SMA may be more efficient for a LULC change detection than traditional pixel-by-pixel comparison methods, because the fractional characteristics of LULC types at one date are comparable with other dates of fraction images. Fraction images may also be translated into significant environmental variables such as impervious surface and vegetation abundance. By relating LST to changing fraction constituency over time with urban growth, the effect of urbanization on LST may be examined.

VI. References

1) Adams, J. B., Sabol, D. E., Kapos, V., Filho, R. A., Roberts, D. A., Smith, M. O. & Gillespie, A. R. (1995) Classification of multispectral images based on fractions of endmembers: Application to land cover changes in the Brazilian Amazon. *Remote sensing of Environment, 52:137-154.*

2) Clapham, W.B. (2003) Continuum-based classification or remotely sensed imagery to describe urban sprawl on a watershed scale. *Remote Sens Environs 86:322-340.*

3) Ilesanmi, F.A. (1999) Urban Settlements In Adebayo, A.A. and Tukur, A.L. (eds) Adamawa State in Maps, Department of Geography, FUTY and Paraclete Publishers, Yola.

4) Lu, D. and Weng, Q. (2004) Spectral Mixture Analysis of the Urban Landscapes in Indianapolis with Landsat ETM+. *Photogrammetric Engineering & Remote Sensing, 70, 1053-1062.*

5) Madhavan, B.B., Kubo, S., Kurisaki, N. and Sivakumar, T.V.I.N. (2001) Appraising the Anatomy and Spatial Growth of the Bangkok Metropolitan Area Using a Vegetation-Impervious surface-Soil Model through Remote Sensing,

International Journal of Remote Sensing, 22:789-806

6) National Population Commission (NPC, 2006) Details of the breakdown of the national and state provisional population totals 2006 census.

7) Phinn, S., Stanford, M., Scarth, P., Murray, A. T. & Shyy, P. T. (2002) Monitoring the composition of urban environments based on the vegetation-impervious surface-soil (VIS) model by subpixel analysis techniques. *International Journal of Remote Sensing 23:4131-4153.*

8) Rasheed, T., Weeks, J. R., Gadalla, M. S. & Hill, A. G. (2001) Revealing the autonomy of cities through spectral mixture analysis of multispectral satellite imagery: A case study of the Greater Cairo region, Egypt, *Geocarto International 16, 5-15.*

9) Ridd, M.K. (1995) Exploring a V-I-S (vegetation-impervious surface-soil) model for urban ecosystem analysis through remote sensing: Comparative anatomy for cities. *International Journal of Remote Sensing* 16: 2165- 2185.

10) Small, C. (2001) Estimation of urban vegetation abundance by spectral mixture analysis, *International Journal of Remote Sensing, 22:1305-1354.*

11) Voogt, J.A. & Oke, T.R. (2003) Thermal Remote Sensing of Urban Climates. *Remote Sensing of environment, 86, 370-384*

12) Weng, Q. (2001) A Remote Sensing-GIS Evaluation of Urban Expansion & Its Impact on Surface Temperature in the Zhujiang Delta, China. *International Journal of Remote Sensing, 22 1999-2014.*

13) Wu, C. & Murray, A.T. (2003) Estimating Impervious Surface Distribution by Spectral Mixture Analysis. *Remote Sensing of Environment, 84, 493-505.*

Determinants of Foreign Direct Investment in Nigeria: An Empirical Analysis

Obida Gobna Wafure[α] Abu, Nurudeen[Ω]

GJHSS Classification (FOR)
140103, 140202, 1502 & 1504

Abstract: The role of foreign direct investment in the development of Nigerian economy cannot be over emphasized. Foreign direct investment provides capital for investment, it enhances job creation and managerial skills, and possibly technology transfer. This paper investigates the determinants of foreign direct investment in Nigeria. The error correction technique was employed to analyze the relationship between foreign direct investment and its determinants. The results reveal that the market size of the host country, deregulation, political instability, and exchange rate depreciation are the main determinants of foreign direct investment in Nigeria. The authors recommend the following policies among others: expansion of the country's GDP via production incentives; further deregulation of the economy through privatization and reduction of government interference in economic activities; strengthening of the political institutions to sustain the ongoing democratic process; gradual depreciation of the exchange rate; and increased investment in the development of the nation's infrastructure.

Keywords: Foreign direct investment, deregulation, unit root, co integration.

I. INTRODUCTION

Foreign direct investment (FDI) not only provides developing countries (including Nigeria) with the much needed capital for investment, it also enhances job creation, managerial skills as well as transfer of technology. All of these contribute to economic growth and development. To this end, Nigerian authorities have been trying to attract FDI via various reforms. The reforms included the deregulation of the economy, the new industrial policy of 1989, the establishment of the Nigeria Investment Promotion Commission (NIPC) in early 1990s, and the signing of Bilateral Investment Treaties (BITs) in the late 1990s. Others were the establishment of the Economic and Financial Crime Commission (EFCC) and the Independent Corrupt Practices Commission (ICPC). However, FDI inflows to Nigeria have remained low compared to other developing countries (see appendix 1). For instance, FDI inflows increased from N786.40 million in 1980 to N2, 193.40 million in 1982, but soon dropped to N1, 423.50 million in 1985. The value of FDI rose from N6, 236.70 million in 1988 to N10, 450.0 million and N55, 999.30million in 1990 and 1995, respectively. However, the value of FDI fell drastically to N5, 672.90 million in 1996 and further to N4, 035.50million in 1999. The inflows of FDI has continued to rise since the year 2001, moving from N4,937.0million to N13,531.20million in 2003 and N20,064.40million in 2004. The FDI inflows stood at N41,734.0million in 2006 (CBN, 2006).

In terms of growth rate, FDI inflows dropped from 95.6 percent in 1971 to -31.20 percent and -17.23 percent in 1976 and 1984, respectively. Although the growth of FDI increased by 182.68 percent in 1986, the value soon fell by -24.76 percent in 1989 and further to -89.87 percent in 1996. Since the year 2000 the growth of FDI has remained positive except in 2001 when the value was -70.00 percent. The recent surge in FDI inflows to the country is attributable to the reduction in the nation's debt profile (through debt arrangements with London club and Paris club) and the renewed confidence of foreign investors in the Nigerian economy (CBN, 2006).

This study is important because Nigeria (before the year 2003) had experienced declining and fluctuating foreign investment inflows. Beside, Nigeria alone cannot provide all the funds needed to invest in various sectors of the economy, to make it one of the twenty largest economies in the world by 2020 and to meet the Millennium Development Goals (MDGs) in 2015. The objective of this study therefore, is to identify the determinants of FDI inflows to Nigeria.

The departure of this study from other studies on the determinants of FDI in Nigeria is the inclusion of deregulation as an important determinant of FDI. This paper is organized into five sections, with review of relevant literature and theoretical background following the introduction. The methodology of the study is presented in section 3, while section 4 provides data analysis and discussion of results. Section 5 is for policy recommendation and section 6 concludes the paper.

II. REVIEW OF RELEVANT LITERATURE AND THEORETICAL BACKGROUND

Many studies have cited the host country's market size (measured by the Gross Domestic Product, GDP) as an important determinant of FDI inflows (Raggazi, 1973; Moore, 1993; Wang and Swain, 1995; Chakrabarti, 2001 and Masayuki and Ivohasina, 2005). However, if the host country is only used as a production base due to low production costs in order to export their products to another or home market, then the market size may be less influential or insignificant (Agarwal,1980). Bajo-Rubia and Sosvilla-Rivero (1994) and Yin Yun Yang et al. (2000) discovered that rising prices (inflation) also influences FDI. Another factor that determines FDI inflows is the exchange rate. If the exchange rate of a country depreciates, it attracts FDI since foreign firms may merge with or acquire domestic

About[α]-Obida Gobna Wafure and Abu, Nurudeen
Department of economics
University of Abuja, Nigeria

industries (Masayuki and Ivohasina, 2005). However, Benassy-Quere et al. (2001) disclosed that the effects of the level of exchange rates on FDI inflows are rather ambiguous. According to Harvey (1990), in the long-run the negative effects of exchange rate volatility are more than the positive effects in attracting FDI. Similarly, Goldberg and Kolstad (1994) found high exchange rate variability to be impediments to FDI inflows between United States and Canada, and Japan and United Kingdom. Some authors have concentrated more on locational factors as important determinants of FDI (Blomstrom et al., 2000). Masayuki and Ivohasina (2005) found that the price of land was a major determinant of FDI inflows into Japan. This is consistent with the work of Blomstrom et al (2000).

Study by Loungani (2003) employ a gravity model of bilateral FDI and portfolio capital flow in order to explain determinants of the mobility of financial capital across countries. The study revealed that the industry specialization in the source countries, the ease of communications between the source country and the destination country (as measured by the telephone densities in each country), and debt equity ratios of publicly traded companies affect the flow of FDI. According to Ahmet (1996), the movement in the exchange rate between the Turkish lira and the Deutsche mark, and interest rate affects inflows of Deutsche mark into the Turkish economy. Focusing on Kenya, Elijah (2006) employed an econometric model to regress FDI on exogenous variables that include human capital, real exchange rate, annual inflation and openness of the economy. The author found that economic openness and human capital affect FDI inflows positively in the short-run. But inflation and real exchange were negatively related to FDI inflows in the short-run and long-run respectively. A similar econometric model of FDI was used by Fuat and Ekrem (2002) to examine location related factors that influence FDI inflows into the Turkish economy. They discovered that the size of the host country's market, infrastructure (proxied by share of transportation, energy and communication expenditures in GDP) and the openness of the economy (as measured by the ratio of exports to imports) are positively related to FDI inflows. The results further revealed that both exchange rate instability and economic instability (measured by interest rate) have negative effects on FDI. As pointed out by Masayuki and Ivohasina (2005), other determinants of FDI inflows are cost of establishing Greenfield plants and the cost of acquiring firms established inside the host country, and the price of land (measured as stock price).

In Nigeria, Ekpo (1997) examined the relationship(s) between FDI and some macroeconomic variables for the period 1970-1994. The author's results showed that the political regime, real income per capita, rate of inflation, world interest rate, credit rating, and debt service explained the variance of FDI inflows to Nigeria. Obadan (1982) in his study argued that market size, trade policies and raw materials are very important determinants of FDI in Nigeria. Anyanwu (1998) maintained that domestic investment, openness and indigenization policy are very important determinants of FDI in Nigeria. According to Ajakaiye (1995), the high bank lending rate that existed during the early days of deregulation (1987-1990) has affected internal rate of return (IRR) on investment negatively, thereby boosting investment inflows. However Aremu (1997) opined that the host country's FDI make credit available to investors in a form of subsidized loans, loan guarantees as well as guaranteed export credits. He noted that these credits are provided directly to foreign investors for their operations particularly to defray some inevitable costs which invariably have an immediate impact on cash flow and liquidity.

Olatunji (2001) in another development argued that despite government efforts to provide incentives to many investors, many investors are still adamant to come to Nigeria. He noted that this might not be unconnected with the lingering problems that still persist on ground. For example, poor infrastructure, general insecurity, sectarian violence, the arm revolt in the Delta region and the pervasive indiscipline that is becoming the order of the day in the Nigerian economy. Apart from the issues mentioned above, one important issue that deters many investors to come to Nigeria is the issue of the stock exchange market, how developed is the market in terms of its structure, duties, methods and its personnel. On his part, Soludo (1998) maintained that it is not profitability of investment today that attracts investors to invest, but how long will the profit remain fairly stable overtime. Whenever the socio-political and economic environment is highly volatile, an investor is better off exercising his option to wait. On the other hand, he might decide to invest on those projects whose cycles are very short and can be easily undone. He also asserted that while the maintenance of the macro economic stability, avoidance of over-valued exchange rates and export orientation are critical for the resurgence of investment they are necessary but not sufficient conditions.

Ekpo and Egwaikhide (1998) observed that public investment directly influences private investment. As such the public (government) should invest in infrastructures which give an enabling environment for private investors, consequently it will help in attracting foreign direct investment to Nigeria. Having survey the relevant literature, we select the variables that could affect FDI inflows into Nigeria. This study is very important because empirical studies that consider deregulation as an important determinant of foreign direct investment in Nigeria are almost non existent.

III. Methodology

In this study we employ a multiple regression model to estimate the relationship between foreign direct investment and its potential determinants. The model expresses foreign direct investment (FDI) has a function of the market size of the host country (GDP), Deregulation (DEREGU), political regime (POLINS), Openness of the economy to foreign trade (EXPIMP), rate of inflation (INFLATIO), Exchange rate of the host country's currency (EXCHRAT) and infrastructural development (FRAS). Our model is thus presented below:

$LnFDI = \beta_o + \beta_1 LnGDP + \beta_2 DEREGU + \beta_3 POLINS + \beta_4 EXPIMP + \beta_5 INFLATIO + \beta_6 EXCHRAT + \beta_7 LnFRAS + U_t$……..…..(1)

Where β_o, β_1, β_2, β_3, β_4, β_5, β_6, and β_7 are coefficients of elastcities, Ln represents the natural logarithm of variables, and U the disturbance term. We expect FDI to be positively related to the host country's market size, deregulation, openness of the economy to foreign trade and infrastructural development. However, FDI is expected to be negatively related to political instability, inflation and exchange rate. The E-view 4.1 software is used to estimate the model above.

IV. Data Analysis and Discussion of Results

Annual (secondary) data of the variables are used, and they were collected from the Central Bank of Nigeria statistical bulletin (various issues) for the period 1977 to 2006. The variables are measured as follows: foreign direct investment is captured by the total inflows of FDI into Nigeria. The host country's market size is a measure of the Gross Domestic Product (GDP). The ratio of exports to imports captures the country's openness to foreign trade, and it is denoted as EXPIMP. Exchange rate (EXCHRAT) refers to the rate at which the naira is converted to the US dollar, while the political regime (POLINS) captures both military rule and civilian rule. Thus, we assign D=0, for civilian rule and D=1 for military rule. The rate of inflation (INFLATIO) refers to the changes in the general price level, while deregulation (DEREGU) of the economy which started in 1986, is captured by dummy variable. That is, D=1 for period of deregulation and D=0 for the era of regulation. Lastly, infrastructural development (FRAS) is a measure of capital expenditure on both transportation and communication. Foreign direct investment, gross domestic product and infrastructure are in natural logarithm.

Before estimation, we performed a stationarity (unit root) test that excludes the intercept and trend. The result of the unit root test is presented below:

Table 4.1: Stationarity (unit root) test for variables

Variables	T-ADF Statistics	Critical values	Decision
LnFDI	**-5.385638 (0.0000)**	**1%=-2.669359 5%=-1.956406 10%=-1.608495**	**Stationary at 2nd difference**
LnGDP	**-4.798739 (0.0000)**	**1%=-2.653401 5%=-1.953858 10%=-1.609571**	**Stationary at 1st difference**
DEREGU	**-5.099020 (0.0000)**	**1%=-2.653401 5%=-1.953858 10%=-1.609571**	**Stationary at 1st difference**
POLINS	**-5.099020 (0.0000)**	**1%=-2.653401 5%=-1.953858 10%=-1.609571**	**Stationary at 1st difference**
EXPIMP	**-6.195226 (0.0000)**	**1%=-2.656915 5%=-1.954414 10%=-1.609329**	**Stationary at 1st difference**
INFLATIO	**-5.062606 (0.0000)**	**1%=-2.656915 5%=-1.954414 10%=-1.609329**	**Stationary at 1st difference**
EXCHRAT	**-4.230409 (0.0001)**	**1%=-2.653401 5%=-1.953858 10%=-1.609571**	**Stationary at 1st difference**
LnFRAS	**-5.130995 (0.0000)**	**1%=-2.653401 5%=-1.953858 10%=-1.609571**	**Stationary at 1st difference**

The results of the unit root test reveal that the market size, deregulation, political regime, openness of the economy, inflation, exchange rate and infrastructure are stationary at first difference. However, foreign direct investment is stationary at second difference. Next we run the regression exercise using the error correction approach. The result of the regression exercise is presented in the table below:

Table 4.2: Results of the regression exercise
Dependent Variable: LNFDI

Method: Least Squares

Date: 12/18/09 Time: 15:49

Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-66.78827	18.56166	-3.598184	0.0019
LNGDP(-1)	6.533206	1.673624	3.903628	0.0010
DEREGU(-2)	3.622192	0.577354	6.273775	0.0000
POLINS	1.604399	0.602659	2.662201	0.0154
EXPIMP(-1)	0.083057	0.378259	0.219577	0.8285
INFLATIO(-1)	0.012179	0.009765	1.247193	0.2275
EXCHRAT(-1)	-0.016734	0.007180	-2.330798	0.0309
LNFRAS(-1)	-0.305542	0.209387	-1.459217	0.1608
ECM(-1)	-0.337272	0.200986	-1.678090	0.1097
R-squared	0.864829	Mean dependent var		8.099433
Adjusted R-squared	0.807915	S.D. dependent var		1.478881
S.E. of regression	0.648156	Akaike info criterion		2.225720
Sum squared resid	7.982012	Schwarz criterion		2.653929
Log likelihood	-22.16008	F-statistic		15.19538
Durbin-Watson stat	1.883202	Prob(F-statistic)		0.000001

1. Discussion of results

The regression results show that the explanatory variables explained approximately 86 percent variations in foreign direct investment in Nigeria. The value of the F-statistic shows that the equation has a good fit, that is, the explanatory variables are good explainer of changes in FDI in Nigeria. The Durbin Watson statistic indicates the absence of autocorrelation among the variables.

The market size of the host country was found to be significant in attracting FDI into Nigeria, and the variable has the correct sign. For example, a 1 percentage increase in the market size of the host country in the previous one year causes the inflow of FDI to increase by approximately 6.53 percent. This is consistent with the findings of Obadan (1982), Chakrabarti (2001), and Masayuki and Ivohasina (2005). Another discovery from the estimation is that deregulation of the economy is positively related to FDI inflows, and the variable is significant. If the economy is deregulated by 1 percentage in the previous two years, FDI inflows will rise by 3.62 percent. The estimation also reveals that political instability in the previous one year has a significant positive effect on foreign direct investment. A 1 percentage increase in political instability leads to a 1.60 percentage increase in FDI. The positive impact of political instability on FDI reflects the situation in the Nigeria's oil sector that has continued to attract more foreign investment regardless of the political situation in the country. Furthermore, the results reveal that exchange rate is significant in explaining changes in FDI. A 1 percent depreciation in exchange rate causes FDI to increase by approximately 0.02. This finding is in line with Masayuki and Ivohasina (2005) that exchange rate depreciation may encourage the inflow of foreign direct investment to the host country.

However, the results illustrate that openness of the economy and inflation are statistically insignificant but positively related to foreign direct investment. Similarly, the results show that infrastructural development has an insignificant effect on foreign direct investment in Nigeria. Lastly, error correction parameter is significant and correctly signed, implying that the variables are con-integrated, and that a long run relationship exists among the variables.

2. Policy recommendation

The above findings have important policy implications. Firstly, since the market size of the host country has significant effect on FDI, there is need for continuous increase and growth of the nation's Gross Domestic Product. Foreign investors will be motivated and attracted when they are certain that the host country creates the needed market for their products. This can be achieved if government creates an enabling environment (or incentives) for production activities. Secondly, government should make efforts to further deregulate the economy (with caution) in order to attract more FDI into Nigeria. This is true because, the inflow of FDI has been on the increase since the introduction of the Structural Adjustment Programme (SAP) in 1986. In addition, the deregulation policies pursued by the immediate past administration (particularly through reduction in government intervention or interferences in economic activities) have further encouraged and boost foreign investment in various sectors of the economy. Thirdly, government should strengthened the political institutions and adopt democratic principles that will ensure stability within the polity. The current crisis in the Niger-Delta region has been a major obstacle to crude oil production. The restoration of peace in the region will in turn woo more foreign investment to Nigeria. The surge in FDI to Nigeria since 1999 has partly been attributed to the democratic rule and relative peace within the system. Fourthly, government should allow the exchange rate to depreciate further since it will reduce the dollar price of some ailing indigenous industries, thereby attracting more foreign investment in the form acquisition or mergers. Finally, government should invest more in infrastructure (like power, energy, transportation, telecommunication, etc,) so as to enhance the competitiveness of the environment of investment and ultimately increase FDI inflows. All of these should be complemented with the on-going war on corruption.

V. Conclusion

The low level (and fluctuation) of FDI to Nigeria, the significance of FDI in a developing economy, and the recent surge in FDI inflows to Nigeria motivated this study. The ordinary least squares regression technique was employed to estimate the relationship between FDI and its potential determinants. The regression results showed that the principal determinants of FDI are the market size of the host country, deregulation, exchange rate depreciation and political instability.

VI. References

1) Agarwal, J.P (1980), ''Determinants of Foreign Direct Investment: A Survey,''
   a. Weltwirtschafsliches Archive, 116, pp. 739-732
2) Ahmet, N.K (1960), ''The Determinants of The Inflows of Deutsche Mark Banknotes into the Turkish Economy,'' The Central Bank of the Republic of Turkey Discussion paper, No.9618.
3) Anyanwu, J.C (1998), ''An Econometric Investigation of The Determinants of Foreign Direct Investment in Nigeria,'' Annual Conference, Nigeria Economic Society.
4) Aremu, J.A (1997), ''Foreign Private Investment: Issues, Determinants and Performance''. Paper Presented at a Workshop on Foreign Investment Policy and Practice, Nigeria Institute of Advanced Legal Studies, Lagos.
5) Bajo-Rubia,O. and S. Sosvilla-Rivero (1994), ''An Econometric Analysis of Determinants of Foreign

Direct Investment in Spain,'' Southern Economic Journal, 61(1), pp. 104-117.
6) Benassy-Quere, A., Lionel F. and A. Lahreche-Revil (2001), ''Exchange Rates Strategies in the Competition for attracting Foreign Direct Investment,'' Journal of The Japanese and International economics, 15(2), pp. 178-198.
7) Blomstrom, M., Denise K. and Robert, E. L. (2000), ''Determinants of Foreign Direct Investment in The Restructuring of the Japanese Economy,'' NBER Working paper 7693.
8) Chakrabarti, A. (2001), ''The Determinants of Foreign Direct Investment pp. Sensitivity Analysis of Cross-country Regressions,'' kyklos, 54(1), pp. 89-114.
9) Ekpo, A.H (1997), ''Determinants of Foreign Direct Investment in Nigeria: Evidence from Time Series Data,'' CBN Economic and Financial Review, Vol.35, No.1, pp.59-78.
10) Elijah, O.K (2006), ''Determinants of Foreign Direct Investment in Kenya,'' Institut African de Developpment Economique et de Planification Publication, Dakar.
11) Fuat, E. and T. Ekrem (2002), ''Locational Determinants of Determinants of Foreign Direct Investment in an Emerging Market Economy: Evidence from Turkey,'' Multinational Business Review, Vol. 10, No. 1.
12) Goldberg, L. S., and C.D. Kolstad (1994), ''Determinants of Foreign Direct Investment, Exchange Rate Volatility and Demand Uncertainty, NBER Working paper 4815.
13) Harvey, J.T. (1990), ''The Determinants of Foreign Direct Investment,'' Journal of Post Keynesian Economics, 12(2), pp. 260-272.
14) Jhingan, M.L. (2001) International Economics. Vrinda publications Ltd, Delhi. 5th edition.
15) Loungani, P. (2003), ''The Role of Information In Driving Determinants of Foreign Direct Investment: Theory and Evidence,'' paper presented in the Northern American Winter Meeting of the Econometric Society, January 3-5.
16) Masayuki, H and F. Ivohasina (2005), ''The Determinants of Foreign Direct Investment into Japan,''Kobe University Economic Review 51.
17) Moore, M.O. (1993), ''Determinants of Manufacturing Direct Investments pp. 1980-1988,'' Weltwirtscaftsliches Archive, 129, pp. 120-137.
18) Obadan, M.I. (1982), ''Direct Investment in Nigeria: An Empirical Analysis,'' African Studies Review, vol. XXV, No.1.
19) Olatunji, D (2001), ''At Home Abroad When Titles Get In The way'' The Nation Newspapers, Tuesday, September, 25.
20) Ragazzi, G. (1973), ''Theories of The Determinants of Foreign Direct Investment,'' The IMF staff papers, 20, pp. 471-498.
21) Yin Yun Yang, J., Groenewold N. and M. Tcha (2000), ''The Determinants of in Australia,'' The Economic Record, 76, pp. 45-54.

Appendix 1: Foreign direct investment inflows into selected countries in 2002

Country	FDI inflows (million dollars)
Nigeria	1,005.0
Malaysia	23,823.0
Indonesia	11,641.0
Tunisia	14,060.0
Turkey	18,846.0
Venezuela	38,080.0
Morocco	12,481.0
Kazakhstan	15,464.3
Hungary	35,890.0
India	20,326.0
Thailand	38,180.0
Argentina	32,394.0
Brazil	100,847.0
South Africa	29,611.0

Source: International Financial Statistics (2005)

Appendix 2: FDI and growth of FDI in Nigeria

Year	Foreign direct investment (Nm)	Growth of FDI (%)
1970	251	-
1971	489.6	95.05976
1972	432.8	-11.6013
1973	577.8	33.50277
1974	507.1	-12.2361
1975	757.4	49.3591
1976	521.1	-31.1988
1977	717.3	37.65112
1978	664.7	-7.33305
1979	704	5.912442
1980	786.4	11.70455
1981	584.9	-25.6231
1982	2,193.40	275.0043
1983	1,673.60	-23.6984
1984	1,385.30	-17.2263
1985	1,423.50	2.757525
1986	4,024.00	182.6835
1987	5,110.80	27.00795
1988	6,236.70	22.02982
1989	4,692.70	-24.7567
1990	10,450.20	122.6906
1991	5,610.20	-46.3149
1992	11,730.70	109.0959
1993	42,624.90	263.3619
1994	7,825.50	-81.641
1995	55,999.30	615.6003
1996	5,672.90	-89.8697
1997	10,004.00	76.34719
1998	32,434.50	224.2153
1999	4,035.50	-87.558
2000	16,453.60	307.7215
2001	4,937.00	-69.9944
2002	8,988.50	82.06401
2003	13,531.20	50.53902
2004	20,064.40	48.28249
2005	26,083.70	29.9999
2006	41,734.00	60.00030

Source: Central Bank of Nigeria (2005, 2006).

Appendix 3: Data used for regression.

YEAR	FDI (Nm)	GDP (Nm)	EXPT(Nm)	IMPT(Nm)	INFLATI (%)	EXCHRAT (N/$)	FRAS(Nm)
1977	717.3	96,100	7,630.70	7,093.70	15.4	0.6466	2,300.40
1978	664.7	89,000	6,064.40	8,211.70	16.6	0.606	1,331.10
1979	704	91,200	10,836.00	7,472.50	11.8	0.5957	1,865.70
1980	786.4	96,200	14,186.70	9,095.60	9.9	0.5464	2,349.30
1981	584.9	70,400	11,023.30	12,839.60	20.9	0.61	1,625.70
1982	2,193.40	70,200	8,206.40	10,770.50	7.7	0.6729	1,283.90
1983	1,673.60	66,400	7,502.50	8,903.70	23.2	0.7241	1,094.40
1984	1,385.30	63,000	9,088.00	7,178.30	39.6	0.7649	261.90
1985	1,423.50	68,900	11,720.80	7,062.60	5.5	0.8938	240.90
1986	4,024.00	71,100	8,920.60	5,983.60	5.4	2.0206	516.10
1987	5,110.80	70,700	30,360.60	17,861.70	10.2	4.0179	375.10
1988	6,236.70	77,800	31,192.80	21,445.70	38.3	4.5367	703.70
1989	4,692.70	83,500	57,971.20	30,860.20	40.9	7.3916	683.80
1990	10,450.20	90,300	109,886.10	45,717.90	7.5	8.0378	877.40
1991	5,610.20	96,600	121,535.40	89,488.20	13	9.9095	353.40
1992	11,730.70	97,000	205,611.70	143,151.20	44.5	17.2984	625.30
1993	42,624.90	100,000	218,770.10	165,629.40	57.2	22.0511	1,436.70
1994	7,825.50	101,300	206,059.20	162,788.80	57	21.8861	1,293.50
1995	55,999.30	103,500	950,611.40	755,127.70	72.8	21.8861	3,800.30
1996	5,672.90	107,000	1,309,543.40	562,626.60	29.3	21.8861	8,819.70
1997	10,004.00	110,400	1,241,662.70	845,716.60	8.5	21.8861	7,147.70
1998	32,434.50	113,000	751,856.70	837,418.70	10	21.8861	6,227.50
1999	4,035.50	117,000	1,188,969.80	862,515.70	6.6	92.6934	3,313.70
2000	16,453.60	121,000	1,945,723.30	985,022.40	6.9	102.1052	3,020.90
2001	4,937.00	126,000	1,867,953.90	1,358,180.30	18.9	111.9433	19,241.00
2002	8,988.50	131,000	1,867,953.90	1,669,485.20	12.9	120.9702	17,083.20
2003	13,531.20	136,000	1,867,953.90	2,295,890.50	14	129.3565	6,639.60
2004	20,064.40	145,400	1,867,953.90	2,193,967.00	15	133.5004	9,750.70
2005	26,083.70	156,000	1,867,953.90	2,496,423.70	11.6	131.6619	19,982.50
2006	41,734.00	169,304	5,752,747.70	2,528,086.00	8.2	128.6516	6,513.1

Source: Central Bank of Nigeria (2005, 2006).

Dependent Variable: LNFDI
Method: Least Squares

Date: 12/18/09 Time: 15:49

Sample(adjusted): 1979 2006

Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-66.78827	18.56166	-3.598184	0.0019
LNGDP(-1)	6.533206	1.673624	3.903628	0.0010
DEREGU(-2)	3.622192	0.577354	6.273775	0.0000
POLINS	1.604399	0.602659	2.662201	0.0154
EXPIMP(-1)	0.083057	0.378259	0.219577	0.8285
INFLATIO(-1)	0.012179	0.009765	1.247193	0.2275
EXCHRAT(-1)	-0.016734	0.007180	-2.330798	0.0309
LNFRAS(-1)	-0.305542	0.209387	-1.459217	0.1608
ECM(-1)	-0.337272	0.200986	-1.678090	0.1097

R-squared	0.864829	Mean dependent var	8.099433
Adjusted R-squared	0.807915	S.D. dependent var	1.478881
S.E. of regression	0.648156	Akaike info criterion	2.225720
Sum squared resid	7.982012	Schwarz criterion	2.653929
Log likelihood	-22.16008	F-statistic	15.19538
Durbin-Watson stat	1.883202	Prob(F-statistic)	0.000001

Study of Information and Communication Technology (ICT) Usage in Technical and Vocational Special Education Programme

Mohd Yusop Ab Hadi[α],
Baharom Mohamad[Ω]
Mohd Shaiful Azhar Jaafar[€]

GJHSS Classification (FOR)
130101, 130103, 130201 & 130306

***Abstract*-The purpose of this study is to survey the level of teachers and students from Technical and Vocational Special Education Programme has utilized Information and Communication Technology (ICT) usage in their learning and teaching process. The respondents of research were teachers and students from three different of Vocational Special Education Secondary School in Malaysia. The samples consist of 55 teachers and 119 students. Questionnaire has used to collect the target data. Data from questionnaire was analyzed by Statistical Package for Social Science 11.3 for Windows (SPSS) to obtain mean score, percentage and standard deviation. Result shows that the teachers and students almost used ICT in teaching and learning process but not achieve at the high level. Thus, several of suggestions have been made to enhance the usage of ICT in teaching and learning process in Special Education Schools.**

Keywords: Special education, vocational, programme

I. Introduction

Malaysia agreed with the idea that the Information and Computer Technology (ICT) are able to enhance effectively education among the students. Thus the teacher and students have been encouraged to utilize the ICT in education in teaching and learning process. The ICT development promised the immense potential in developing education to the students. ICT can be infused in students learning style which it helps students to gain knowledge more effectively. ICT also may change student's ordinary study, the approach to get information, and knowledge sharing. Therefore, Ministry of Education Malaysia (MOE) has taken some strategies to integrate ICT in teaching and learning process in all category of school system over the country. No doubt that the ICT will help teacher easier to increase the student academic achievement. The ICT developments also give benefits to the students in special education especially in term of emerging the effectiveness of teaching and learning process. According to Malaysia Ministry of Education (2010) Special Education Program consists of:

Special Schools for students with vision and hearing disabilities Special Education Integration Program is provided for children with learning, hearing and vision disabilities. The Program is carried out in normal primary and secondary school, as well as in technical/vocational secondary schools that use the withdrawal and partially inclusive approach to teach and learn.

The Special Education Integration Program is managed by the State Department of Education while the Special Education Department is in charge of issues pertaining to policies and content. The curriculum used in Special Schools and the Special Education Integration Program are the National Curriculum and the Alternative Curriculum. Special education students participate in extra-curricular activities with normal students.

All special education students sit for public examinations such as the Primary School Assessment Testing *(Ujian Penilaian Sekolah Rendah)*, Lower Secondary School Assesment *(Penilaian Menengah Rendah)* and Malaysia Certificate Education *(Sijil Pelajaran Malaysia)* except for those who are following the Alternative Curriculum.

For students under the Alternative Curriculum, those taking the National Standard Skills *(Standard Kemahiran Kebangsaan)* will be certified with the Malaysia Skills Certificate *(Sijil Kemahiran Malaysia)*, while those taking Art and Design Courses will be awarded the Special Vocational Certificate.

Special Esducation Rehabilitation Program is called the Label One Special Education Rehabilitation Program *(Program Pendidikan Pemulihan Khas Tahap Satu)*. Students are assessed for reading writing and mathematics skills using the Reading, Writing and Mathematics skills Achievement Standard Instrument *(Instrumen Penentu Penguasaan 3M)*. This instrument divided into instrument for Year 1 students, instrument for Year 2 students and instrument for Year 3 students.

Conditions of entry for students into the Special Education School Program are:

- Aged no less than 5 years (for Preschool Program).
- Aged 6+ to 14+ years (for Primary School Program).
- Aged 13+ to 19+ years (for Secondary School Program).
- Certified by medical doctor.
- Can manage themselves (self-care) without the assistance of others. (Ministry of Education Malaysia, 2010)

About- Faculty of Technical EducationUniversiti Tun Hussein Onn Malaysia86400 Parit Raja, Batu Pahat, Johore, Malaysia
Phone: +607 4538096H/Phone: +607 0137516451 Faks: +607 454 1050
E-MAIL[α]yusop@uthm.edu.my,E-MAIL [Ω]yusop02@hotmail.com

1. *Problem Statement*

There are a number of questions about the ICT acceptance and usage among teachers and students from special education which emerge problem in special education program and effect the enrollment of the students. The utilize of the ICT in school will develop highly confident upon effort Special Education School to society expectation in educating special students. Therefore, a study in Technical and Vocational Special Education School should be conducted for the purpose of surveying ICT and usage in the teaching and learning process among teachers and students. The focus of the study is to identify the level of ICT acceptance and usage in teaching process among the special education program teachers and the level of ICT acceptance and usage in learning process among the special education program students.

2. *Purpose of Study*

The purpose of this study is to be acquainted with the requirement of ICT in teaching and learning process among teachers and students from Technical and Vocational Special Education Program. The finding results of the research can be considered as values add suggestion to guide and enhance the usage of ICT in Special Education Program.

3. *Research Objectives*

The objectives of the research are:

(i) To be acquainted with the weight level of special education teachers acceptance in ICT usage toward teaching and learning process in Special Education Programme.

(ii) To be acquainted with the ICT usage in teaching process by Special Education Programme teachers.

(iii) To determine the Special Education Programme students acceptance in ICT usage toward teaching and learning process in Special Education Programme.

(iv) To be acquainted of the ICT usage by Special Education Programme students in teaching and learning process.

4. *Research Questions*

The research questions of the study are:

(i) What is the weight level of the special education teacher's acceptance in ICT usages toward teaching process in Special Education Programme?

(ii) What is the weight level of the special education programme teachers using ICT in teaching management task which involve teaching and learning process?

(iii) What is the weight level of the students' acceptance toward ICT usage in learning process in Special Education Programme?

(iv) What is the weight level of the ICT usage concerning helps the special education programme student in learning process?

5. *Research Scope*

Scope of research are:

(i) ICT usage in the research is focus on the ICT usage in teaching and learning process conducted in the class.

(ii) Special education students which taken as respondents are the deaf special education programme students.

6. *Research Limitation*

The schools that are chosen to be taken as research sampel are three special education secondary schools which situated in southern region and central region of Malaysia pennisular

7. *Research Importance*

The result of the study are expected to cultivate the idea of renewal teaching and learning process method in Special Education Programme. Invented previously teaching and learning method by attaching ICT in teaching and learning process is pursue to increase the effectiveness of learning among the special education programme students

I. Related Works

Education is the learning process that was established since BC. At the beginning, the education is enlightened in form informal education. The education is accomplished under control of non authority institutions. There is no need a particular institution to distribute conscientious knowledge. Nowadays in Malaysia education was allocated in three types of process. The educations are employing either through informal process, non formal process and formal processes. Formal education process is an education that accomplish under control of authority institution especially be in authority of Ministry of Education Malaysia. There are many types and categories of schools were introduced to deliver formal education. Almost the contents of the education is bind by Malaysian National Educational Philosophy which it is interpret into curriculum and then disseminate to the students through teachers tasks.

1. *Special Education*

In Malaysia, special education is classified since specific education to be given to the handicap person such as the individual with visual disabled (blind), and deaf. The Special Education Philosophy declares that the handicap students should be entertained equally to the normal children is a fundamental right in getting formal education.

2. *Listen Disabled Student (Deaf)*

This research was conducted among deaf students from technical and vocational special education. Based on the statement by Chua and Koh (1992), a deaf student is a student which has listen disabled. Their sense of listening is disorder compare to listening sense capability of normal

person. Endorsement of listening disorder is clarified by authorize body before the child is categorized to special student.

In Special Education System, the students with listening problem will situated in Listening Problem Special Education Programme. Through this programme students will be educate amid signal language communication. Although the entire course given to the normal student equally given to the disability student. This programme is available in special school and normal school (integration programme).

3. *ICT Usage In Special Education Programme*

Based on Abdul Rahim Razalli, *et al.* (2005), the study shows that computer technology are consider to help special students upon enhancing their effectiveness of learning especially onto perform new attitude and value add to reading, writing and mathematic skills.

Multimedia technology if fully utilize in education process will brought positive impact to the students, It emerge an exciting learning situation, and friendly use without reducing the quality and quantity of course contains. Example of multimedia technology utilize in learning teaching and learning process are music, video and visualize (Plamen Miltenoff dan Judith Rodgers, 2003)

4. *Teachers And Students Acceptance Toward Ict Usage In Special Education Programme.*

Based on Goh (1998), ICT usage in teaching and learning is not only serving teachers to achieve their teaching objectives but it is also introduce to students of new learning technique to value add the various of learning techniques. Strongly supportive from school administration is the essence to vow the ICT usage in teaching and learning process succeed its target. Accordingly to Zoraini Wati Abas (1995) the positive attitude of school administration toward ICT usage wills courage school citizen to involve in ICT usage in teaching and learning process. It is almost easily influent of changing attitude among staff attitude.

Teacher in special education school should play a role to cultivate disability student's interest towards ICT usage in learning process. By holding positive attitude upon infusing ICT in teaching and learning process, they are prepared to accept any recently arrival ICT.

II. RESEARCH METHODOLOGY

The research is an endeavor to acquire a result of a surveying toward ICT usage in Technical and Vocational Special Education Programme. The methodology used to get the result is a quantitative research method. The research process is involved the activities of data collection, data arrangement, data interpretation, and summarizing the data.

1. *Location of Research*

Location of study is at the southern of Malaysia peninsular and central of Malaysia peninsular.

2. *Population and Sample of Study*

The research population of this study is teachers and students from Technical and Vocational Special Education Programme. The number of research population and the number of research sample among the teachers is shows in Table 3.1.

Table 3.1: Population and Sample of Study (Teachers)

Locations	Population	Sample
Southern of Malaysia peninsular	32	30
Central of Malaysia peninsular	35	25
Total	**67**	**55**

Total of population and sample among the students is shows in Table 3.2.

Table 3.2: Population and Sample of Study (Students)

Locations	Population	Sample
Southern of Malaysia peninsular	57	57
Central of Malaysia peninsular	90	62
Total	**147**	**119**

3. *Instrument of Research*

The instrument of the research is questionnaire.

4. *Questionnaire of Research*

There are two set of questionnaire available to identify weight level of ICT usage in teaching and learning process. Two different set questionnaires are for teachers group of respondent and students group of respondents.

The set questionnaire for teachers is consist of questionnaire item divided into Part A, Part B, and Part C. Items in Part A is to identify teacher demography. It is about teacher sex, experience in teaching and learning process and age.

Item in Part B is to identify the weight level of teacher's acceptance toward ICT usage in teaching and learning process. Item in Part C is to identify the weight level of teacher's ICT usage in implementation task of special education school.

The set questionnaire for the students is also consist of item for Part A, Part B, and Part C. Questionnaire in Part A is to identify students' demography. It is concern on student's sex, student's school and student's study field.

Item in Part B is to identify the weight level of student's acceptance toward ICT usage in the teaching and learning process. Item in Part C is to identify the weight level of student's ICT usage in learning process.

The respondents gave the answer of research questions by responding to all the questionnaire items in term of weight of scale. The weight level of ICT usage in teaching and learning process is shows in Table 3.3

Table 3.3: Weight Level of Scale

Weight	Score
Strongly Agree	5
Agree	4
Slightly Agree	3
Not Agree	2
Strongly Not Agree	1

The interpretation of mean weight scale of ICT usage in teaching and learning process among teachers and students in technical and vocational special education program is shows in Table 3,4. It interpretation of weight scale is adapted from (Mohd Yusop, 2009).

Table 3.4: Interpretation of Mean Weight Scale of ICT Acceptance and Usage

Weight	Scale	Mean Range Scale	Interpretation
Strongly Agree	[5]	>4.21 to ≤ 5.00	Very high in ICT acceptance and usage in teaching and learning process
Agree	[4]	>3.41 to ≤4.21	High in ICT acceptance and usage in teaching and learning process.
Slightly Agree	[3]	>2.61 to ≤3.41	Moderate in ICT acceptance and usage in teaching and learning process.
Not Agree	[2]	>1.80 to ≤2.61	Low in ICT acceptance and usage in teaching and learning process.
Strongly Not Agree	[1]	1 to ≤1.80	Very low in ICT acceptance and usage in teaching an learning process.

5. *Data Collection*

There are two sources of research data and information. The primer data is collected through questionnaire and the secondary data is collected from mass media like books, journals, reports and internet.

6. *Data Analyzed Method*

The collected data was analyzed by descriptive statistical approach in order to get the answer of research questions. The data that collected from Part A questionnaire is presented in form of percentage. Furthermore the data that collected from Part B and Part C questionnaire are presented in form of mean score and standard deviation.

III. RESEARCH FINDING

Research finding is presented concurrence to the research questions.

1. *Weight level of special education teacher's acceptance in ICT usage towards teaching process in Special EducationProgramme*

The weight level of special education programme teacher's acceptance in ICT usage towards teaching and learning process is shows in Table 4.1

Table 4.1: Weight level of special education teacher's acceptance in ICT usage towards teaching process in Special Education School

Item	Mean	Standard Deviation
I am interested to learn about computer usage in teaching process.	3.55	0.538
I am ready to apply computer usage lesson in my teaching activity.	3.49	0.791
I can maintain my focus on teaching by using computer in teaching activity.	3.22	0.738
Computer built students interested upon my teaching activity.	3.15	0.911
Computer usage in my teaching process causes my teaching task easier.	3.15	0.780
Computer technology can be invented to diversity my teaching method.	3.13	0.818
I prefer to use computer in teaching activity.	3.00	1.018
Computer usage in teaching process causes my teaching effectively.	2.95	1.044
Computer technology helps me to teach systematically.	2.82	1.263
Computer built me confident in my teaching process.	2.80	1.253
Computer usage in my teaching process causes me energetic in teaching.	2.80	1.253
I alert on the changing of computer technology development for education.	2.22	1.487
I always use computer in my teaching process.	1.91	1.266
I always solve my teaching problem by using computer technology	1.04	1.440
Weight level of special education teacher's acceptance in ICT usage towards teaching process in Special Education School	**2.80**	**1.043**

Overall mean of weight level of special education teacher's acceptance in ICT usage towards teaching process in Special Education Programme is 2.80. It shows that the acceptance of teacher in Special Education Programme towards ICT usage in teaching process is at a moderate level. Although teacher acceptance is at a moderate level, they have a high interested to learn about ICT usage in teaching process (mean 3.55) and ready to apply ICT usage lesson in teaching activity (3.49). The lower action of teacher acceptance in ICT usage in teaching process is the teacher always solve teaching problem by using computer technology. Mean of it is 1.04.

2. Weight level of ICT Usage among Special Education Programme Teachers

The weight level of ICT usage among special education school teachers is shows in Table 4.2.

Table 4.2: Weight Level of ICT Usage among Special Education Programme Teachers in Teaching Process

Item	Mean	Standard Deviation
Use computer to set up examination paper.	3.31	1.200
Use computer to finish job assignment.	3.31	0.940
Use computer to practice students in order to learn.	3.16	1.316
Engage computer in daily activities.	3.13	1.203
Use computer to prepare teaching note.	2.96	1.247
Use computer to manage student's assessment.	2.95	1.420
Use computer to admin teacher' task.	2.82	1.415
Use computer to record student's back ground.	2.69	1.464
Use internet to find teaching material.	2.53	1.501
Use computer to prepare teaching material.	2.44	1.358
Use computer to keep confidential information.	2.36	1.704
Use computer to solve teacher's duty.	2.29	1.524
Use Power Point slide in teaching activity.	2.15	1.471
Computer as a teaching aid tool.	2.13	1.667
Encourage students to use computer in learning process.	2.09	1.469
Use computer to present teaching material.	1.84	1.537
Weight Level of ICT Usage among Special Education School Teachers in teaching process	**2.64**	**1.402**

Overall mean of weight level of ICT usage among Special Education School Teachers in teaching process is The interpretation of this mean is teacher practice ICT usage in teaching and learning is at a moderate level. The highest action of using ICT in teaching process is also at moderate level. They use ICT to set up examination paper (mean 3.31) and use ICT to finish job assignment (mean 3.31). The lowest practice of ICT usage in teaching process among the special education school teachers is using ICT to present teaching material. It is at low level (mean 1.84). The others ICT usage at low level practice are `Use internet to find teaching material' (mean 2.53), `Use computer to prepare teaching material' (mean 2.44), `Use computer to keep confidential information' (mean 2.36), `Use computer to solve teacher's duty' (mean 2.29), `Use Power Point slide in teaching activity' (mean 2.15), `Computer as a teaching aid tool' (mean 2.13), and `Encourage students to use computer in learning process' (mean 2.09)

3. Weight level of the student's acceptance toward ICT usages in learning process in Special Education Programme

The weight level of student's acceptance towards ICT usage in learning process in Special Education Programme in Table 4.3.

Table 4.3: Weight level of student's acceptance towards ICT usage in learning process in Special Education Programme

Item	Mean	Standard Deviation
Computer assists me to understand learning material in learning process.	2.71	1.371
Computer is able to build up my interest in learning process.	2.66	1.334
I like teacher to teach me with computer assist.	2.53	1.399
Computer built up my confident to achieve learning objective.	2.44	1.494
Use computer to complete	2.44	1.417

school work.		
Computer usage in my learning process causes me energetic to learn.	2.43	1.392
Computer cause me easily to learn learning material.	2.43	1.295
Computer assists me to gain right impression of learning material.	2.17	1.422
Computer cause me not sleepy in learning process.	1.78	1.320
I can maintain my focus on learning by using computer in teaching activity.	1.41	1.445
Weight level of student's acceptance towards ICT usage in learning process in Special Education Programme	2.30	1.389

Overall mean of Weight level of student's acceptance towards ICT usage in learning process in Special Education School is 2.30. It shows that the acceptance of students in Special Education School towards ICT usage in learning process is at a low level.

The highest action of using ICT in learning process is at moderate level. There are `Computer assists to understand learning material in learning process' (mean 2.71) and `Computer is able to build up interest in learning process'. The lower action of students acceptance in ICT usage in learning process are 'Computer cause student not sleepy in learning process' (mean 1.78) and 'Student can maintain his/her focus on learning by using computer in teaching activity' (mean 1.41). There are at very low level.

4. *Weight level of the ICT usage concerning helps the special education student in learning process*

Weight level of the ICT usage concerning helps the special education student in learning process is shows in Table 4.4.

Table 4.4: Weight level of the ICT usage concerning helps the special education student in learning process

Item	Mean	Standard Deviation
Use computer to revise learning material.	2.50	1.297
Store learning material in computer.	2.43	1.422
Use computer to accomplish school work.	2.18	1.483
Experience in using Microsoft Power Point in learning process.	2.09	1.489
Use computer for writing.	2.03	1.383
Use internet to find learning material.	1.84	1.408
Experience in using Microsoft Excel in learning process.	1.83	1.341
Use computer to do calculation in learning process.	1.82	1.381
Experience in doing animation graphic in learning process.	1.73	1.271
Use computer to reduce learning burden.	1.70	1.334
Weight level of the ICT usage concerning helps the special education student in learning process	**2.02**	**1.381**

Overall mean of weight level of ICT usage among special education school students in learning process is 2.02.

The interpretation of this mean is student practice ICT usage in learning process is at a low level. The highest action of using ICT in learning process is at moderate level. There are 'Use computer to revise learning material' (mean 2.50) and 'Store learning material in computer' (mean 2.43).

The lowest action of ICT usage in learning process among the special education school students are 'Experience in doing animation graphic in learning process'. (mean 1.73) and 'Use computer to reduce learning burden' (mean 1.70)

IV. Discussion, Summary and Suggestion

The result of the study shows that the special education teachers aware on the important of ICT usage in learning process however the awareness is not achieve at high level. It is summaries that the teacher is willing to use ICT in teaching activity instead of ordinary teaching method after completed with the knowledge of ICT aid in teaching and learning. Intellectual discourse of ICT is necessitated to them in conjunction to construct ICT teaching aid knowledge and skills. By means of training, participants are anticipated in obtaining new knowledge and skills (Tritos & Lynn, 2008). Through the research finding it shows the teacher is willing to apply ICT usage lesson in teaching activity. Training organizer should emphasize on training agenda to provide the knowledge and skills of teaching problem solving by computer technology onto participants. It is essential to be complete since the research finding shows that `the teacher always solve teaching problem by using computer technology' is at very low level.

Practically ICT usage upon special education programme in teaching process is at a moderate level. The existent of this practice level is influent by various factors (Alessi & Trollop, 1991). Referring to research finding, the items that consequence of ICT usage in teaching process situated at moderate level are `Using computer to present teaching material', `Use internet to find teaching material', `Use computer to prepare teaching material', `Use computer to

keep confidential information', `Use computer to solve teacher's duty', and `Use Power Point slide in teaching activity', All practicing of these ICT usage items in teaching process among the teacher are at low level. It is a highly expected that the more level of practicing ICT usage item among the teacher increase the more ICT usage in teaching process among them will be increase.

According to Alessi and Trollip (1991) the main source of teacher refuse to use ICT in teaching and learning process are they are insufficient of skill and knowledge, lack of motivation and lack of supportive from surrounding. Thus to increase the level of practicing ICT usage in teaching learning the teachers should be develop their level of all influences factor of using ICT in teaching process.

Further more the research finding shows that student's acceptance towards ICT usage in learning process is at a low level. Amongst the criterions that attract student to low level acceptance over using ICT in learning process are they feel that the ICT are unable to vanish out student drowsy while learning and the ICT is able to maintain students focus on learning activity. Meanwhile research finding also shows students practice on ICT usage in learning process is at low level. Two main factor that influent student to low level practice on ICT usage in learning process are very low level in doing animation in learning process and very low level in using computer to reduce learning burden.

Just as students hold expectation for ICT acceptance and usage in learning process, there are some knowledge and skill about the ICT usage in learning need to teach well to them. According to the research finding to being knowledgeable about the ICT usage in learning process, students must have the ability to use ICT to revise learning material, store learning material in computer, computer to accomplish school work, experience in using Microsoft Power Point in learning process, use computer for writing, use internet to find learning material, experience in using Microsoft Excel in learning process, use computer to do calculation in learning process, experience in doing animation graphic in learning process, and use computer to reduce learning burden.

V. Conclusion

As the research is completed, it can conclude that the teacher and student of technical and vocational special education programme toward ICT acceptance and usage in teaching and learning process is still can be improvise. Although the level of acceptance and usage are almost at moderate level it does not mean recently the effectiveness of teaching and learning in technical and vocational special education programme is worried. The effectiveness of teacher teaching is still emerging because the teacher has various of teaching methods to be selected. ICT usage is among the teaching method to be select for teaching activity. According to Parkay and Stanford (2010) to respond effectively to the complexities of teaching, they must have four kinds of knowledge: knowledge of teacher self and student self, knowledge of subject, knowledge of educational theory and research, and knowledge of how to integrate technology into teaching. In addition to being knowledgeable about the subject they teach, teachers must have the ability to communicate, inspire trust and confidence, and motivate students, as well as understand their students' educational and emotional needs. Teacher must be able recognize and respond to individual and cultural differences in students and employ different teaching methods that will result in higher students achievement.

Teacher will be expected to know how to integrate ICT technology into teaching. Teacher also is expected to be familiar with newly emerging technologies and how they can be used in the classroom. Using ICT to enhance students' learning requires more than knowing how to use the latest hardware and software. Conducting classroom demonstrations augmented with multimedia, using presentation graphics to address students' varied learning styles, and designing lessons that require students to use ICT as a tool for inquiry.

VI. Reference

1) Abdul Rahim Razalli, Noor Aini Ahmad and Kamaliah Ahmad (2005). "Computer application in teaching and learning for special needed students". Proceeding ICT Education 2005.
2) Alessi and Trollip (1991). Computer Based Instruction: Methods and Development. 2nd ed.Boston:Allyn & Bacon.
3) Chua, T. T. & Koh, B. B. (1992). "Remedial and special education, basic reading". Kuala Lumpur: Dewan Bahasa dan Pustaka.
4) Effandi Zakaria (2004). "Management of children with difficult to learn". Pahang: PTS Professional Publishing Ptd. Ltd.
5) Hawa Rahmat, Rohaida Mashudi, Noor Watee Rahman (2005). "Teaching and learning effectiveness by ICT at University". Core learning center and Continuing Education (FoSEE), Multimedia University Malaysia Publication.
6) Mohd Yusop Ab.Hadi (2009). "Readiness in Becoming Future K-Workers in Fulfilling the Needs of the Industry among Students of Industrial Training Institutes of Malaysia. Universiti Tun Hussein Onn Malaysia: PhD Thesis. Unpublished.
7) Tritos & Lynn (2008). Skills Inexistence and KnowlwdgeRequirements of Technology Marketing and Management Programs in Emerging Thailand and Vietnam. International Journal of Business and Management, 3 (5). 151-160.
8) Ministry of Education, Malaysia (2010). Services provided for children with special needs. http://www.disabilityMalaysia.com/index2.php/type=view&table=factsheet. Attrived on 9 January 2010.
9) Mohd. Arif Hj. Ismail, Norsiati Razali. (2003). "Application of ICT in teaching and learning:

Chemistry subject perspective." Journal of Education UKM. Vol. 3. No. 1. April 2003:7-11

10) Plamen Miltenoff and Judith Rodgers, (2003). "Teaching With Technology : Multimedia And Interactivity in Social Science Education". ProQuest Education Journals, 10, 2 , pg 34
11) Parkay, F.W. and Stanford, B. H (2010). Becoming a Teacher. 8th ed. New Jersey: Pearson Education Upper Saddle River.
12) Goh, T. A. (1998). "Computer usage among Kajang Convent School". Journal of Education Vol. 1(2). pg 1-5
13) Zoraini Wati Abas (1995). "Going Global On The Internet: What's In It For The Educator". Proceeding Educomp 94 Vision For Teching And Learning. Kuala Lumpur: Malaysian Council For Computer In Education 2.

Global Journals Guidelines Handbook 2010

www.GlobalJournals.org

FELLOW OF INTERNATIONAL CONGRESS OF HUMAN SOCIAL SCIENCE (FICHSS)

- 'FICHSS' title will be awarded to the person/institution after approval of Editor-in-Chief and Editorial Board. The title 'FICHSS' can be added to name in the following manner:
  e.g. **Dr. Andrew Knoll, Ph.D., FICHSS**
- FICHSS can submit two papers every year for publication without any charges. The paper will be sent to two peer reviewers. The paper will be published after the acceptance of peer reviewers and Editorial Board.
- **Free unlimited Web-space** will be allotted to 'FICHSS 'along with subDomain to contribute and partake in our activities.
- A **professional email address** will be allotted free with unlimited email space.
- FICHSS will be authorized to receive e-Journals -GJHSS for the Lifetime.
- FICHSS will be exempted from the registration fees of Seminar/Symposium/Conference/Workshop conducted internationally of GJHSS (FREE of Charge).
- FICHSS will be Honorable Guest of any gathering held.

ASSOCIATE OF INTERNATIONAL CONGRESS OF HUMAN SOCIAL SCIENCE (AICHSS)

- AICHSS title will be awarded to the person/institution after approval of Editor-in-Chef and Editorial Board. The title 'AICHSS' can be added to name in the following manner:
  eg. Dr. Thomas Knoll, Ph.D., AICHSS
- AICHSS can submit one paper every year for publication without any charges. The paper will be sent to two peer reviewers. The paper will be published after the acceptance of peer reviewers and Editorial Board.
- Free 2GB Web-space will be allotted to 'FICHSS' along with subDomain to contribute and participate in our activities.
- A professional email address will be allotted with free 1GB email space.
- AICHSS will be authorized to receive e-Journal GJHSS for lifetime.

ANNUAL MEMBER

- Annual Member will be authorized to receive e-Journal GJHSS for one year (Journal Subscription for one year).
- The member will be allotted free 1 GB Web-space along with subDomain to contribute and participate in our activities.
- A professional email address will be allotted free 500 MB email space.

PAPER PUBLICATION

- The members can publish paper once. The paper will be sent to two-peer reviewer. The paper will be published after the acceptance of peer reviewers and Editorial Board.

Process of submission of Research Paper

The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.

Online Submission: There are three ways to submit your paper:

(A) (I) Register yourself using top right corner of Home page then Login from same place twice. If you are already registered, then login using your username and password.

(II) Choose corresponding Journal from "Research Journals" Menu.

(III) Click 'Submit Manuscript'. Fill required information and Upload the paper.

(B) If you are using Internet Explorer (Although Mozilla Firefox is preferred), then Direct Submission through Homepage is also available.

(C) If these two are not convenient, and then email the paper directly to dean@globaljournals.org as an attachment.

Offline Submission: Author can send the typed form of paper by Post. However, online submission should be preferred.

Preferred Author Guidelines

MANUSCRIPT STYLE INSTRUCTION (Must be strictly followed)

Page Size: 8.27" X 11'"

- Left Margin: 0.65
- Right Margin: 0.65
- Top Margin: 0.75
- Bottom Margin: 0.75
- Font type of all text should be Times New Roman.
- Paper Title should be of Font Size 24 with one Column section.
- Author Name in Font Size of 11 with one column as of Title.
- Abstract Font size of 9 Bold, "Abstract" word in Italic Bold.
- Main Text: Font size 10 with justified two columns section
- Two Column with Equal Column with of 3.38 and Gaping of .2
- First Character must be two lines Drop capped.
- Paragraph before Spacing of 1 pt and After of 0 pt.
- Line Spacing of 1 pt
- Large Images must be in One Column
- Numbering of First Main Headings (Heading 1) must be in Roman Letters, Capital Letter, and Font Size of 10.
- Numbering of Second Main Headings (Heading 2) must be in Alphabets, Italic, and Font Size of 10.

You can use your own standard format also.

Author Guidelines:

1. General,
2. Ethical Guidelines,
3. Submission of Manuscripts,
4. Manuscript's Category,
5. Structure and Format of Manuscript,
6. After Acceptance.

1. GENERAL

Before submitting your research paper, one is advised to go through the details as mentioned in following heads. It will be beneficial, while peer reviewer justify your paper for publication.

Scope

The Global Journals welcome the submission of original paper, review paper, survey article relevant to the all the streams of Philosophy and knowledge. The Global Journals is parental platform for Global Journal of Computer Science and Technology, Researches in Engineering, Medical Research, Science Frontier Research, Human Social Science, Management, and Business organization. The choice of specific field can be done otherwise as following in Abstracting and Indexing Page on this Website. As the all Global Journals are being abstracted and indexed (in process) by most of the reputed organizations. Topics of only narrow interest will not be accepted unless they have wider potential or consequences.

2. ETHICAL GUIDELINES

Authors should follow the ethical guidelines as mentioned below for publication of research paper and research activities.
Papers are accepted on strict understanding that the material in whole or in part has not been, nor is being, considered for publication elsewhere. If the paper once accepted by Global Journals and Editorial Board, will become the *copyright of the Global Journals.*

Authorship: The authors and coauthors should have active contribution to conception design, analysis and interpretation of findings. They should critically review the contents and drafting of the paper. All should approve the final version of the paper before submission

The Global Journals follows the definition of authorship set up by the Global Academy of Research and Development. According to the Global Academy of R&D authorship, criteria must be based on:

1) Substantial contributions to conception and acquisition of data, analysis and interpretation of the findings.
2) Drafting the paper and revising it critically regarding important academic content.
3) Final approval of the version of the paper to be published.

All authors should have been credited according to their appropriate contribution in research activity and preparing paper. Contributors who do not match the criteria as authors may be mentioned under Acknowledgement.

Acknowledgements: Contributors to the research other than authors credited should be mentioned under acknowledgement. The specifications of the source of funding for the research if appropriate can be included. Suppliers of resources may be mentioned along with address.

Appeal of Decision: The Editorial Board's decision on publication of the paper is final and cannot be appealed elsewhere.

Permissions: It is the author's responsibility to have prior permission if all or parts of earlier published illustrations are used in this paper.

Please mention proper reference and appropriate acknowledgements wherever expected.

If all or parts of previously published illustrations are used, permission must be taken from the copyright holder concerned. It is the author's responsibility to take these in writing.

Approval for reproduction/modification of any information (including figures and tables) published elsewhere must be obtained by the authors/copyright holders before submission of the manuscript. Contributors (Authors) are responsible for any copyright fee involved.

3. SUBMISSION OF MANUSCRIPTS

Manuscripts should be uploaded via this online submission page. The online submission is most efficient method for submission of papers, as it enables rapid distribution of manuscripts and consequently speeds up the review procedure. It also enables authors to know the status of their own manuscripts by emailing us. Complete instructions for submitting a paper is available below.

Manuscript submission is a systematic procedure and little preparation is required beyond having all parts of your manuscript in a given format and a computer with an Internet connection and a Web browser. Full help and instructions are provided on-screen. As an author, you will be prompted for login and manuscript details as Field of Paper and then to upload your manuscript file(s) according to the instructions.

To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

4. MANUSCRIPT'S CATEGORY

Based on potential and nature, the manuscript can be categorized under the following heads: Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications

Research letters: The letters are small and concise comments on previously published matters.

5. STRUCTURE AND FORMAT OF MANUSCRIPT

The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also. Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

Papers*:* These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)*Title* should be relevant and commensurate with the theme of the paper.
(b) A brief Summary, *"Abstract"* (less than 150 words) containing the major results and conclusions.
(c) Up to *ten keywords*, that precisely identifies the paper's subject, purpose, and focus.
(d) An *Introduction*, giving necessary background excluding subheadings; objectives must be clearly declared.
(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.
(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;
(g) Discussion should cover the implications and consequences, not just recapitulating the results; *conclusions* should be summarizing.
(h) Brief Acknowledgements.
(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.
Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.
Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.
Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

Structure

All manuscripts submitted to Global Journals, ought to include:

Title: The title page must carry an instructive title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) wherever the work was carried out. The full postal address in addition with the e-mail address of related author must be given. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining and indexing.

Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the *Harvard scheme* of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

The Editorial Board and Global Journals recommend the use of a tool such as Reference Manager for reference management and formatting.

Tables, Figures and Figure Legends

Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.
Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

Preparation of Electronic Figures for Publication

Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).
For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.
Color Charges: It is the rule of the Global Journals for authors to pay the full cost for the reproduction of their color artwork. Hence, please note that, if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a color work agreement form before your paper can be published.
Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.

6. AFTER ACCEPTANCE

Upon approval of a paper for publication, the manuscript will be forwarded to the dean, who is responsible for the publication of the Global Journals.

6.1 Proof Corrections

The corresponding author will receive an e-mail alert containing a link to a website or will be attached. A working e-mail address must therefore be provided for the related author.
Acrobat Reader will be required in order to read this file. This software can be downloaded
(Free of charge) from the following website:
www.adobe.com/products/acrobat/readstep2.html. This will facilitate the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof.
Proofs must be returned to the dean at dean@globaljournals.org within three days of receipt.
As changes to proofs are costly, we inquire that you only correct typesetting errors. All illustrations are retained by the publisher. Please note that the authors are responsible for all statements made in their work, including changes made by the copy editor.

6.2 Early View of Global Journals (Publication Prior to Print)

The Global Journals are enclosed by our publishing's Early View service. Early View articles are complete full-text articles sent in advance of their publication. Early View articles are absolute and final. They have been completely reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after sending them. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the conventional way.

6.3 Author Services

Online production tracking is available for your article through Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The authors will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript.

6.4 Author Material Archive Policy

Please note that if not specifically requested, publisher will dispose off hardcopy & electronic information submitted, after the two months of publication. If you require the return of any information submitted, please inform the Editorial Board or dean as soon as possible.

6.5 Offprint and Extra Copies

A PDF offprint of the online-published article will be provided free of charge to the related author, and may be distributed according to the Publisher's terms and conditions. Additional paper offprint may be ordered by emailing us at: editor@globaljournals.org .

Informal Tips for writing a Social Science Research Paper to increase readability and citation

Before start writing a good quality Social Science Research Paper, let us first understand what is Social Science Research Paper? So Social Science Research Paper is the paper which is written by professionals or scientists who are associated to Human Social Science or doing research study in this area. If you are novel to this field then you can consult about this field from your supervisor or guide.

Techniques for writing a good quality Social Science Research Paper:

1. Choosing the topic- In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Social Science. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: At a first glance, this point looks obvious but it is first recommendation that to write a quality research paper of any area, first draft your paper in Microsoft Word. By using MS Word, you can easily catch your grammatical mistakes and spelling errors.

7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. **Pick a good study spot:** To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. **Think technically:** Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear
· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table

- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.
- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.

You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described.
Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Administration Rules Listed Before Submitting Your Research Paper to Global Journals

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals:

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.
- Do not give permission to anyone else to "PROOFREAD" your manuscript.

Written Material: You may discuss with your guides and key sources.

- Do not copy or imitate anyone else paper. (Various Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

CRITERION FOR GRADING A RESEARCH PAPER *(COMPILATION)* BY GLOBAL JOURNALS

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

Index

P

R

S

V

Global Journal of Human Social Sciences

Visit us on the Web at www.GlobalJournals.org | www.ComputerResearch.org
or email us at helpdesk@globaljournals.org

ISSN 0975587