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Markov Switching Heteroscadasticity Model of Stock Return: A Test

By Amaresh Das
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Abstract- This paper applies the Markov switching heteroscedasticity model to stock return for India. The Markov switching model in our study takes into account the chance of regime shift, a possibility outside the purview of the GARCH model. Our finding tells us that the high variance of the transitory component tends to be short lived.

Keywords: *ARCH process, GARCH process, Markov switching.*

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Abstract- This paper applies the Markov switching heteroscedasticity model to stock return for India. The Markov switching model in our study takes into account the chance of regime shift, a possibility outside the purview of the GARCH model. Our finding tells us that the high variance of the transitory component tends to be short lived.

Keywords: ARCH process, GARCH process, Markov switching.

I. Introduction

Although the ARCH process controls the short-run dynamics of stock return, the long-run dynamics are controlled by regime shifts in unconditional variance, while an unobserved Markov switching process drives the regime changes. Hamilton and Susmel (1994) propose a switching ARCH model in which they allow the parameters of the ARCH process to come from one set of several different regimes.[1] Regime switching models can match the tendency of financial markets to often change their behavior abruptlyand the phenomenon that the new behavior of financial variables often persists for several periods after such a change. While the regimes captured by regime switching models are identified by an econometric procedure, they often correspond to different periods in regulation, policy, and other secular changes[2, 3] Suppose the variable u_t is governed by

$$u_t = \sigma_t \, v_t$$

where $\{ v_t \}$ is an i. i. d sequence with zero mean and unit variance. The conditional variance of u_t is specified to be a function of its past realization

$$\sigma^2 = g \ (u_{t-1} , u_{t-2} \ \ldots)$$

Often it is assumed that $u_t \rightarrow (0, 1)$ and that $g \ (\ . \ )$ depends linearly on the past squared realization of u .

$$\sigma^2 = \sum_{i=1}^{q} a_t \, u_{t-1}^2 + \sum_{i=1}^{p} b_i \, \sigma_{t-2}^2$$

This is a Gaussian GARCH ($p \ \ q$) specification introduced by Belterstev (1986). When $p = 0$it becomes ARCH (q) specification of Engle (1982). The popular approach to modelling sock volatility is the autoregressive conditional heteroscedasticity (ARCH)specification introduced by these authors. These authors argue that the variance ratio test that is often used for analyzing mean reversion[4]may need to be modified to take into account the changes in variance due to changes in regimes[5].e. The cause of the debate lies in the fact that testing for mean reversion is inherently difficult due to a lack of historical data on stock prices. Accurate estimation of the degree of long-run mean reversion requires very long stock price series, which are not available. For example, if stock prices were to revert back to their fundamental value every twenty years, one would need at least 1,000 to 2,000 yearly observations to obtain reliable estimations. Moreover, the likely structural breaks during long sample periods further complicate statistical analysis of mean reversion (Spierdijk et al. 2012). These methodological

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[1] Contagion plays a crucial role in the short-term transmission of a currency crisis. Its effects rely primarily on liquidity effects experienced by international investors. Thus, the drop in asset values after the Russian crisis represented a capital loss for investors, with the ensuing liquidity problems being countered by a reallocation of their respective portfolios

[2] For example, interest rate behavior markedly changed from 1979 through 1982, during which the Federal Reserve changed its operating procedure to targeting monetary aggregates. Other regimes identified in interest rates correspond to the tenure of different Federal Reserve Chairs.

[3] The notion of regimes is closely linked to the familiar concept of good and bad states or states withlow versus high risk, but surprising and somewhat counterintuitive results can be obtained from equilibriumasset pricing models with regime changes. Conventional linear asset pricing models imply a positiveand monotonic risk-return relation. In contrast, changes between discrete regimeswith different consumption growth rates can lead to increasing, decreasing, flat or non-monotonic riskreturnrelations as shown by, e.g., Backus and Gregory (1993), Whitelaw (2000), Ang and Liu (2007),and Rossi and Timmermann (2011).

[4] After the seminal studies by Summers (1986), Poterba & Summers (1988), an ongoing debate has emerged in the literature as to whether stock prices and stock returns are mean-reverting or not. The substantial amount of recent publications in this field (Goyal & Welch 2008, Spierdijk et al. 2012) illustrates that the meanreverting behavior of stocks is still an important issue

[5] The standard sensitivity analysis shows that the choice of the variance ratio may have substantial impact on investment decisions. If the variance ratio is high – meaning that stock prices are strongly mean-reverting – stocks become relatively less risky in the long run, making it optimal to invest a relatively large share of wealth in stocks. However, if the true variance ratio is lower than the assumed value, the perceived risk exposure is lower than the actual risk exposure. Hence, too much wealth is allocated to stocks, resulting in a non-optimal overexposure to risk.

difficulties explain why mean reversion is a controversial issue in the economic literature.

Analyses suggest that the speed at which stocks revert to their fundamental value is faster in periods of high economic uncertainty, caused by major economic and/orpolitical events. The highest mean reversion speed is found for the period including the Great Depression and the start of World War II. Furthermore, the early years of the ColdWar and the period containing the Oil Crisis of 1973, the Energy Crisis of 1979 and Black Monday in 1987 are also haracterized by relatively fast mean reversion.

II. The Model

We will, to begin with, assume that the return series is drawn from a mixture of normal distributions as in Kim and Nelson(1998). These authors have shown that the Markov switching heteroscedasticity modelof stock return is a good approximation of the underlying data generating process. This leads us to formulate the return series as follows:

$$r_t = \rho m_t + x_t$$

$$\rho m_t = \mu + (Q_0 + Q_1 \omega_{1,t}) \Psi_t$$

$$x_t = \phi x_{t-1} + (h_0 + h_1 \omega_{2t}) \varsigma_t$$

$$\text{where } \varsigma_t \rightarrow N\ (0, 1)$$

In this model we use x_t to represent the temporary part of the return and not the prices directly. We include ϕ simply reflecting the fact that the temporary component of the return could be autocorrelated. ω_{1t} and ω_{2t} are unobserved state variables that evolve independently as two state Markov processes. These state variables determine the underlying regime at any given time. Their associated transitional probability matrices govern the evolution of these state variables. We define the transitional probability of the Markov process as follows

$$\begin{bmatrix} p_{11} & 1-p_{22} \\ 1-p_{11} & p_{12} \end{bmatrix}$$

The parameters h_1 and Q_1 help us identify any shift in variance during periods of uncertainty. The estimation of this model would allow us to comment on the time series behavior of the return volatility and how this is influenced by the switching probability of the transitoy component.

The two Markov switching variables are independent of each other and the respective transition probabilities are defined as

$$\rho rob(\ \omega_{1t} = 0 \mid \omega_{1t\ -1} = 0) = \rho_{00}\,,$$

$$prob\ (\omega_{1t} = 1 \mid \omega_{1t-1} = 1 = \ \rho_{01}$$

$$\rho rob(\ \omega_{2t} = 0 \mid \omega_{2t-1} = 0) = q_{00}\,,$$

$$\rho rob\ (\omega_{2t} = 1 \mid_{2t-1} = 1\ ) = \ q_{11}$$

In order to estimate such a model that involves unobserved components and is subject to Markov switching shocks, we use the procedure used by Kim and Nelson. (1999).This involves generating a probability weighted likelihood function and a recursive algorithm to update the probabilities as new observations become available. This has been written with computer programming in mind. The parameters to be estimatedare, therefore,

$$[\ \rho_{11}\ ,\ \rho_{00}\ .\omega_0\ ,\omega_1\ ,\mu\ ,q_{11}\ ,q_{00,}\ ,h_0\ ,h_1\ ,\phi\ ]$$

III. Data

The stock price index is obtained from the Morgan Stanley Capital International Index, MSCI's All Country World Index (ACWI) is the industry's accepted gauge of global stock market activity. Composed of over 2,400 constituents, it provides a seamless, modern and fully integrated view across all sources of equity returns in 46 developed and emerging markets. The company has used eight factors in developing its indexes: momentum, volatility, value, size, growth, size nonlinearity, liquidity and financial leverage.

The rate of return on stocks for India is calculated as $x_t = (P_t - P_{t-1}) \times 100 / P_{t-1}$ where P_t is the stock price index at time *t*. The rates of return on stocks are obtained for the period from January 1980 to April 2010.Table 1 summarizes statistics on the rate of return in India, including descriptive statistics on the mean, standard deviation, skewness, kurtosis and the *P* - value of the Jarque – Bera test statistic (JB test) for testing the normality of the series. Under the null hypothesis, the Jarque- Bers statistic has a chi-square distribution with two degrees of freedom. When the required probability for the Jarque – Bera statistic is small, the null hypothesis of a normal distribution is rejected. The mean and standard deviation is quite high and the null hypothesis of normal distribution is rejected at the 5 % significance level

Table 1.1: Summary Statistics

Mean(%)	Std.Dev	Skewness	Kurtosis	JB Test
1.786	7.453	2.312	9.654	.0000

Note: the hypothesis of normal distribution is rejected at the 5 %level of significance if the P value for the JB test isless than .01

IV. Results

Table 1.2 shows the parameter estimates of the Markov switching heteroscedasticity model for the

sample for our given time [6]. The results are computed using the algorithm used by Kim and Nelson (1998). The initial values for the filter are obtained from the observations on January 1980 ending through December 1980.

Table 1. 2: Permanent and Transitory Components of Equity Return (Markov Switching Heteroscedasticity Model)

p_{11}	0.9898*
	(0.0004)
P_{00}	0.8767*
	(0.1034)
ω_0	1.5236*
	(0.2341)
ω_1	1.3458*
	(0.6451)
μ	1.5621
	(0.6945)
q_{11}	0.7658*
	(0.1342)
q_{00}	0.9868*
	(0.0666)
h_0	0.0423
	(0.0541)
h_1	6.7832*
	(3,4571)
ϕ	-0.3214
	(0.3461)

Note: Standard errors given in parenthesis. Significance at the 5% level is indicated by*

The estimates of the transition probability p_{11} (high variance state of the permanent component) and the probability p_{00} (low variance state of the permament component) are both highly significant for India. The low variance state estimate ω_0 appears to be statistically significant. In contrast the additional variance (ω_1)of the permanent component due to the high volatility regime is also significant. It is also interesting to find that the magnitude of the overall variance of the permanent component during the high volatility state, i.e., $\omega_0 + \omega_1$ says very little for the Indian marketTheparameters relate to the transitory components of our model. The transitional probabilities q_{11} (high variance state of the transitory component) and q_{00} (low variance state of the transitory component are highly significant for India. This is an indication that the low volatility state dominates in India. The expected duration of the high volatility state is 4.41 months and the expected duration of the low volatility state is 26.12 months The average duration of the low volatility state is 54.32 months while the average duration of the high volatility state is 11 months, This means that the high volatility transitory state fades in about 11 months on average for India. In order to check for the performance of the table, we analyze the residuals from the model using a variety of diagnostic tests.

The test results are presented in Table 1.3

Table 1.3: Residual Diagnostics Tests

Portmanteau	0.412
ARCH	0.333
KS	0.013
RB Test	0.041
MNR	0.889
Recursive T	0.771

Entries are P values for the respective statistics. The residuals in the portmanteau test is that the residuals are serially uncorrelated. The ARCH test residuals are for no serial correlation in the squared residuals up to lag 18. MNR is the Von Neuman ratio test using recursive residuals for model adequacy. If the model is correctly specified then Recursive T has a standard t- distribution. (Harvey (1990)). KS statistic represents the Kolmogorov Smirnov test statistic for normality. 95% confidence level in this test is .071 When KS statistic is less than 0.071 the null hypothesis of normality

Can'ot be rejected at the given level of significance We also applied a pair of tests specifically designed for the recursive residuals produced by the state space system used in in this study. The first, the modified Von Neuman ratio, test against serial correlations of the residuals; the second, the recursive T test, check for correct model specification. The adequacy of the model is overwhelmingly supported.

V. Conclusion

We applied the Markov switching heteroscedasticity model to stock returns in India. The modelling approach is superior to GARCH model. In particular the Markov switching model explicitly

[6] A key issue in regime switching models is whether the same regimes repeat over time, as in the case of repeated recession and expansion periods, or if new regimes always differ from previous ones. If "history repeats" and the underlying regimes do not change, all regimes will recur at some time. With only two regimes this will happen if $p_{00} < 1$, $i = 0, 1$,Models with recurring regimes have been used to characterize bull and bear markets, calm versus turbulent markets, and recession and expansion periods. Alternative to the assumption of recurring regime is the change point process studied in the context of of dynamics of stock returns by Pastor and Stambaugh (2001) and Perez- Quiros, and Timmermann, A (2012) This type of model is likely to be a good approximation of regime shifts related to technological change. Our model has abstracted from such technological changes.

considers the possibility of regime switch whereas the GARCH model does not. In terms of our estimate the high variance state of the transitory component lasts for an average of only 4 months.

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Impact of Ife-Modakeke Intra-Communal Conflicts on Spatial Realignment of Ile-Ife City

By Adegbite, A. A., Balogun, B. O. & Buba, F. N.
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Abstract- Ife and Modakeke communities in South-western Nigeria have engaged in several years of communal conflicts. The conflicts have reconfigured both the economic systems and land use structure of the Central Business District of Ile-Ife. This study assessed the impact of the Ife/Modakeke crisis with emphasis on mapping the spatial realignment of land-use in the CBD and the rate of urbanization before and after the last conflict. Primary data were collected through field survey and oral interviews. The secondary data used included the base map and Land sat images of 1999 and 2015 for Ile-Ife. The period of 1999 and 2015 represents the period before and after the last conflict in 2000. GPS coordinates of some of the features were taken and plotted on the base-map extracted from the Google-Map, geo-referenced and classified into the existing land-use and land-cover types. The results showed that physical reconstructions, urbanization and new economic activities have been generally fast in Ife but relatively slow in Modakeke. The study also showed that 31% of the vegetated land-cover had been lost. The study concluded on the need for intra-communal peace for sustainable development of the two communities.

Keywords: *Ile-Ife, modakeke, conflict, CBD, GIS, GPS, landsat, google map.*

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I. Introduction

Human socio-economic and political developments are frequently preceded by conflicts. Conflict is inevitable, as it is present in daily public and private life (Ekpenyong, 2011). Conflict has been variously defined. Fabiyi, Thontteh and Borisade (2012) contend that conflict often occurs when social, economic or political space is contested or injustice is perceived in the allocation of economic resources among groups in political jurisdictions such as states, regions or communities. Collier (2004) refers to conflicts as disputes, disagreements, quarrels, struggles, fights and wars between individuals, groups and countries while Bujra (2002) defines conflicts as violent and armed confrontations and struggles between groups, between the state and one or more groups, and between two or more states.

These conflicts vary in time space within large or small group of people that are either from same or different cultural background, seeking survival for financial gains from land resources and political strength over each other. Different types of conflicts emerge during different periods because of varying political, economic and social conditions and environments (Bujra, 2002).

In every nation there is no complete agreement on how to share wealth, power and status among individuals and groups, and how to effect necessary changes and reforms (Fabiyi *et al*, 2012). Since different groups and individuals have diverse interests, the aims of some groups will conflict with those of others. Bassey (2007), cited in Ekpenyong (2011) contends that conflict is very often the interaction of political, economic and social instability, frequently stemming from bad governance, failed economic policies and inappropriate development programmes which have exacerbated ethnic or religious differences. Conflicts occur when deprived groups and individuals attempt to increase their share of power and wealth or to modify the dominant values, norms, beliefs or ideology (Angaye, 2003, Akenpuun 2013).

Ife and Modakeke communities in Southwestern Nigeria have engaged in protracted intra-communal conflicts. Asiyanbola (2007) and Olayiwola and Okorie (2010) asserted that so far, there had been seven major wars between the Ifes and Modakekes and listed the periods to include: 1835-1849, 1882-1909, 1946- 1949, 1981, 1983, 1997-1998, and 2000. Based on this, the conflict appears to be the oldest intra-ethnic conflict in Nigeria. Its psychological dimension has reached an extent that both parties are in cold war (Olayiwola and Okorie, 2010).

Different types of conflicts have different causes. Ekpenyong (2011) listed some of the causes of conflicts to include land ownership and resource availability, disputed jurisdictions of traditional rulers and chiefs, prestige and jealousy, corruption, creation of councils and locations of headquarters, environmental destruction, religious rivalry, competition for scarce resources, power used to control economic resources, political processes, social and cultural institutions. Population increase with little economic growth is also a major cause of conflict in Nigeria (Ikejiaku, 2009). Fabiyi *et al* (2012) related the cause of the Ife – Modakeke conflict to the subtle social and cultural differences between the two communities over the years. They posited that when adjacent communities are differentiated by ethnicity, especially by a myth of ancestry, it often leads to violent conflict as each community appears to protect and defend ancestral homes or the ancestors' burial sites. On the other hand,

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Otite (1999), cited in Ekpenyong (2011) observed that the strong resistance by the Kingship and people of Ile-Ife to the Modakekes' ownership claims to their settlement and farmlands, has been the major cause of the conflict.

McGrath (2013) illustrated in different studies, how war and conflicts transform various cities. He cited as examples, Rome, New York and Bangkok Central Business Districts in which war, trade and desire for expansion were major elements of urban realignment. The conflicts between the Ifes and the Modakekes have realigned both the economic systems and land use structure of the Central Business District (CBD) of Ile-Ife, thereby increasing the rapid urban land use demand to support the contiguous expansion of economic activities in Ife CBD.

In almost all cities, the Central Business District (CBD) also referred to as "downtown" or the "City Center," is the nucleus of the city; the business, commercial and government hub (Kamunyori, 2007). Historically, the CBD developed as the market square in ancient cities. The market serves as forerunner and point where people, particularly farmers, merchants and consumers gathered on market days to exchange, buy and sell goods and services, and interact socially. City centres later grew and developed as fixed CBD location points for retail trading and commerce (Olayiwola, 2014). Ife CBD grew from the Obalufon market through the city's main transport route to May-Fair roundabout (Figure 1.1), which was one of the main areas often affected by the conflict.

Ife CBD like other Central Business Districts is continuously facing transformation in order to meet the socioeconomic developmental needs of Ile-Ife city and its environs. This transformation can be readily noticed in the fast rate of urbanization, coupled with commercial and administrative activities in Ile-Ife city, which is a very useful catalyst in the economic development of the city. The commercial growth in Ife CBD can be testified by the heavy traffic congestion in Sabo/Lagere and May-Fair roundabout. High level of commercial activity can be noticed such as banks, office buildings, call centres, chain of stores, gas stations, grocery stores, pharmacies, restaurants, shopping malls that have replaced the major cocoa merchants' warehouses that once dominated the area before the conflicts.

Communal conflict between Ife and Modakeke communities had been occurring for many years. The effects of the last conflict in both communities were enormous, and are still felt till today. These conflicts have contributed significantly in shaping the spatial pattern of expansion and growth of both communities. They have adversely affected the degree of socio-economic and cultural activities between the two communities. There has been limited research work in terms of mapping the impacts of the communal conflicts on the land use pattern, life and other human resources using geographic information systems (GIS). A detailed spatio-temporal analysis of urban land use changes and mapping of the pattern of growth would elucidate further on the impacts of these conflicts on the study area. The objective of this study is to assess the impact of the Ife/Modakeke intra-communal conflicts with emphasis on mapping the spatial re-distribution of land use in the CBD and the rate of urban development before and after the last Ife and Modakeke conflict.

Ayanlade, and Orimoogunje, (2011) employed geographic information (GIS) to map areas affected by the Ife-Modakeke conflicts. The present study will employ GIS to investigate the impact of the conflict on the economic development of Ile-Ife CBD.

II. Study Area

The Ile-Ife and Modakeke intra-communities in Osun State are located approximately on latitude 7°29'N - 7°30'N and longitude 4°32'E - 4°34'E (Figure 1). They have a total land area of about 22.96 square kilometres. Ife/Modakeke share boundaries with Ibadan to the east, Ilesa to the south-west, and Ondo to the north. They are situated on an elevation of 275 m above the sea level.

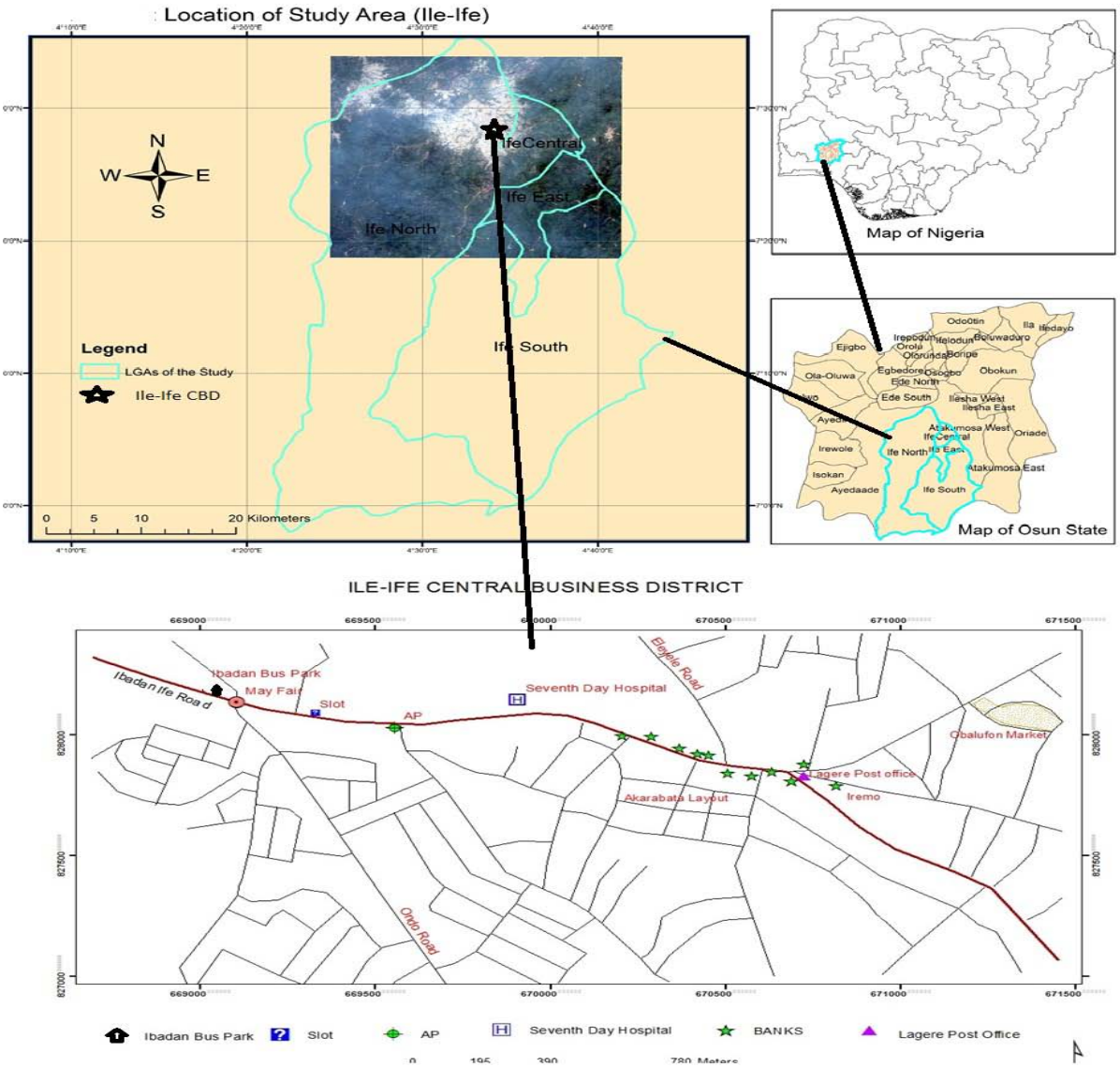

Figure 1.1: Study area

III. Materials and Methods

Explanatory research method was used to acquire fundamental information that uncovered the nature of the problem under investigation while the conclusive research method was used in gathering data through field survey and oral interviews. The primary data acquisition involved the identification of the effects of conflict, socioeconomic needs, information, population increase and urbanization variables that were used in assessing the spatial realignment of the Ile-Ife Central Business District. The secondary data included the base map and 30m resolution Landsat (ETM and ETM+) images of 1999 and 2015 for Ile-Ife. The period of 1999 and 2015 represents the period before and after the last Ife-Modakeke conflict in 2000. GPS coordinates of some of the features were taken and plotted. The coordinates of some of the buildings; residential, commercial and public which were destroyed during the crisis were taken using a global positioning system (GPS). The base map was extracted from Google Map, geo-referenced and classified into the existing land use and land cover types.

IV. Results

From the field survey it was discovered that most commercial enterprises were destroyed and some of the investors never returned. Ayanlade and Orimoogunje (2011) described several features that were destroyed during the crisis along Oke Yidi, Mayfair, Seventh Day Adventist, Lagere and Akarabata Layout-Lines 1, 2 and 3. These areas fall within the Ile-Ife Central Business District (CBD) which was the economic hub for cocoa merchants and other small scale and medium business enterprises before the last conflict. This led to the evolution of new economic activities in the CBD such as banking, fast food, buying and retail

businesses and other small businesses. The result also showed that physical reconstructions were generally very slow in Modakeke region mainly in Oke Yidi, Sijuade Estate, Ondo road, and Akarabata Lines 1, 2, and 3 (Fig 3.2 and Plates 3a and 3b.). This may not be unconnected with the fear that the conflict may reoccur at the slightest provocation in the future. This was attested to by Fabiyi *et al* (2011) that rebuilding is often fast and effective only if there is no likelihood that there will be a reoccurrence of such conflicts. The reconstruction process in Ife is however relatively fast, most especially along Lagere, Ibadan, and Ede roads. This fast rate of development is due to the strategic location of these areas along the primary travel route in the Ile-Ife CBD as shown in Figure 3.1, Plates 1a and 1b, and Plates 2a and 2b. These developments are observed to be private efforts of members of the communities. This agrees with Fabiyi *et al* (2012) that found no government-sponsored initiatives for physical and social rebuilding in affected communities, but the community associations and cooperative societies are actively harnessing social capital for rebuilding in the affected neighbourhoods.

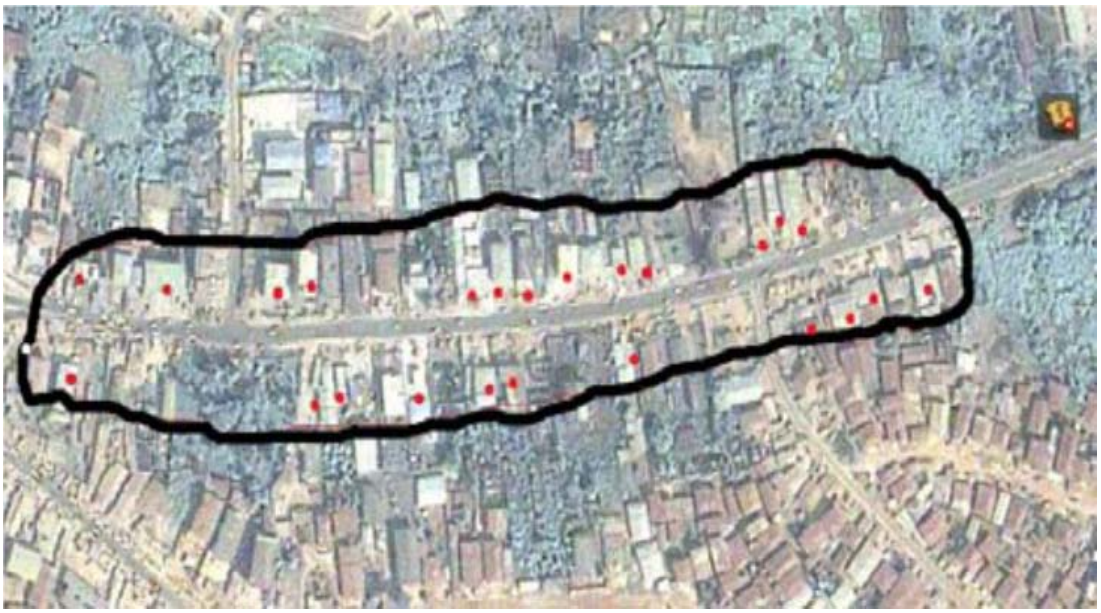

Figure 3.1: Image showing areas of active reconstruction in Ile Ife (red spots show reconstructed buildings) Adapted from Fabiyi *et al* (2012)

Figure 3.2: Image showing areas of slow reconstruction activities in modakeke (red spots show renovated buildings). Adapted from Fabiyi *et al* (2012)


Plates 1a and 1b: Thriving Economic development in the CBD


Plates 2a and 2b: New developments Along Ibadan-Ife Road


Plates 3a and 3b: Relics of Ife-Modakeke Conflict

V. Discussion

From the results of the classification procedures it was observed that Ife North, Ife Central and Ife East Local Governments were fast developing while there was relatively slower development in Ife South Local Government. It can be recalled that in 1983, Modakeke was renamed Ife South which triggered violent reactions that resulted in loss of lives and further damage to property. The data collected from the field survey revealed that most properties in Modakeke were owned by indigenes of Ife who were reluctant to rebuild them for fear of a relapse to conflict. However, from the field survey carried out, it was observed that the Federal Government through the establishment of a Police Training School and the creation of several police out-posts and police stations in the two communities have helped in preventing a relapse to conflict and also in reducing violent crimes and activities in the study area. Table 1 shows the results of the classification of the images acquired for the study area in 1999 and 2015.

Table 1: Classification result of Ile-Ife land use classes

Class	1999 (Hectares)	2015 (Hectares)	Difference (Hectares)	% Change
Urban	2916	6983.37	4067.37	31
Water	33	29	-4	-0.03
Vegetation	10321	6258.69	-4062.31	-31
Total	13271	13271		

From the above classification result (table1), it can be noticed that there had been increase in the rate of demand for urban development. In the year 1999 before the Ife-Modakeke conflicts, urban land use stood at 2916 hectares but increased to 6983 hectares in 2015. This demand for urban development can be clearly noticed in the rapid reduction in vegetation land cover from 10321 hectares in 1999 to 6259 hectares in 2015. From this result, it can be clearly noted that urbanization has been on a rapid increase, with 31% of the vegetated land cover lost. Also a closer observation of the satellite images indicated a parallel growth in the two neighbouring communities, with the Ife community expanding mostly towards the north west while the Modakeke area expanding mostly towards the south and south west especially towards Ondo Road. Similarly, the fear of reprisals or spontaneous attack that lingered amongst the two communities seemed to make them to expand spatially away from each other. This can be seen in the orientation of the pattern of development and expansion as shown in the 2015 Ife land use map (figure 3.4b).

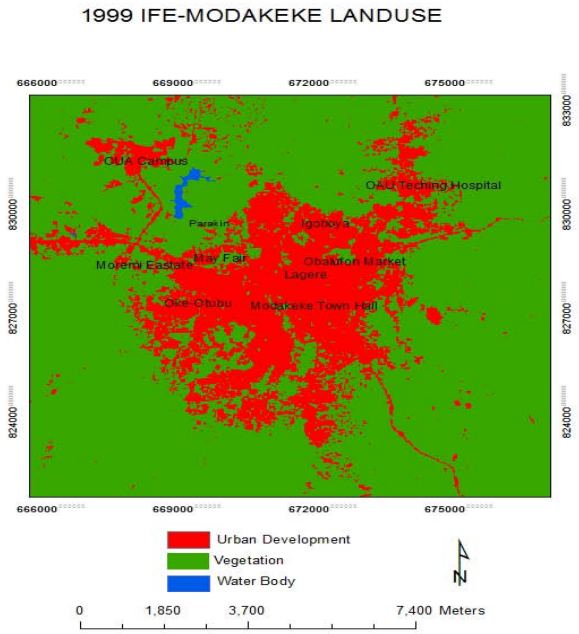

Figure 3.3a: 1999 land-use map

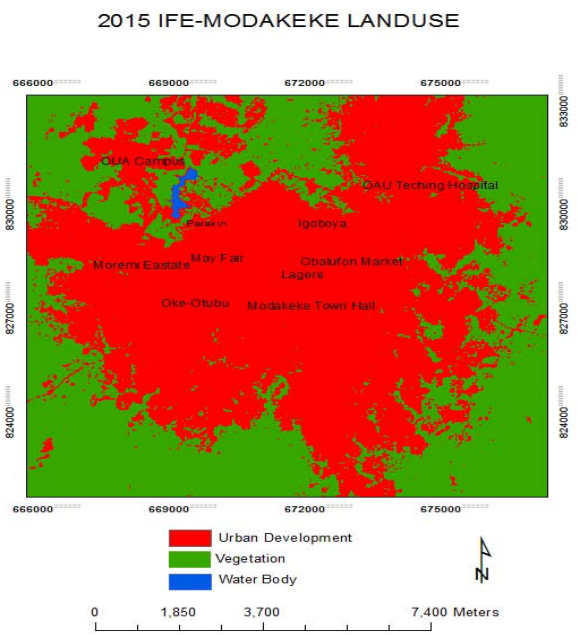

Figure 3.3b: 2015 land-use map

Data obtained from the Federal Bureau of Statistics showed that the population of males in Ife North in 2006 was 78,175 while that of females was 75,519. The population of males in Ife Central was 84,653 while that of females was 82,601. The population of males in Ife East was 92,054 and that of females was 96033. Also the population of males in Ife South was 69,798 while that of females was 65,540. In 1991 the total population of males and females in Ife North was 186,856. From these figures, it can be deduced that the total population of Ife North decreased from 186,856 in 1991 to 153,694 in 2006. Figures obtained from the 1991 and 2006 census shows a gradual decrease in the population in Ife and Modakeke. This change in population can be attributed to migration in the aftermath of the war. It is important to note that the population of Ife and Modakeke communities would have changed from the 2006 census figures as a result of rapid economic development in Ife Central Business District and increased demand in land use. Therefore, there is urgent need for national and local authorities to carry out demography study of the city for meaningful planning and community development.

VI. Conclusion

This study observed the rapid development in Ile-Ife Central Business District as a result of destruction of majority of the cocoa merchant's warehouses during the conflicts and this paved way for new socio-

economic development presently noticed in the CBD. The most prominent business establishments that sprang up in Ile-Ife CBD after the war are banking, fast food businesses, buying and retail businesses and other small scale enterprises.

There were parallel growths in the two neighbouring communities, with the Ife community expanding mostly towards the north-west while the Modakeke expanded mostly towards the south and south-west especially towards Ondo Road. This can be attributed to the continuous fear of reprisals or spontaneous attack that lingered amongst the two communities. This fear seemed to make them expand spatially away from each other. There is tendency of a possible relapse to conflict in the two communities due to the volatile atmosphere in these areas. The indigenes of the two communities have been traumatized and the relics of the war can still be found in these areas. Establishment of police posts and military training institutions in some areas that were adversely affected by the crisis such as Akarabata lines I-III and Oke yidi can help to check the activities of violent youths in these areas. The indigenes that have been traumatized by the war should be compensated and rehabilitated to reintegrate them back into the society. The Federal Government should carry out disarmament of the two warring communities to forestall a relapse to conflict.

Social welfare, community-based organizations and Non-governmental Organizations (NGOs) should be set up to counsel the youths on the dangers of war. Also the status of the local chiefs and traditional rulers in these communities can be upgraded to give them more influence with the authorities and their subjects. Secondary and tertiary institutions should be established in these areas to engage the youths in meaningful activities and also employment opportunities should be created to boost the financial state of the locals.

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Achieving Integration of Nigerian Cadastral and Topographic Information Systems Based on the German Aaa Model

By Felix Ndukson Buba, Olakunle Rufus Oladosu, Abdulrahman Adegbite & Okibe Ogah
Obafemi Awolowo University Campus

Abstract- Now more than ever before data integration has become a very important issue because of the problems associated with heterogeneous geospatial data. It is almost impossible to handle heterogeneous data in a coherent manner because different data sets have different methods of acquisition, different representations, different resolutions and quality, and are based on different data models. Analysis of different data sets becomes difficult and data sharing almost impossible. Germany successfully integrated their topographic, cadastral, and geodetic data sets into a single application schema called the AAA data model. This ensured standardization and the elimination of redundancies leading to coherent analyses and data sharing. In Nigeria, the national mapping agency is the custodian of topographic and geodetic data sets while cadastral data sets are the responsibilities of the various state governments as stipulated in the Nigeria Land Use Act.

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Strictly as per the compliance and regulations of :

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Abstract- Now more than ever before data integration has become a very important issue because of the problems associated with heterogeneous geospatial data. It is almost impossible to handle heterogeneous data in a coherent manner because different data sets have different methods of acquisition, different representations, different resolutions and quality, and are based on different data models. Analysis of different data sets becomes difficult and data sharing almost impossible. Germany successfully integrated their topographic, cadastral, and geodetic data sets into a single application schema called the AAA data model. This ensured standardization and the elimination of redundancies leading to coherent analyses and data sharing. In Nigeria, the national mapping agency is the custodian of topographic and geodetic data sets while cadastral data sets are the responsibilities of the various state governments as stipulated in the Nigeria Land Use Act. There is no harmonized system of spatial data management, leading to difficulties in data sharing and other related problems. The goal for Nigeria is to achieve integration which will allow for the exchange of data stemming from different sources, different representations and structures, and thus establish the base for performing combined, integrated analyses, leading to the development of a national spatial data infrastructure which is a sine qua non for sustainable national development and good governance. This paper examines the possibility or viability of the integration of Nigerian cadastral and topographic data sets based on the German AAA data model. The paper also highlights the immense contribution such integration can make to the management of geospatial information in Nigeria. It concludes by challenging the Office of the Surveyor-General of the Federation (OSGOF) to be the catalyst for achieving integration of these fundamental data sets.

Keywords: geospatial data sets, cadastral and topographic data, integration, german AAA data model.

I. Introduction

Although in geo-scientific applications the topography of the Earth surface and thus topographic data sets constitute a common base for most related data sets, discrepancies and even disagreements often arise when inspecting one and the same object in different data sets. This is visible when superimposing different data sets of identical objects in reality. The reason is that the different data sets are typically based on different data models and have been collected for different purposes (Butenuth *et al.*, 2006). Thus, different aspects of reality are important and have consequently been mapped. Also, different sensors are being used, data acquisition takes place at different dates, data representation differs (for example, in terms of vector and raster data), and so does the resolution and the quality of data.

Data integration is a big issue today when more and more digital data sets are being collected and made available. Due to the heterogeneity of the data sets, it is complicated and sometimes even impossible to handle them in a coherent manner. The integration of inhomogeneous data is therefore becoming more and more important. The benefits of such integration include:

i. To use the stored data for various purposes and applications. For example, the information which is not contained in one data base may be available in another.
ii. To complete and enhance the data bases thematically. For instance, from the integration of a data set with another one, new thematic information can be derived.
iii. To automatically verify the stored data regarding their quality, to correct them and improve their accuracy.
iv. When integrated data sets are standardized, they ensure sharing in a framework such as the Geospatial Data Infrastructure.

Basically, this means that new data acquisition – typically the most expensive part of spatial analysis tasks – can be largely reduced and is only required if no data are available or changes in the reality have occurred. Consequently, a considerable saving of cost and labour is achieved by adding significant value to the existing data. The challenge for Nigeria is to establish appropriate institutional and organizational infrastructures to manage the integration of topographic mapping and cadastral information into a coherent land administration system for sustainable development.

II. Motivation

Cadastral and topographic data sets have been identified as parts of the fundamental data sets of any country. Fundamental data sets are sometimes referred

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to as core or foundational data sets. The National Geo-information (NGI) Policy document (2003) defines fundamental data sets as data sets with national coverage needed consistently by more than one government agency in order to achieve their objectives; or a data set that cannot be derived from another data set and other agencies derive significant benefit from using it. This implies that fundamental data sets are required for national development. The NGI Policy (2003) lists the core data sets to include geodetic control database, topographic database/DEM, digital imagery and image maps, administrative boundaries data, cadastral databases, transportation data, hydrographic data, land use/land cover data, geological database, and demographic database.

The cadaster as a land information system is very important for social and economic development. Enemark (2004) lists some of the benefits of a cadastral system to include identification of land parcels and securing land rights, facilitating land registration, land valuation, and land use control, and a foundation for sound land management. It is therefore crucial that governments invest in appropriate cadastral system development as the traditional systems are no longer adequate to support the sustainable development and to stimulate land markets (Tuladhar, 2003).

Germany has successfully developed a common AAA-application schema for AFIS (the official geodetic points information system), ALKIS (the official cadastral information system), and ATKIS (the official topographic-cartographic information system) based on the AFIS-ALKIS-ATKIS Reference Model for the basic geo-data sets of all public surveying and mapping authorities in Germany (Muller and Siebold, 2007). ALKIS combines the digital cadastral information system ALK (Automated Cadastral Map) which mainly represents geometric features like parcels, buildings, etc. and the Automated Land Register (ALB) where all the titles of the land records exist. ALKIS was launched in order to harmonize the cadastral information and the topographic data base ATKIS. ALKIS and ATKIS formed the new data model. But by integration of the geodetic reference points as well, AFIS becomes another part of the data model. Thus it is called the AFIS-ALKIS-ATKIS data model or the AAA data model.

The advantages of the AAA model are the integration of the spatial reference system, the real estate cadaster, and topography in one AAA-application schema, the harmonization of cadastral and topographic data, and the facilitation of the data exchange process. AAA contains descriptive and illustrative data in several product groups and will enable the surveying authorities to provide their customers in business and administration with data of high quality.

In Nigeria, such a harmonized system of spatial data management does not exist. The Office of the Surveyor-General of the Federation (OSGOF) have the constitutional mandate to produce topographic data sets and to act as custodians (NGI Policy, 2003), while cadastral data sets are the responsibility of individual state governments. These data sets are therefore fragmented and scattered. There is limited or no computerization of records, weak links between the two components of 'land registration' and 'cadastral mapping', and deficiencies in financial, administrative, and organizational issues. Some of these deficiencies include the use of paper records which are often incomplete and poorly organized, lack of a system to detect multiple registration of land, lands not properly surveyed and demarcated (plans mostly descriptive), susceptible to fire/destruction, difficult to manipulate data, etc. These deficiencies/weaknesses create a lack of security for land owners and authorities, resulting into:

i. Poor conditions for land credit (mortgaging)
ii. Problems for a transparent land market
iii. Arbitrariness, corruption, and political disturbances.

Set against these considerations, this paper will highlight the crucial role of an integrated spatial information system to sustainable development, examine the German AAA data model and its successful implementation, examine the viability of integration of cadastral and topographic data sets in Nigeria based on the German AAA model, and highlight the requirements for such an integration, its advantages and the possible challenges that may hinder a successful integration.

III. The Role of the Cadaster in National Development

a) *Definitions of the Cadaster*

Land is one of the most important financial assets in a country. Every investment in one way or the other is dependent on land. Land entails such concepts as ownership, use, and value (figure 1). Land administration refers to the processes of recording and disseminating information about the ownership, value, and use of land and its associated resources. Such processes include the determination of (sometimes known as the "adjudication") of rights and other attributes of the land, the survey and description of these, their detailed documentation and provision of relevant information in support of land markets (Dale and McLaughlin, 1999).

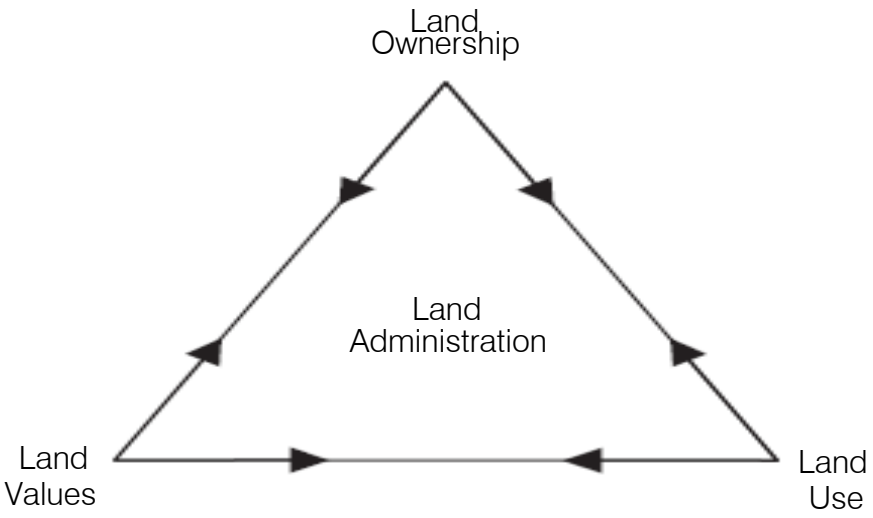

Figure 1: Land – ownership, values, and use (Dale and McLaughlin, 1999)

The cadaster is at the core of land administration. The cadaster has been variously defined by different authors. Dale and McLaughlin (1989) defined the cadaster as a parcel-based land information system where data are organized around the cadastral parcel. The cadaster therefore provides data concerning such matters as land ownership, value, and use, with the cadastral records consisting of maps and text.

The International Federation of Surveyors (FIG, 1995) defines a cadaster as a "parcel-based and up-to-date land information system containing a record of interests in land (e. g rights, restrictions, and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, ownership or control of these interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (valuation and taxation), legal purposes (conveyancing), to assist in the management of land and land use control (planning and administration), and enables sustainable development and environmental protection".

Enemark (2004) adopts the FIG definition but argues, however, that it makes sense to talk about cadastral systems or cadastral infrastructure rather than just cadaster. These systems or infrastructure include the interaction between the identification of land parcels, the registration of land rights, the valuation and taxation of land and property, and the control of present and possible future use of land. The cadaster provides the spatial integrity and unique identification of every land parcel usually through a cadastral map updated by cadastral surveys. The parcel identification provides the link for securing rights in land, controlling the use of land, and connecting the ways people use their land with their understanding of land (Enemark, 2009).

IV. Types of Cadaster

Dale and McLaughlin (1989) classified cadasters according to the information they contain or the primary purpose for which they have been developed. Based on these, 3 types of cadasters were recognized:

i. *Juridical cadaster*– which serves as a legally recognized record of land tenure. This is made up of two parts: written record or register (text), and the geometric records in form of maps or survey measurements.

ii. *Fiscal cadaster*– which is developed primarily for property valuation

iii. *Multi-purpose cadaster*– which encompasses both the fiscal and the juridical with the addition of other parcel-related information.

The International Federation of Surveyors (1995) classified cadasters in many ways, e. g by:

i. Primary function (e. g supporting taxation, conveyancing, land distribution, or multi-purpose land management activities).

ii. The types of rights recorded (e. g. private ownership, use rights, mineral leases).

iii. The degree of state responsibility in ensuring the accuracy and availability of the data (e. g. complete state mandate, shared public and private responsibility).

iv. Location and jurisdiction (e. g. urban and rural cadasters, centralized and decentralized cadasters).

v. The many ways in which information about the parcels is collected (e. g. ground surveys tied to geodetic control, uncoordinated ground surveys and measurements, aerial photography, digitizing existing historical records, e. t. c.)

Enemark (2004) recognized that the cadastral system is changing over time as a response to general trends in societal development. In line with this, he identified four phases of the evolution of the cadastral system:

i. *Feudalism:* 1800 (land as wealth)– fiscal cadaster (land valuation and taxation paradigm)
ii. *Industrial revolution:* 1800– 1950 (land as a commodity)– legal or juridical cadaster (land market paradigm).
iii. *Post-war reconstruction:* 1950– 1980 (land as a scarce resource)–managerial cadaster (land management paradigm).
iv. *Information revolution:* 1980 – to date (land as a community scarce resource)–multi-purpose cadaster (sustainable development paradigm).

V. Importance of the Cadaster

Dale and McLaughlin (1989) highlighted some of the benefits of a cadastral system to include certainty of ownership, security of tenure, reduction in land disputes, improved conveyancing, stimulation of land markets, security for credits, monitoring of land markets, facilitating land reforms, support for land taxation, improvements in physical planning, recording of land resource infrastructure, e. t. c.

Cadasters provide the location or place for many activities in the built environment through the cadastral map (Williamson, 2008). Cadastral systems provide a basic land information infrastructure for running the inter-related systems within the areas of land tenure (land rights, legal means leading to social stability, economic growth, efficient land markets, and security of tenure and investment). The cadaster is the primary means of providing information about property rights (FIG, 1995). Specifically, the cadastre provides the private and public sectors with:

i. Information identifying those people who have interests in parcels of land
ii. Information about those interests (e. g. nature and duration of rights, restrictions, and responsibilities)
iii. Information about the parcels (e. g. their location, size, improvements, value).

The cadaster forms part of the base data required in any land information system. Since information about land parcels and land holdings is often needed by many different users, having a unified, standard cadaster for each jurisdiction helps to avoid duplication and assists in the efficient exchange of information. Hence a national cadaster has been identified as the engine room of the entire land administration system, underpinning a country's capacity to deliver sustainable development. Enemark (2009) argues that the cadastral map is a tool that represents the human scale of land use and how people are connected to their land. The digital cadaster is a representation of the human scale of the built environment, and the cognitive understanding of land use patterns in people's farms, businesses, homes, and other developments, then form the core information sets that enable a country to build an overall administrative framework to deliver sustainable development.

Williamson and Wallace (2007) identified the cadaster as being at the operational core of a land administration system (LAS). They argue that modern digital cadasters are much more central to governments because they are spatially enabled and allow computers to accurately identify where a feature, such as a street or house, is on the globe. They change computerized data into intelligible, people-friendly information and present it in visual (picture) formats. By adding geo-coded addresses, cadasters can show how parcels of land are arranged into properties and businesses.

All modern economies recognize the importance of the cadaster as being central to a successful Land Administration System (Williamson *et al.*, 2006). The cadaster provides a spatial integrity and unique identification for land parcels within a system. Critically, it provides the spatial component for LAS and more particularly the location and place dimension with the most useful output being a geo-coded street address of each property. Simply, the cadaster is the central component in spatially enabling government. It is destined for a much broader role as fundamental government infrastructure equivalent to a major highway or railway though it was created on behalf of tax payers merely for better internal administration of taxation, and, more recently, titling of land in support of more efficient and effective land markets (Williamson, 2008). Without these digital facilities, modern governments cannot understand the built environment of cities, manage land competently, and utilize computer capacity to assist policy-making, or retrieve significant value out of land.

Therefore, integration of such an essential component of a nation's spatial information with the topographic and geodetic components is necessary for sustainable national development. Germany have successfully integrated these three components in the AAA data model and they provide Nigeria with a platform on which we can explore the viability and possibility for such an integration,

VI. The German AAA Data Model and its Benefits

Germany recognized certain deficiencies and shortcomings in their cadastral and topographic information systems and their applications (Muller and Siebold, 2007). Some of the deficiencies or deficits identified included:

i. Model description and feature catalogues were only in text documents
ii. Lack of integration of graphical and attribute data
iii. No semantic harmonization of cadastral and topographic data
iv. Difficulties in realization of cartographic aspects, and lack of data modeling between cadaster and topography
v. No concept to integrate additional data (metadata, quality data), no versioning/historical data, and no standardized notation of the data models and the exchange structure
vi. Redundant data within the cadastral application (ALB and ALK), as well as between ATKIS and the cadaster
vii. Implemented with old-fashioned software and hardware

There was therefore the need to combine these applications into one common application schema in order to reduce or avoid the noted or existing deficiencies. The new data model was designed to ensure:

i. Standardized and to a large extent redundancy-free object view
ii. Standardized notation and encoding
iii. Integration of additional data (metadata, quality data)
iv. Management of different temporal versions of the same object
v. Inclusion of cartographic information

In Germany, geo-base data were available in 3 data sets: Authoritative Topographic-Cartographic Information System (ATKIS); the Official Cadastral Information System (ALKIS); and the Official Geodetic Points Information System (AFIS). The three geo-data sets were integrated into one data model called the ATKIS-ALKIS-AFIS (AAA) data model. The AAA model now serves as a standardized basin for specialized information systems.

a) Authoritative Topographic-Cartographic Information System (ATKIS)

ATKIS was developed to establish and maintain uniform topographic geo-data bases at the federal level and aims at the provision of digital models of the Earth's surface suited for data processing (Gundelsweiler and Bartoschek, 2007). It is used as a base for spatial reference and for the linkage to and combination with thematic geo-data. The ATKIS describes the surface of the Earth with digital landscape and terrain models. The topography (landscape) includes settlements, transport networks, vegetation, water, terrain, boundaries of political and administrative units with names, etc. There are four main data sets (Hintze and Lakes, 2009):

i. Digital landscape models (DLM)
ii. Digital elevation models (DEM)
iii. Digital topographic maps (DTM)
iv. Digital orthophotos (DOP)

b) Official Cadastral Information System (ALKIS)

The ALKIS provides the official list and proof of land property and ownership where parcels of land and buildings are listed and described (Hintze and Lakes, 2009). It also provides basic functions for legal services, administrative and economic. It handles identification of land values, environmental and nature conservation considerations, and integrates official house coordinates data sets. It also provides the basic data for Spatial Data Infrastructure (SDI). ALKIS is made up of:

i. The ALK (real estate maps or digital cadastral maps) – covers property and real estate in the form of maps, location and geometry of the real estate, and individual parcels of land and their borders, the buildings, type of land use and its borders, etc.
ii. The ALB (real estate cadaster book or digital cadastral register) – identification, area and position description; public law provision for areas such as nature protection areas; and for tax purposes and property ownership.
iii. The HK – official house coordinates

c) Official Geodetic Points Information System (AFIS)

AFIS contains information about the geodetic points and their spatial references. Reference points for location, height, gravity, and reference stations for Global Positioning Systems (GPS) are integrated (Hintze and Lakes, 2009).

d) Benefits of the AAA Model

The main goal of the AAA model is to integrate cadastral information (ALKIS), geodetic information (AFIS), and topographic information (ATKIS) into a new model, into one single application schema (Muller and Siebold, 2007). The AAA-Reference Model for the basic geo-data sets of all public surveying and mapping authorities in Germany has been developed by the Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany. Some of the benefits derived from this include:

i. Integration of the spatial reference system, the real estate cadaster, and topography in one AAA application schema
ii. Harmonization of cadastral and topographic data as a base for the modeling of application-specific themes
iii. Integrates the data management of historical data (data versioning)
iv. Defines metadata and a standard-based Data Exchange Interface (DEI) based on Geography Mark-up Language (GML)

v. Lays the foundation for a broadly applicable geo-data base, which can be the impulse for the implementation of a beneficial and also economically successful National Spatial Data Infrastructure (NSDI).

VII. Achieving Integration in Nigeria

a) The Need for Integration

The geo-data infrastructure described above is a must for a modern state. In Nigeria at the moment, geo-information is acquired and stored mostly in analogue form by various agencies of government such as Ministries of works, environment, etc., and by the private sector for their own use and applications with attendant problems of unnecessary overlaps and duplication, lack of accountability, and varying standards and formats (NGI Policy, 2003). The Office of the Surveyor-General of the Federation (OSGOF) has the constitutional mandate as custodians of topographic and geodetic data while cadastral data are in the custody of the various state governments (NGI Policy, 2003). The aim is to achieve an object-related data integration which will allow for the exchange of data stemming from different sources, different representations and structures, and thus will establish a base for performing combined, integrated analyses. Secondly, the integration of topographic, cadastral, and geodetic data sets is a sine qua non for the development of a functional National Spatial Data Infrastructure (NSDI) for Nigeria since cadastral and topographic data sets are basic elements of an SDI. With the integration, a fundamental technical and practical contribution for the NSDI would become available. In this vein, Enemark (2004) argues that Land Information should be organized to combine the cadastral and topographic data, and hence as a spatial data infrastructure at national, regional/federal and local levels based on relevant policies for data sharing, cost recovery, access to data, standards, etc. Thirdly, integration of these data sets will contribute to the local and national strategic agendas of economic growth, social cohesion and well-being, environmental sustainability, and good governance. Wide availability of more accurate, timely, and accessible data will facilitate better planning, better governance by providing citizens with richer information, and will support economic growth through enhanced resource planning, and therefore improved decision-making.

b) Requirements for Achieving Integration

For Nigeria to achieve the integration required for sustainable national development, certain steps must be taken. Some of the key steps include:

i. Need for development of a consistent and transparent legal and policy framework leading to planning, development, and maintenance of a national geospatial data infrastructure as a statutory infrastructure. For example, development of a geo-portal for data access.
ii. Education and broader capacity building to ensure that both the skills required to make best use of spatial information are available, and key decision-makers are aware of the value of this infrastructure
iii. Staff of the national mapping agency (OSGOF) will need to be retrained to acquire multidisciplinary skills. For example, the use of standards which is important for implementation, such as following the rules of ISO and use of "standardized" modeling language (UML).

c) Challenges of Integration

The major challenge of integrating the Nigerian cadastral and topographic information systems involves the way the Nigerian Land Use Act is structured. At the beginning of the 20th century when Britain made a colony and protectorate of Nigeria, there was a multiplicity of land tenure systems in the country. Apart from the system in the Lagos colony where an English freehold system had been established following its annexation in 1861, these diverse systems can be grouped broadly into two (Olakanmi and Co., 2009).

The first obtained in northern Nigeria where the colonial administration had placed all lands under the control and subject to the disposition of the Governor. Without the consent of the Governor, no title to occupation and use of land was valid. The Governor was to hold and administer the land for the use and common benefit of the native peoples. Any native or native community lawfully using and occupying land in accordance with native law and custom enjoys a right of occupancy and no rent is paid in respect of such rights. By contrast, in southern Nigeria, the second system recognized that land was owned by lineages or extended families. Individuals have only right of use on such family land. The only land held at the Governor's disposal was that which had been expressly acquired for public purposes as Crown land. It was not surprising, therefore, that faced with these contrasting land tenure systems and the considerable hassle in getting land for public purposes especially in southern Nigeria, the Military government sought to unify the two systems through the Land Use Decree of 1978 (Olukanmi and Co., 2009; Kenneth, *et al*., 2010; Otubu, 2010; Nuhu, 2011).

The Land Use Act, the major land statute in Nigeria, confers the right to allocate land on individual state governors. As it stands, land use/allocation is subject to political interference. Governors use their powers as conferred on them by the land use act to settle political scores, compulsorily acquire land belonging to their opponents or at other times revoke their certificates of occupancy, or delay granting consent on the issuance of such rights (Kenneth *et al*., 2010). The shortcomings and weaknesses of the

Nigerian Land Use Act of 1978 have to do with corruption and abuse of power by the state governors or their representatives. There is a stringent call for the amendment of the Land Use Act to reflect a modern system that is geared towards the generation of land markets, digital cadastres and sustainable social, economic and environmental development. Bennett *et al*. (2013) argues that good governance, transparency, social inclusion, effective disaster management, and spatially enabled societies, amongst other things, are more difficult to achieve if static, inadequately funded land administration systems prevail.

d) Digital Cadasters Required for Integration

Digital cadasters ensure security of tenure and land rights of citizens. This is an important foundation for economic development. The traditional systems of land administration are no longer adequate to support sustainable development and to stimulate land market (Tuladhar, 2003). For many of these, land titles are the main sources of land collaterization for obtaining credit from informal and established institutions. Consequently, securing land rights and land titles is particularly relevant for all socio-economic classes in the nation's economy but especially to the farmers whose pervasive poverty to date derives from not having definitive property rights appropriate to a market economy. Furthermore, fees and taxes on such landed properties are very important sources of revenue for governments. However, a large share of land in the country is not formally registered while informal titles cannot be used in obtaining loans hence limiting financing opportunities for businesses, especially small and medium-size enterprises (Nuhu, 2011).

If Nigeria is to meet the challenges of competing effectively in an increasingly globalizing world, it is imperative that it gives urgent and sustained attention to promoting its land reform to facilitate property development. The use of traditional forms of tenure to provide security of tenure have proven to be a cumbersome approach that ultimately results in lengthy procedures which offer totally inadequate access to the poor (van der Molen, 2003). The Land Use Act has not and cannot guarantee an equitable distribution and administration of land in Nigeria. Unless the current legal regime is reviewed, the inequality and injustice in land administration engendered by the Act will continue unabated with dire consequences for the proper development of land market and land economy in the country (Olayiwola and Adeleye, 2006; Otubu, 2010). The land reform should seek to solve, among others, multiple allocations, unattended applications, forgeries, encroachments/conflicts, revenue generation, unplanned growth, misuse of land for non-compatible uses, and under-utilization of large expanse of land across states. This calls for a comprehensive digital cadaster survey to provide for a comprehensive digital cadaster and to capture the entire land holding in the country and establish coordinates therefrom (Nuhu, 2011).

To achieve digital cadasters as advocated above, there must be concerted and deliberate efforts towards:

i. Collection and maintenance of data digitally
ii. Improving internal processes, such as quality of management
iii. E-governance
iv. Improving services such as marketing, cooperation with partners and customers
v. Optimizing use of available resources, such as the training and re-training of staff
vi. Information Communication Technology (ICT), which is a major challenge in Nigeria in terms of computerization of records and internet availability and accessibility
vii. Standardization leading to interoperability
viii. Legal framework, organizations, and responsibilities to support policy implementation

e) Nigeria and the National Spatial Data Infrastructure Challenge

For Nigeria to achieve the required integration of its cadastral, topographic, and geodetic data sets, the country must overcome the National Spatial Data Infrastructure (NSDI) challenge. Nigeria has recognized that geo-information is critical to national development issues such as poverty alleviation, food security, improvement of quality of life, economic planning, and natural disaster management. Geo-information also plays a significant role in regional integration and international cooperation. It is therefore essential to the development of various sectors of the economy such as petroleum, solid minerals, forestry, agriculture, transport and aviation, environment, security and defense, tourism, population census, education, health, and water resources.

Several government agencies in Nigeria acquire and store geo-information for their own use and applications. There is no coordinated effort at production, management, and dissemination of geospatial data sets that are commonly used by many of these agencies. This creates problems such as unnecessary overlaps and duplication, lack of accessibility, varying standards and formats, and difficulty in sharing and exchange (NGI Policy, 2003). Some of the organizations involved in geo-information production and management in Nigeria include National Space Research and Development Agency (NASRDA), Office of the Surveyor-General of the Federation (OSGOF), Abuja Geographic Information System (AGIS), Regional Centre for Training in Aerospace Surveys (RECTAS), Nigerian Geological Survey Agency (NGSA), various relevant ministries, land and survey departments in all the states of the federation, etc.

These organizations require geo-information data in formats that are accessible to them, and that enable sharing and exchange.

Due to the increasing awareness of the use of geo-information for decision-making over the past years and coupled with the apparent availability of data from Nigerian satellites, the country has realized the need to adopt policies for promoting greater awareness and public access to standard and coordinated geospatial production, management, and dissemination by all sectorial institutions and therefore the need for the establishment of geospatial data clearinghouse at various levels in the country and linkages with the private sectors (NGI Policy, 2003). An efficient functioning NSDI is a vital requirement for sustainable development, but Nigeria should go beyond this. Nigeria should strive to develop a data model that integrates three of the key/critical fundamental data sets, i. e., topographic, geodetic, and cadastral, into one data model that is accessible to all the relevant agencies of government and the private sector.

f) Benefits to be derived in Achieving Integration

The advantages Nigeria stands to gain in integrating topographic, geodetic, and cadastral data sets are myriad. It will lead to sustainable local and national development (economic, environmental, social, and governance dimensions) since these are key fundamental data sets required by most agencies of government and the private sector. Some specific benefits include:

i. Standardization in Nigerian surveying to include standardized feature catalogue, data content, and standardized format for data exchange. It will also enable the standardization of project management and utilization of international standards (ISO/OGC).
ii. Use of metadata to describe, explain, or locate, makes it easier to retrieve, use, or manage an information resource. Metadata is often called data about data or information about information. It is commonly stored in a database system and linked to the objects described. It therefore facilitates discovery of relevant information. In addition to resource discovery, metadata can help organize electronic resources, facilitate interoperability and legacy resource integration, provide digital identification, and support archiving and preservation.
iii. Modeling base for specialized information, including eliminating difficulties in the realization of cartographic aspects and the lack of data modeling between cadaster and topography, and management of different temporal versions of the same object.
iv. Cadaster becomes part of e-government and thus more important for business and industry because the cadaster is the heart of land administration. The cadaster provides a spatial integrity and unique identification for land parcels within the land administration system. All land administration systems require some form of spatial data infrastructure. SDIs and cadasters support the vast majority of society in a transparent manner and are seen as enabling platforms in support of spatially enabled societies and governments.
v. More and quicker information becomes possible because redundancies have been eliminated, graphical and attribute data have been integrated and semantic harmonization of cadastral and topographic data has been achieved.

VIII. Conclusion

The Nigeria Land Use Act is the instrument employed for land administration in the country. Given the multitude of criticisms and adverse comments on the imports and effects of the Land Use Act on the individual property rights, the land economy and management, commercial activities and social harmony within the country, the time is ripe for a total and comprehensive review and amendment of the Act. One approach may be the integration of the cadastral, topographic, and geodetic data sets into one data model. Such an integrated data model will make for efficient use and application of geo-information for sustainable development. Germany has successfully integrated these three data sets into one data model called the AAA model. Nigeria has the potential to achieve a full integration of these three fundamental data sets. This paper advocates that Nigeria should study the processes involved and the system adopted by Germany and adapt these processes to suit any peculiarities in our system in order for us to have a single data model for easier access to, and sharing of geo-information, and for the country to establish appropriate institutional and organizational infrastructures to manage the integration of topographic mapping and cadastral information into a coherent land administration system for sustainable development. The Office of the Surveyor-General of the Federation (OSGOF) should be the catalyst and provide leadership in this direction, in collaboration with relevant agencies such as NASRDA, NGSA, AGIS, etc. Institutional, legal, technical, and administrative frameworks should be established to ensure that integration is achieved, while these agencies promote research, training, education, and capacity building. Our aim should, first and foremost, be the recognition of the importance of spatial data infrastructure by politicians and government. Local initiatives should be pre-requisites for a national spatial data infrastructure as we seek to encourage user-orientation as key to a successful and sustainable SDI leading to full integration of our topographic, geodetic, and cadastral data sets into a single data model.

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Disability and Integration: Gambian Experience

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Abstract- This study investigated factors that hinder the integration of Gambians with disabilities into mainstream society through focus groups and surveys. Stigma towards those with disabilities was perceived as common and more community education on the medical causes of disabilities is needed. Full integration surfaced as fundamental and to achieve this, more support is needed, including both concrete supplies as well as training.

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I. Introduction

In 2007, the United Nations opened the Convention on the Rights of Persons with Disabilities (CRPD) and its Optional Protocol for signatures. With 82 signatories on the first day, it achieved the highest number of signatories on an opening day ever (UN ENABLE, n.d.). It entered into force in 2008 and offers those with disabilities in ratifying nations a new spectrum of rights. Two of its core principles are: "*Full and effective participation and inclusion in society*," and "*Respect for difference and acceptance of persons with disabilities as part of human diversity and humanity*" (United Nations, 2006).

It is especially important that these rights are realized in nations of the Global South, as persons with disabilities are not only more likely to be living in these nations, but also because of the strong correlation between having a disability and living in poverty (McClain-Nhlapo, 2007).The Gambia, located in West Africa, ratified the CRPD in July 2013, and discrimination against those with disabilities is prohibited under the 1997 revision to its Constitution. Despite this, Gambians with disabilities face challenges in equal participation in society and access to services (VSO Netherlands, 2007).

More than 10% of the Gambian population constitutes persons with disabilities as a result of mental, sensory, or physical impairments (Gambia Federation of the Disabled, 1995). Such disabilities should not disqualify these persons from the same entitlements, rights, and opportunities as all other human beings. Even though lives and functions may be limited in some respect by physical, social, or other factors, as stated by the CRPD, persons with disabilities should not be excluded from applying their fullest potential for self-development and their contribution to national development.

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Integration in this study refers to making persons with disabilities part and parcel of the society, and their interaction with all other persons in life activities. In other words, they have the right to live together in the same communities and participate in all activities on an equal footing from childhood to old age. Community-based rehabilitation (CBR) has been promoted as the ideal means for societal integration of those with a disability.

Community-based rehabilitation evolved after initial attempts to transplant the Global North model of rehabilitation to impoverished nations failed when the majority of clients could not access the services. Thus, in the 1970s, CBR was developed to better meet the needs of these nations (World Bank, n.d.). Since that time, CBR has continued to evolve. Currently, it is viewed as a multidisciplinary approach in which the primary goal is the improvement of the quality of life of persons with disabilities. This includes not only medical rehabilitation, but also access to other services, including healthcare, education and employment, and thus is integral to social development (World Bank, n.d.; World Health Organization & Swedish Organizations of Disabled Persons International Aid Association, 2002). It is recognized that in order to achieve this, the stigma surrounding disability and persons with disabilities must be eliminated(World Health Organization & Swedish Organizations of Disabled Persons International Aid Association, 2002).

People in different parts of the world attach different meanings to different types of disabilities. Persons with disabilities may be perceived as unproductive, burdens to society, as well as unfit for marriage or reproduction and local beliefs can affect these views. For example, in places where people believe that fits or seizures are the work of devils, a child with fits may be feared, teased or kept hidden, whereas in places where they are viewed as the result of a biological disorder, such a child is more likely to participate fully in everyday activities of the family and/or peers. Concepts and negative attitudes have even subjected newly born babies to death or to be thrown away, and mothers who failed to comply were threatened with severe sanctions by their communities (Holbrook, 1991). Attitudes towards persons with disabilities are viewed by many diverse cultures or models to comprehend disability. Understanding these models is fundamental as they don't only shape attitudes but also policies and programmes for, with and by persons with disability.

The charity model. Presents disability as a personal tragedy with persons with disabilities being objects of sympathy and described as crippled, crazy, idiot etc.They are perceived as useless, dependent, dangerous and strange resulting in being feared, hidden or institutionalized for the good and protection of society. Survival rather than empowerment is the priority of the model (Barnes and Mercer, 2003), which is similar to the religious model that considers persons with disabilities as people who are cursed as a result of having committed sins in the past or due to sins committed by their family members and ancestors (Katz, 1987).

The medical/biomedical model. Believes that a perfect world is a world without disabilities. Disablement is a defect, deficiency, dysfunctionality, abnormality, failure or biomedical "problem" that is located within the individual, viewing persons with disabilities as patients and medicalizing disability. Though created awareness in preventing and treatment of disability it came with a high price like professionals being in total control of the lives of persons with disabilities, deciding what is best for them, institutionalization or isolation from the community, limiting empowerment to functional independence, presenting disability as a disease, perpetuation of dependency, and a problem of the individual, etc. The model is criticized for not covering the full spectrum of the problem, ignoring the capacity of persons with disabilities, presenting them as tragic or people to be pitied, reinforcing the erroneous view that professionals are best qualified to make key decisions, placing little responsibility on the environment and societal attitudes towards disability, etc. (Hans and Patri, 2003).

The social model. Response to negative attitudes created by the charity and medical/biomedical model and their profound negative impacts on the self-identity of persons with disabilities. It locates the problem in the barriers existing in society and advocates the rights of persons with disabilities, and the imperative to eradicate the socio-economic, political and environmental barriers that hinder the capacity of persons with disabilities to participate and engage in societal development like all citizens, thus shifting focus away from medicalization and tragedy to environment as the disabling factor. The order becomes mainstreaming disability by creating opportunities for persons with disabilities through policies, legislation and their active participation in matters affecting them, hence the call for empowerment, de-institutionalization, community participation and independent living programmes. The model is criticized for the dichotomy of "body" and "society" assuming that impairment is given and doesn't affect the social experience of persons with disabilities. Equally, it is criticized for removing out of the equation the impacts of both injuries/diseases and the negative attitudes of others in the social environment out of the equation (Crow 1996; Goodley, 2001).

The citizenship model. Focuses on reconceptualization of disability, building an inclusive and rights-based community committed to diversity, equality, and participation of all. Representing a development paradigm in which the core is equal rights and equal opportunities for all; expanding empowerment to include active participation in decision-making, barriers removal, human rights legislation, access to appropriate and quality education, skills, support systems and programmes which enhance functional independence plus an overall control of their destiny. Thus, it addresses the shortcomings of the social, medical, and charity models while building on their strengths by conceptualizing individual and social responses to disability in terms of people's capacities and restrictions in a positive and constructive manner, which contributes to mainstreaming and inclusion of all. Persons with disabilities must be granted equal opportunities for attaining full economic potential and realizing their fundamental human rights (Elizabeth Anne England Richard, 2011).

The sociopolitical model. In a perfect world, persons with disabilities are accorded full civil and political rights. The sole commonality among persons with disabilities is the prejudice and discrimination they experience. Society teaches persons with disabilities to submit to prejudice and discrimination with patience- to be a "good sport." It mobilizes persons with disabilities into political and civil rights organizations. The problem of disability is located in the social and political environment and the solution is changing the environment. It dismisses the legalized treatment of persons with disabilities based on their so-called biological pathology or inferiority. (Juliet Smart, 2014; Lorna Jean Edmonds, 2005).

The biopsychosocial model. Presents disability as emanating from a combination of factors at the physical, emotional, and environmental levels, focusing on another level the beyond individual in addressing matters that affect people's ability to maintain a high level of well-being. It recognizes illness, biological, emotional and associated impacts on health, well-being, and function in society. It is criticized for emphasizing the disabling situation rather than the person and the experience of the person with a disability, being the defining construct of the model (Smeltzer, S.C., 2007).

It has been documented throughout Africa that persons with disabilities have been stigmatized. In countries as widespread as Ethiopia (Brown, 2012), Ghana (Tijm, Cornielje, & Edusei, 2011), Lesotho (Kabzems & Chimedza, 2002), Nigeria (Smith, 2011), Senegal (IRIN, 2010), South Africa(Nel, 2011) and Zaire (Devlieger, 1995), stigma against those with disabilities

has been documented. Some believe it is a curse from God, witchcraft or is caused by eating certain foods (Smith, 2011). The person with a disability is often regarded as being of no worth, which can result in exclusion and low self-esteem (Tijm et al., 2011).

This stigma can create barriers to integration that hinder the ability of persons with disabilities to live and interact with others. This, in turn, can affect their opportunities to earn a living. Employment discrimination in the form of unemployment and underemployment is common practice against individuals with disabilities (Smith, 2011; Tijm et al., 2011). In Gambian society, attitudes toward those with disabilities have clearly affected employment opportunities. Many persons with disabilities are often seen begging within the capital city of Banjul and other growth centers. Even the few, who are educated or have had some vocational training, are sometimes discriminated against in the job market. Few of the persons with disabilities in The Gambia are in gainful employment, either in the formal or informal sector. The vast majority of those in the formal sector are engaged in the lowest paid jobs such as clerks, typists, and receptionists. This imbalance is also reflected in the informal sector (National Disability Survey, 1998).

As noted, there have been studies conducted in other areas of Africa regarding peoples' attitudes towards/against persons with disabilities and integration of persons with disabilities. However, none have been conducted in The Gambia. The primary impetus for this study was to investigate the problems and barriers associated with the integration of persons with disabilities and to shed more light on these problems, especially on institutional, public, and individual attitudes. The purpose of this study was therefore to investigate those factors that hinder the integration of persons with disabilities into mainstream Gambian society. There were three research questions on which respondents' views were sought:

- How people's perceptions and attitudes about disabilities affect the integration of persons with disabilities into their communities;
- What respondents believed was needed in order to achieve community-based rehabilitation;
- The perceptions of the community regarding the importance of the societal integration of persons with disabilities in relation to their fundamental needs.

II. Methodology

a) Research design

This was a cross-sectional research that sought to gauge people's attitudes towards persons with disabilities and their integration into mainstream society. The research sought to gather both quantitative and qualitative data on the participants' attitudes towards both persons with disabilities and their integration.

b) Inclusion and exclusion criteria

To participate both in the survey and the FGDs, persons selected from the communities must come from a compound/family with at least one person with a disability and must be above 20 (twenty) years old. Forprofessionals, s/he must have worked for at least two years with disabled people's organizations (DPOs) while for persons with disabilities; one must be a registered and active member of a disabled people's organization.

c) Sample size- determination

The study was conducted in Banjul, the capital and commercial city of The Gambia as a sample representative of the country. This was strengthened by the look and roles of a capital and commercial city in developing nations where almost all government ministries, departments, hospitals and major health centers, national rehabilitation centers, higher learning institutions, business enterprises, organizations for and/or of the persons with disabilities, non-governmental organizations (NGOs), etc. are located; and furthermore many persons with disabilities are often found begging or moving around with social and economic constraints. The city was divided into five constituencies with a population of about 120,084 inhabitants. But because of constraints such as funds, human resources, and time the study was limited to three (3) constituencies, five (5) government departments, four (4) associations of persons with disabilities, and three (3) non-governmental organizations that support persons with disabilities.

d) Sample and sampling technique

There are various sampling techniques; however, due to the nature of the population studied I used the stratified and random sampling techniques. This was necessary as the aim was to collect information from various strata of society with at least a population of approximately one hundred (100).

Of 100 respondents surveyed, 90 responded. This represented a participation rate of 90%. While 56%male, 44% were female and over half (58%) of them were employed (i.e. 67% worked full-time, and 33% work part-time). All respondents had attained senior secondary education with 4(4%) holding master's degree, 12(12%) holding bachelor degree, 48(48%) holding ordinary or advanced diplomas, and the rest 36(36%) holding either an ordinary or advanced level certificate.While 32(32%) were between 25 and 35 years, 43(43%) between 36 and 46 years, the rest 25(25%) were between 47 and 55 years. Over half (63%) of the respondents are persons with disabilities with 41% female and 59% male.

e) Description of research instruments

Owing to the sensitivity of disability in The Gambia, the most suitable and convenient technique of data collection was the questionnaire. This technique, in addition to the nature of the study, was chosen for its reliability and practicability and that it hardly exerts much pressure on the respondents. It facilitates the collection of more data, limits bias of interviewers, and responses are in the respondents' own words or choices. Focus group discussions (FGDs) were also held to complement the questionnaire method.

The focus group participants were recruited with the support of the ward councilors of the three constituencies and the head of the National Rehabilitation Centre at the Department of Social Welfare. The Executive Secretary Generals of the respective Disabled People's Organizations (DPOs) equally assisted by pasting an announcement on their notice boards urging their members to register and participate in the study. Participation was purely voluntary and the purpose of the study was explained to the participants. Six focus group discussions consisting of seven participants were conducted. A discussion guide validated by key stakeholders (e.g. members of DPOs and professionals) in a steering committee was used in the focus groups to ensure that all groups discussed the same topics.

The use of the focus group method was found to be effective in capturing the salient viewpoints and personal feelings towards persons with disabilities and their integration Webb & Kevern, (2001) thus augmenting the statistical data gathered from the questionnaires. Equally, it availed participants of an open platform in which to express their opinions freely on the subject.

Six focus group discussions, which were an afterthought, were held in three wards in Banjul. The sessions were held with a variety of stakeholders. Key informants were selected using purposive sampling to recruit those able to provide relevant information, as well as representing different constituencies. Three out of five constituencies of the capital city of Banjul as well as five government departments of state, associations of persons with disabilities and three non-governmental organizations were the sample groups. A discussion guide was used in the focus groups to ensure that all groups discussed the same topics. Questionnaires were designed and administered together with the focus group discussions to complement the survey data.

f) Data analysis method

The quantitative and qualitative data obtained from the field were entered using the SPSS, and were subsequently processed and interpreted both quantitatively and qualitatively. The process entailed two stages: initial analysis was by codes and table creation, variables prepared through combining a number of codes, converting codes into variables or developing completely new variables in the case of the quantitative data.

To analyze the qualitative data obtained both from open-ended questions and focus group discussions, content analysis procedures described by Bogdan and Bilken (2003) were used. To start with, categories describing participants' attitudes towards persons with disabilities and integration were created and data were grouped into such categories to allow proper analysis and interpretation.

All responses from focus group discussions and open-ended questions were included in the qualitative analysis. The researcher worked with one senior lecturer and private consultant familiar with qualitative data analysis. Both parties independently read all responses to become familiar with the overall nature of the responses. As they read the responses, they highlighted phrases and sentences that captured the essence of the participants' opinions and generated labels to represent fundamental concepts. Then, they independently grouped all repeated responses to gain a sense of the relative importance of the issues identified by respondents. Independently, they defined tentative categories for coding responses by combining opinions that seemed to address the same issue and wrote definitions that described the focus of the category.

After such an exercise, the parties met to discuss the initial wave of analysis, conducted a page-by-page comparison of their highlighting and agreed on broad categories that were used to independently code all the responses. In a subsequent joint review of their independent analysis, they compared notes, negotiated discrepancies, identified gaps, and reached consensus on a streamlined set of categories.

In summary, both descriptive and inferential statistics were used in the analysis. Descriptive statistics were used to provide a summary of patterns that emerged from the responses of the sample. Inferential statistics, on the other hand, were used to provide an overview of the applicability of the resulting patterns to the population.

III. Results

a) Survey results

There were 48 respondents to the survey. For most questions, participants were able to pick more than one response, so totals exceed this sample number. Research question one was how people's perceptions and attitudes about disabilities affect the integration of persons with disabilities into their communities. Three questions were used to assess information in this area. Question one asked, "What do you think of the attitudes people have towards disabilities and persons with disabilities?" The most common statement was that disability was a result of

punishment from God (24%). Following closely were the ideas that it is a result of witchcraft (22%) or a bad omen (21%). Thus two-thirds of respondents believe people are influenced by some form of superstitious beliefs in a negative manner. An additional 17% thought that it was due to the will of God. Only 6% stated it was a result of birth or an accident. (See Table 1 for details).

Table 1: Type of attitudes

	N	%
Punishment from God	22	24
Witchcraft	20	22
Bad omen	19	21
Will of God	15	17
Birth	5	6
Accident	5	6
Diseases	4	4
Sacrifice for wealth	1	1
Total	91	100

The second question in this section asked respondents to identify what effects they believed these attitudes had on persons with disabilities in society. As illustrated in Table 2, it was believed that these effects were overwhelmingly negative. Twenty-seven percent believed it resulted in the rejection of persons with disabilities, while 25% stated it resulted in persons with disabilities being hidden, and 24% saw it resulting in denial of services. When asked if these attitudes influenced the process of integrating persons with disabilities while staying with their families within their communities, 88% said yes, while 12% did not view the question as applicable. However, Table 3 below illustrates that the vast majority (82%) believed that the negative attitudes towards persons with disabilities could be changed for better through awareness-raising campaigns.

Table 2: Types of effects due to negative attitudes

	N	%
Rejecting them	24	27
Hiding them	22	25
Denial of services	21	24
Sympathy	06	7
Tendency of killing them	05	6
Humiliation	04	5
Discrimination	03	3
Reducing them to beggars	02	2
Maltreatment	01	1
Total	88	100

Table 3: Type of effective intervention for attitudinal change

	N	%
Awareness raising	39	82
Encouragement of acceptance of persons with disabilities	5	11
Independence	3	6
Giving moral support	1	2
Total	48	100

Research question two

Community-based rehabilitation is considered the best strategy for the proper integration of persons with disabilities into mainstream society. The next set of questions assessed what respondents believed was needed in order to achieve this. The first question in this section asked respondents what supportive services they believed persons with disabilities needed in their communities for proper mainstreaming (see Table 4). Approximately one-quarter of the respondents subscribed to the view that persons with disabilities need education and training for any effective integration into mainstream society. An additional 21% of the respondents saw guidance and counseling as key supportive services needed by persons with disabilities.

Table 4: Type of supportive services needed by persons with disabilities

	N	%
Education and training	45	24
Guidance and Counseling	40	21
Medical services	36	19
Financial and material support	32	17
Taken care of	21	12
Access to facilities and services	06	4
Employment	04	3
Technical Aids	02	2
Legislative support	01	1
Total	187	100

The next question assessed who the appropriate service provider should be. It was almost evenly tied between governmental agencies, non-governmental organizations, individuals and families/communities. Only three percent mentioned organizations specifically for those with disabilities.

Table 5: Categories of service providers

	N	%
Government institutions	45	27
Non-governmental organizations –NGOs	40	24
Individuals members	38	23
Families communities	38	23
PWD's Organizations	5	3
TOTAL	166	100

Research Question three

Research question three sought to determine the perceptions of the community regarding the importance of the societal integration of persons with disabilities in relation to their fundamental needs. To assess this, respondents were first asked where they thought it would be most beneficial for persons with disabilities to live. Forty-four percent of the respondents believed that persons with disabilities benefited most by staying with their families/communities, while 39% responded they are better off living independently. Only 17% thought it was better for them to live in an institution.

Lastly, respondents were asked their opinion on how the process of integration could be best maintained and sustained. The purpose was to ascertain which institution was viewed as most suitable for the coordination and sustenance of disability and integration programmes. Table 6 below depicts the responses of the respondents. The most common response was community support (39%), followed by government funding (29%) and donor support (24%).

Table 6: Means of maintaining and sustaining integration programs

	N	%
Community support	42	39
Government funding	31	29
Donor support	26	24
Individual support	4	4
Organization of PWD support	2	2
Awareness raising	1	1
Employment	1	1
Total	107	100

Focus Groups

Participants were first asked to name types of disabilities. The only forms of disabilities mentioned by the groups were mental disability, visual impairment and vocal disability. The second question asked what children with disabilities needed and elicited several themes. The most salient points made by the groups were early child education and schooling, a caring and friendly relationship with their parents, and a clean and safe environment. A few people made reference to the fact that children with disabilities should not experience discrimination. One participant said:

People think that it is only good food, clothing and hygiene that make a child with disabilities feel recognized, valued, accepted and well cared for. If you don't show your child with disabilities that you care and love him and if you always isolate him in the house or even his bedroom, he will be psychologically and mentally disturbed and once he sees you as a parent who is not proud of him like the other children, you are creating a problem for the child right from the tender age.

When participants were asked to talk about the benefits of reintegrating the persons with disabilities, a variety of responses was obtained. Many participants stated it was critical for social interaction. One woman stated, "When you allow your child with disabilities to interact with other children, you are simply helping him/her to develop his/her intellect and learn the art of caring and sharing." Other common benefits were social acceptance, access to quality education and healthcare, employment, and relieving the burden on the family. A few mentioned increased self-esteem. Interestingly, equal rights and opportunities were not highlighted at all as one of the benefits of disability and integration.

When asked about attitudes towards those with disabilities, participants felt that treating persons with disabilities like any other member of the community could not be over-emphasized as it is an indication of being valued and accepted as a partner in societal development; it is the right of persons with disabilities to be treated humanely like any other person. Encouraging those with disabilities to give their views about issues of concern to the family and communities is a way of encouraging them to feel positive about themselves and their communities. They stated that acceptance accelerates intellectual and social development, allowing persons with disabilities the chance to move freely, go to school, or be employed. One participant said, "Wise societies discourage their persons with functional limitations from begging and dependence. They provide them with several vocational training programmes and motivate them to explore the diverse opportunities out there with their brains."

Participants were asked about their views on the provision of technical aids to those with disabilities, such as wheelchairs or white canes. A common viewpoint was that this shows, "We are a nation that cares and shares."An older adult with visual impairment stated,"It is a person with disabilities' human rights to have a technical aid, for it is either our third leg or third eye, ears in the case of the hard of hearing person." One advocate stated:

Many people in this community don't know what is involved in having disabilities or a family member who has disabilities, but we know that it is critical that they are provided with technical aid. Imagine having to crawl in the hot sun or having to manage a wheelchair in this sandy community. It is painful and sometimes unbearable. The technical aid must be appreciated, accessible and affordable. In the past we believed that when you take your person with disabilities to a rehabilitation center, you were exposing your family to ridicule but now we must do away with those irrational beliefs to support them to access modern technology for they are our blood.

However, discussants were split as to who should be responsible for the provision of technical aids.

While some said the central government, others stated the local authorities, and yet others said disabled persons organizations (DPOs).

The sixth question asked about early childhood education for children with disabilities. The majority of the participants stated that early education was beneficial, especially for children with disabilities, as it develops the mind at a young age, and that early childhood education was a means of training and setting the child on the road to school. Others felt it also helped to relieve the burden of care giving on families. It was noted that this should be balanced with religious education as well. One man stated:

The human mind is like a rubber band; if you pull it, it will stretch but if you don't pull it will not. So the earlier we send children to school, the better, but we should not play down the significance of early enrollment in Islamic centers either.

The issue of hiding children with disabilities triggered a tense debate in most of the sessions. Opinions were widely divided on what constituted "hiding" and whether or not hiding was justifiable. Nevertheless, a good number of the participants said that only persons who are dangerous and/or have severe disabilities should be hidden by their parents and families. However, a significant proportion of the discussants opined that hiding is necessary because if persons with disabilities were visible in the community, it would bring shame to their families and the community. Acommunity leader said, "Isolating severely disabled person is not bad in principle because even in democratic societies they have different institutions for different disabilities. The bone of contention is about the method of hiding. Locking up, tying them to poles, etc. is unwarranted and inhumane; but to keep them away from the public view, especially visitors, is sometimes necessary, just to maintain peace and security."

When asked how communities could assist in the support and integration of persons with disabilities, it was very difficult for the participants to come up with answers. The moderators had to probe exhaustively to elicit answers. Spreading knowledge and skills in caring and supporting a person with disabilities was one method to provide support. Others mentioned enrolling them in schools and vocational centers, building ramps, taking them to rehabilitation centers and assisting them in how to use their technical aids to move freely in their communities. A few said the role of the community includes lobbying the central government, local authorities, parliamentarians, policy makers for a Disabilities Act and a national disabilities policy.

Participants were asked how they carried out their assigned roles, whether they were officials or volunteers. Most of the discussants said they always made sure parents practiced what they were taught. Many of them cited education and sensitization, as well as periodic treks to the communities. They also conducted discussion forums and even drama shows to highlight the plights of persons with disabilities and what they can do if given the chance with a conducive socio-economic and political environment.

When asked about barriers the participants encountered in their role, the majority stated that they faced some constraints in carrying out their roles. When asked to elaborate, more than half said more training was urgently needed. They also lamented that their basic needs and concerns needed to be addressed, like the provision of the necessary tools and resources and recognition and appreciation of their efforts by the authorities and immediate managers. Many participants also alluded to the opening of more rehabilitation centers to reach those in the rural areas. A number of them raised questions of transport or means of transportation, supply of machines, materials and more funding for community-based activities. Few participants felt it was necessary for them to be provided with "overseas training."

When asked about factors that motivated them to work as volunteers and rehabilitation officials, the majority said they derived satisfaction and a sense of pride from serving disadvantaged groups like persons with disabilities. Some said they enjoyed the learning and skills acquisition process. Others said they have built a strong coalition with different organizations including, community and faith-based organizations. Many participants said the fact that they have been making some changes in the lives of persons with disabilities, their family and the communities is a marvelous incentive. One young person said:

You don't do this kind of voluntary work for pay or any kind of material reward – it is the blessing, the sense of satisfaction, sense of duty to one's people, community and the respect you earn in the process that keep you going. If you have supported a family in how to assist a family member with disabilities or understand the right issues or what it takes to support a person with disabilities to develop intellectually and emotionally, you have attained a lot.

IV. Discussion

The findings of the study revealed that it was perceived that stigma towards those with disabilities is still common, but that there is a community working towards the integration of this population based on the concepts of CBR. Participants believed that services should primarily be community-based and that there was a wide variety of positive benefits that resulted from integration (Jean-Francois Trani, et al., 2012; Biggeri, M. et al., 2014). Early childhood education was seen as vital for social inclusion (Jenny, M. A. et al., 2002; Kelly Budisch, 2004). Full integration surfaced as a fundamental solution to the problems of persons with

disabilities because it ushers in acceptance and respect and subsequently promotes equal rights and equal opportunities for persons with disabilities(Helen Jackson, 1988, p. 12; Sarah Rule et al., 2006). This is crucial in a country like The Gambia where due to limited resources, most Gambians see employment in the formal sector as a source of income generation. Denial of education means denial of certain job opportunities and increasing dependence on others (e.g., family, society), which in turn reinforces the held negative beliefs about persons with disabilities (Oliver Walton, 2012, p. 13; David McDaid, 2008).

In order to achieve these goals (i.e. full integration, independence, equal rights and equal opportunities), participants stated that more support was needed. This includes both concrete supplies, such as technical aids, as well as non-tangible items such as training (Justin, L., Grider, 2014; Oliver Walton, 2012, p. 18). Education about what the community can do to support those with disabilities is needed. The results made it clear that more education on the medical causes of disabilities is needed (Daniel Vershima, et al., 1994; Miller, P. et al., 2004).

The stigma that is still attached to disability in The Gambia was clear. Similar to other African countries, disability may be seen as a curse from God and is therefore shameful (Smith, 2011). This stigmatization can result in hiding, as found in these results and concurs with previous findings (Tijm et al., 2011). Even among these stakeholders, the use of hiding was a debated topic with some participants sympathetic to the practice.

V. Implications

Based on these findings, a variety of recommendations can be formulated at all system levels. On the micro level, those with disabilities should be helped to accept their disabilities and to think positively about themselves, rather than viewing themselves as inferior and needing charity(Dr E. Pupulinet al., 2003; Reema Chauchan 1980). They should also be empowered to form and/or strengthen different organizations through which they can influence government policies and decision-making processes that either directly or indirectly affects their lives, possibly through collaboration, such as with NGOs, government, UN system, and other organizations(UNESCO – Beirut, 2013; Sunil Deepak et al., 2013).

On the mezzo level of families without a person with disabilities, there is a need for a reduction of the stigma surrounding disability and a concurrent need to recognize persons with disabilities and their families as normal and capable of contributing in the development process (Maria Isabel Novo-Corti, 2010). Families should be supportive to those with disabilities and should be assisted to recognize that the problems of disabilities are a community problem and the solutions lie within the communityitself (Myezwa H. et al., 2003; Olaogun, M.O.B., et al., 2009). Family members of persons with a disability should recognize all their family members as equals; those with disabilities and those without. They should also be helped to advocate for their family member by forming supportive associations, being actively involved in the search for advice, information, support, and be even ready for any call vis-à-vis disability and the integration of persons with disabilities (Sunil Deepak et al., 2013).

At the macro system level of government, committees inclusive of persons with disabilities should be formed to critically examine the needs and aspirations of persons with disabilities with regard to employment, education, recreation, rehabilitation, technical aids, and so forth (Denis Thompson et al., 2011). Second, they should create the necessary legal framework and authorities for measures to achieve such rights as the right to security and protection from inhumane and degrading treatments (Andrew K Dube, 2005; LexFrieden, 2010). The community should be educated about the support they can offer to those with disabilities and their families (Daniel Vershima et al., 1994).

In recent years, disability has been accorded considerable attention and concern in The Gambia but there is still room for further sensitization and further research in problems associated with it. Disabilities can have a number of negative impacts both on the persons with disabilities themselves and on their families as well as on the socio-economic development of a nation (Benny Feffermann, 2002). This study revealed that negative attitudes towards persons with disabilities still persist and can result in these individuals feeling unaccepted, isolated and unproductive. The findings further revealed that the rehabilitation of the persons with disabilities is feasible through CBR programmes which ensure community participation as opposed to the institutional approach and marginalization of persons with disabilities. These findings can help support such an approachas well as increase understanding and knowledge about disability and integration persons with disabilities in The Gambia, improve attitudes and attention, and ultimately enhance pertinent services and polices.

VI. Summary and Conclusion

Disability, like any other social problem in The Gambia, has been accorded some considerable attention and concerns in recent years from different walks of life, since it has numerous negative impacts not only on the socio-economic and political development of persons with disabilities and their families but also on the nation at large.

The study showed that the negative attitudes that people have towards persons with disabilities have substantially affected the integration of persons with disabilities. For with such attitudes, they feel unwanted, unproductive and isolated. This results in the creation of that wider gap between them and the rest of society, not mentioning the psycho-social and physical torture some are faced with.

Furthermore, the findings revealed with that CBR, successful integration is feasible. For it recognizes disabilities as a community problem and the solution lies within the community as opposed to the institutional approach, thus, acknowledging the significance of the participatory approach. The lack of full integration of persons with disabilities has been highlighted as one of the main causes of their marginalization.

In conclusion the findings concurred with the widely-held belief that "your attitudes towards persons with disabilities may be our biggest handicap and you too."

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Mobile based Communication System for Child Monitering

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Abstract- Child has been a victim of these fast growing mobile technologies, and their behavior and mobile usage are beyond the control of the parent. Hence they are freely addicted to the unethical behavior of mobile phones, especially smart phones, without the awareness of the parent.

This system mainly focused on monitoring the behavior of children when they are using mobile phones. Most parents give mobile phones to their children because they rely on giving mobile phones will keep them safe in case of any emergency. But using a mobile phone can make much dangerous significances in other hand. It can make a child an easy target for Cyber bullies, predators and exposure to explicit material and sexing.

Keywords: *mobile, SMS, caller- list, google-maps, web, android.*

GJSFR- I Classification: *FOR Code: 740101*

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Mobile based Communication System for Child Monitering

D. N. S. Kuruwitaarachchi [α], H. K. Y. Rathnamali [σ], S. Ranasinghe [ρ], C. B. Hettiarachchi [ω] & V. V. Haputhanthiri [¥]

Abstract- Child has been a victim of these fast growing mobile technologies, and their behavior and mobile usage are beyond the control of the parent. Hence they are freely addicted to the unethical behavior of mobile phones, especially smart phones, without the awareness of the parent.

This system mainly focused on monitoring the behavior of children when they are using mobile phones. Most parents give mobile phones to their children because they rely on giving mobile phones will keep them safe in case of any emergency. But using a mobile phone can make much dangerous significances in other hand. It can make a child an easy target for Cyber bullies, predators and exposure to explicit material and sexing.

This system designed to offer a better relief to the parent, which consists of two modules, android application and the web server infrastructure. Parent can monitor SMS, incoming and outgoing calls, websites visited and the location of each child separately. Child can be more motivated to doing the tasks allocated by parent because according to their performances they can receive ratings. It will help child to self-motivated and increase their enactments.

Through the web server infrastructure, the parent will allow viewing all above tracking data, as well as will allow to view how the progress of the child from secure parent web account by providing the child IMIE, since every child is separated from their IMIE. Our main objective is providing a better solution to the most challenging problem that the parent face to protecting child from misusing the mobile phones.

Keywords: mobile, SMS, caller list, google-maps, web, android.

I. Introduction

Smart phones, with their user-friendly and intuitive interface, have shown great demand among children and young people. In fact, the popularity of iPhones among children is so great that the New York Times called the iPhone as the Toddlers favorite toy of 2010.

Mobile phone usage has increased with age; with 40% of teenagers spend with mobile phones chatting with friends, exchanging text messages and browsing internet for more than 2 hours a night. Possibly more surprising, 22% of 7-9 also spend with their phones for more than 2 hours. [1]

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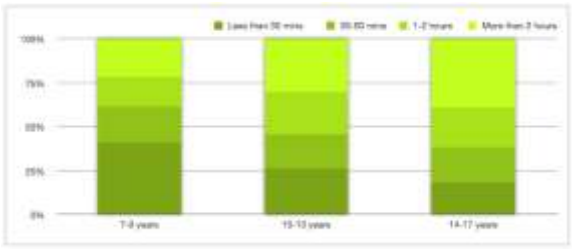

Figure 1: Mobile phone usage among teens

A Research Center study, Teens and Technology 2013, conducted by Lucia Moses(April 16,2013) found that while cellphone ownership has held steady, 37% of kids who were in age between 12-17 owned a smartphone in 2012, up from 23% the year before. [2]

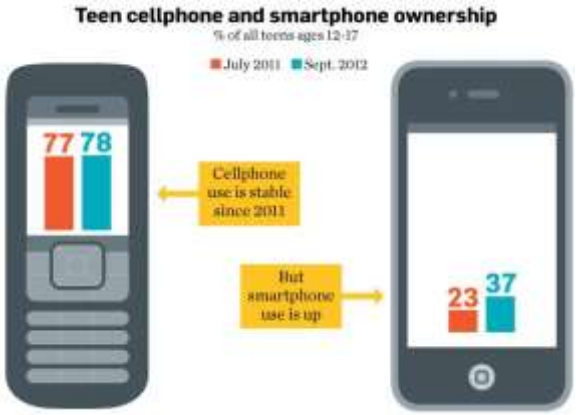

Figure 2: Ownership between teen cellphone and smartphone

Since the usage of mobile phones has become a most significant factor, there are biggest challenges that parents have to face in order to protect their kids being victims from the mobile phones.

The survey done by The National Campaign, to Prevent Teen and Unplanned Pregnancy in 2008, found 20% of teenagers who were in age between 13-20 and 33% of young adults who were in age between 20-26 among total of 1280, had sent nude or semi-nude photographs of themselves. Also it demonstrates 39% of teenagers and 59% of young adults had sent sexually explicit messages. [3]

Sue Marquette Poremba, who is published his article about monitoring the usages of children cell phone on nbcnews, defined since it has become a most effective tool, one of the biggest challenge relating to children and young people's use of smart phones, is the danger of encountering or downloading applications with wrong content. Therefore the mobile phones can make a child an easy target for Cyber bullies, predators and exposure to explicit material and sexing.

Today with the availability of social media and other Internet platforms of communication, youth are more open to communicating with strangers and may not think twice, about giving out their phone numbers to someone who friended them on Facebook. Yet the way many children and teens now use technology puts them at a different level of risk.

Therefor experts say that the best way to keep track of kid's activities is to essentially fight fire with fire, which means using technology to keep track of the way that the kids use technology. [4]

This study is focusing on since child has been a victim of these fast growing mobile technologies, and their behavior and mobile usage are beyond the control of the parent, they are freely addicted to the unethical behavior of mobile phones, especially smart phones, without the awareness of the parent.

This system designed to offer a better relief to the parent, which consists of two modules, parent module and the child module. Parent can monitor SMS, incoming and outgoing calls, websites visited and the location of each child separately. Child can be more motivated to doing the tasks allocated by parent because according to their performances they can receive ratings. It will help child to self- motivated and increase their enactments. This system includes a web server infrastructure; so that, the parent will allow viewing all above tracking data, as well as will allow to view how the progress of the child from secure parent web account by providing the child IMIE, since every child is separated from their IMIE.

Our main objective is providing a better solution to the most challenging problem that the parent face is to protecting child from misusing the mobile phones.

II. Methodology

Figure 3 illustrates the high level architecture of the system. This mobile based child monitoring system basically consists of two mobile applications and Web server infrastructure. Two mobile applications are parent and child mobile applications and both of them are android applications.

Figure 3: Technical Overview

This child monitoring system consists of five major components,

1. Measuring child performance by allocating tasks
2. Tracking child's mobile activities (SMS history, Call history, Web history)
3. Tracking child's location and show using Google map
4. Predict the child's location
5. Develop web server infrastructure

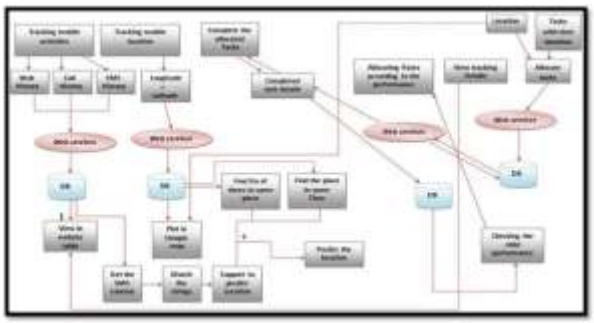

Figure 4: Development Procedure of the System

According to the figure 4, following section described the development procedure of each function.

a) Measuring child performance by allocating tasks

Allocating task is a module that is used to interconnect the parent and child mobile applications and which is mainly targeted to allocate the tasks to the child by the parent. All the data will be transferred using Web services. When the parent logged on to the parent application, the list of children who have registered under the relevant parent will be displayed. At that point, parent could select the relevant child to allocate the tasks. The tasks can be assigned weekly or daily basis to the child and it can be assign the location if parent want. Also parent is given the opportunity to modify and delete the tasks. After the parent allocates the tasks for

the child, the child can view those tasks by logging to the child application. Child can perform the tasks accordingly. When child completes a particular task, the child should update the tasks status as "Completed". Then those completed tasks will be notified to the parent. Parent is given the opportunity to evaluate the child's work and award the ratings according to the child's performance. When the parent awards the ratings, it is not only considering whether the child completes the task on time. Parent can also consider whether the child completes the task in a correct manner and achieved the expected result. Correct manner mean, when parent allocated that task by considering location, at that time parent can get that point also to evaluate the child. There is a map view to check the child location against to the parent assigned location. Also when parent assign the ratings they can check the child's work load manually and can measure the child's performance.

After parent awarding the ratings for the work done by the child, will be displayed to the child. At the end of each day child's performance will be displayed in a graph with ratings against to the task name. Then the child could know about their performance. By that child can get a clear idea about how should work more to increase the performance. In this case child will get self-motivated and continue his/her tasks well.

b) Tracking child's mobile activities (SMS history, Call history, Web history)

This module is implemented as back-end services in the child mobile application and not visible to the child. It is used to track all the child's mobile activities such as SMS history, call history, web history without knowing to the child.

Call history tracking feature is used to track the child mobile call history and implemented as a service in the child android mobile application. It track the contact number, contact date and time, contact type (incoming or outgoing) and call duration of the call history. After tracking these details, those are passed in to the web site through the internet using web services. In the web site, it is displayed these details for the parent.

SMS history tracking feature is used to track the child mobile SMS history and it is implemented as service in the child mobile application. SMS tracking consists of contact number, SMS date, and time, SMS content, and SMS type (sent received). After tracking the SMS history it will update to the web site through the internet using web services. In the web site those details are displayed to the relevant parent.

Same as to the above features web history tracking feature is used to track the browsing history of child mobile and it is implemented as a service in the child application. Web history tracking details consist of web URL and access date and time. After track the web history, it is passed in to the web site through the internet using web services for displayed to the parent.

In this function, it is not only consider these three features (SMS history tracking, call history tracking, web history tracking). It also consists of another feature of blocking specific contact number. This feature is useful for parent when parent want to avoid the connection between child mobile and other mobile for child protection. This feature is enabled in the web site and it is help the parent to block specific identified contact number that is connect with the child mobile phone.

c) Tracking child's location and show using Google map

This is implemented in the back-end service of the android application. The location is tracked in the child mobile and it is updated to the web server. In child mobile application, it is sent the latitude and longitude values according to the changes of the geolocations of the child location through the Internet using web services frequently. Those GPS values are updated to the web site and plot those GPS data in a Google map in the web site. This feature is unaware from the child and it is passed the GPS data frequently. Parent can checked the real time GPS tracking details of the child easily using Google map. Also this map view is update to the parent mobile phone checking the child location against to the allocated task location. In that situation the real time GPS data are viewed against to the allocated task. Parent can get these details to evaluate the child by checking whether child complete the task in correct location. Using that result parent can accurately evaluate the child.

d) Predict the child's location

Predict the child location useful when the connection between the child mobile application and web server goes down. In this system, it has the real time location tracking facility. But it is not provide longitude and latitude values when the connection lost. It totally depends on the internet connection between them. To avoid that in such situation it is predicted the child location using past GPS data of the child locations. In here this system considers all other major functions data when doing the location prediction.

a. Keywords searching
b. GPS data
c. SMS history
d. Call history
e. Web history

This location prediction module is working in two ways.

a. Parent can predict the location with considering keyword searching.

b. Parent can predict the location only considering the past GPS data.

Parent can predict the location with considering keyword searching:

In here there is a facility to searching the keyword by parent. Using the keyword searching parent can search any word. When a keyword type in the keyword search bar, the system check is this keyword is in any of the data of call history, SMS history or web history. It can be a contact name, location or any other word regarding to the SMS content, web URL or other than that. In that situation the system is capable of finding the location according to the predefined time range. When that keyword is found in somewhere of the details, the system find the location according to the keyword result. Also it considers the time range against to the prediction time. As an example if parent going to predict the location in 11 am, it add time range to that time. It mean it search the keyword of the time between 10.30 to 11.30. Also it is not considering the am or pm as well as the date. This searching data can be in any date of within the time range. When parent going to predict the location using keyword, in every time it consider the previous keyword result set also within that time range.

Parent can predict the location only considering the past GPS data:

Other than previous way parent can predict the location only considering the past GPS data. In that situation it is only consider the past geo-location within the time range. If parent is going to predict the location in 11am. It get the time range as 10.30 to 11.30 in any date. Likewise it adds the -30 and +30 to time. In that time it is retrieved the result set according to the time range and past child locations.

At the end both of ways are produce possible locations where child will be in.

e) Develop web server infrastructure

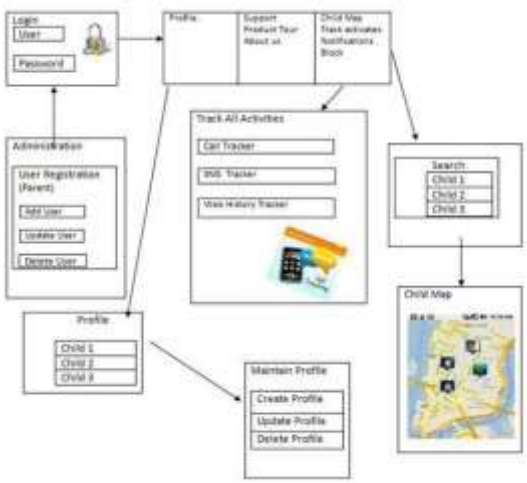

Figure 5 : Web Server Infrastructure

Figure 5 explained the web server infrastructure of the system. The following section is explained how it is captured this web server infrastructure in this implemented system

The main purpose of developing web server infrastructure is to build administration task well. In this implemented system it has to manage two mobile applications for one parent. When considering a mobile it is difficult to monitor these entire tasks with only using mobiles with limited capacity and speed. This web server infrastructure is giving major support to this implemented system by providing better administration.

This web site there are two user levels for manage this product. Parent can view all the details of child with including tracking mobile details, real time GPS locations, and child performance. But only child can access to the web site to view the performance details. All the child mobile tracking details of the child mobile and GPS tracking locations details are updated to the web server. Other than it is updated the child performance details to the web server. According to each child, it is displayed the relevant tracking details and Google map. Other than that it is measured the child performance and it is shared each child performance details to a separate page. This page can be accessed by both parent and child. Basically this web server is used to manage this product and to monitor child, parent mobile applications. All the details, data are kept in this web server.

III. Results and Discussion

The main result that wants to be achieved is the development of the fully completed system. Evidence plays an important role in any software product. Because from that, end user and other external parties, related to the project development, can get an idea of final output and the quality of the final product. This verifies the final output verification and the validation. According to this, project outcomes can be viewed under following major units.

- Motivate the child by allocating tasks and awarding ratings.
- Track all the child activities done using the mobile phone.
- View all the tracked detail in the web server infrastructure.

These are the test outputs of the Child Mobile Monitoring system (CMS)

Figure 6 : Task View

Figure 7: Completed Tasks

For each child, it is displayed the call history report interface. That is included all the call tracking history of the child.

Figure 8: Call Tracking Report

Figure 9: SMS Tracking Report

Figure 10: Web History Tracking Report

Figure 11: Child Location Tracking Map

This is the results and output finding final state for relevant to our system. We have successfully built the Child Mobile Monitoring System Software Application and demonstrated our achievements in the final presentation of our project.

IV. Conclusion

With the development of new technology, lots of features are added to mobile phones. Since kids are more addicted to mobile phones, the usage of smart phones has been increased up to 44% in year 2013 among kids aged between 10-15 years old. The most challenged problem that the parents face is to protect their child from misusing the mobile device. Therefore this child monitoring system is developed as a solution to help parents to protect their children from the negative impact of using the mobile device.

Child has both negative and positive impact by using a mobile phone. When the child understands the correct usage of a mobile phone, there won't be any negative sides. Negative impact is occurred when child is miss-using the phone. Unexpected repercussions may arise such as superfluous photos, videos, and messaging and these things might spoil a child's mind and he may be a victim one day. Therefore this mobile application can be used to monitor the child ethical behaviour.

This child monitoring system consists of two main parts. They are tracking all activities and motivating the child to perform well in his/her work. This system helps parents to track all activities of the child which is done using mobile phones and to motivate children to increase their performance. The existing systems that the research team has examined contained only one function, either tracking or motivating the child by tasks allocation. This child monitoring system is a combination of those two functions. This will be an advantage for parents to carry out their work using only one system. Therefore the usage of phone memory will be decreased.

This system contains a mobile application and a web server infrastructure. All the administrative functions will be handling by the web server infrastructure. That will help to reduce the memory consumption of the mobile phone. Overall, this application can be used to monitor the child in every angle. The child can be motivated from the task allocation feature.

Another advantage of this system is to predict the location of the child when the internet facility is down. Once the internet is down, using GPS technology it is unable to detect where the child is. Therefore this system will give the parents a better solution for that problem.

Children can lie to parents in any situation. By tracking all the activities, parent can get to know the truth about their children. Therefore parents will get the 100% accurate details and will able to protect their child.

This system can be enhanced for future activities. Moreover, this system is basically implemented to protect as well as motivate, and this can be expanded in future by any organization to allocate tasks and track activities of the employees.

Also this system can be used to monitor and increase the performance of the parent as well. Through this a parent will be transformed into a good role-model for a child to follow.

A social network can be created to share ratings and badges that a user has awarded for performing tasks properly. Therefore the user can get feedbacks of others about the performance, so the user enhances his/her performance according to the feedback.

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The Effect of Maize-Cowpea Blends on Complementary Food Nutritional Quality

By Abdulkarim Mohammed, Gizachew Shiferaw & Aklilu Bajigo

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Abstract- The study was conducted with the objective of improving Food nutritional quality in Complementary food through Maize-Cowpea Blends. Maize (Melkassa 7) and two cowpea varieties (Asebot and Bole) were collected from Melkassa Agricultural Research Center. 100 seed weight, volume and density measure of two cowpea varieties were done. Sample preparations were done after cleaning, soaking, dehulling (cowpea), milling, and sieving. Proximate composition analyses were done for grains. And a 25.07%, 21.20% and 10.14% protein contents; 3.71%, 2.61% and 1.01% ash content were observed on Asebot, Bole and Melkassa 7 (Maize) respectively which are significantly different at $P<0.05$. Based on this, Asebot variety (cowpea) was selected and blended with maize (Melkassa 7) to 67:33 (maize-cowpea) ratios to achieve protein need in the complementary food produced.

Keywords: *anti-nutrient, complementary foods, cowpea fortification, fermentation, steamed cowpeas.*

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The Effect of Maize-Cowpea Blends on Complementary Food Nutritional Quality

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Keywords: anti-nutrient, complementary foods, cowpea fortification, fermentation, steamed cowpeas.

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I. Introduction

Malnutrition is a general term that indicates a lack of some or all nutritional elements necessary for human health. Malnutrition is responsible, directly or indirectly, for over half of all childhood deaths. It leads to ill-health and ill-health contributes to further deterioration in nutritional status. In 2001, 50−70% of the burden of diarrheal diseases, measles, and malaria and lower respiratory infections was attributable to malnutrition [1].

Complementary food as those which are appropriately timed, nutritionally adequate and hygienically prepared foods that are given to infants along with continued breast feeding from six months of age. The target age range for complementary feeding is generally taken to be 6 to 24 months of age, even though breastfeeding may continue beyond two years [2].

In developing countries, because of limited access to animal based products such as meat, egg, fish that provide high intake protein and micronutrient, they deliver protein and micronutrient from cereal-legumes [3]. So the development of low cost high protein food supplements from combination of locally available cereal-legumes that treated through different processing methods will be the solution for these peoples. Processing methods like fermentation, heat treatments, soaking, dehulling, etc are believed to improve the nutrient content by enhancing bioavailability of foods, reducing ant-nutrients, microbial contamination [3].

Generally, maize plays a very important role in in order to produce complementary food that fulfils all energy needed for infants and pre-school age child, fortification with legumes like soybeans, cowpeas which contains higher amounts of protein that has essential amino acids like lysine, tryptophan and other essential components are needed.

The objective of this study was to evaluate the effect of Maize-Cowpea Blends on Complementary Food nutritional quality

II. Materials and Methods

All samples yellow maize (Melkassa 7) and two of cowpea (vigna ungulculata) varieties (Asebot and Bole) were collected from Melkassa Agricultural Research Center which is located South-East of Addis

Ababa at 118Km. All others materials such as chemicals, almunium foil, packaging materials, were bought from local market. Equipment such as miller, sieves, washing plates, was used for samples preparation. Centrifuge, pH-meter, pipette, distilled water, taste tubes, batch type centrifuge, oven measuring tube were used in the determination of pH-values, TTA, dispersibility, bulk density WAC and OAC. Despite some of the equipment used from external laboratory, most of the equipment necessary for the preparation and analysis of the samples were obtained from laboratories in Addis Ababa Institute of Technology (AAiT), Chemical Engineering Department.

a) Proximate composition of maize and cowpea varieties

Moisture content, total ash, crude protein, crude fiber, and crude fat of the seed flours were determined according to [4], using the official methods 925.09, 923.03, 979.09, 962.09, and 4.5.01, respectively. Minerals were determined by the method of [5].

b) Determination of energy

Gross energy was determined by calculation from the three groups of nutrients such as; fat, carbohydrate and protein contents using the Atwater's conversion factors; 16.76 kJ/g (4 kcal/g) for protein (P%), 37.4 kJ/g (9 kcal/g) for fat (F%)and 16.76 kJ/g (4 kcal/g) for carbohydrates (C%) expressed in calories by Birch et al. (1980). Hence, Energy value = (P* 16.76) + (F* 37.71) + (C* 16.76) in KJ/100g of the sample. Where, Kj and Kcal are related through this conversion factor; 1Kj/100g=4.18Kcal/100g.

c) Experimental design and statistical data analysis

A mixed 2x2x2x3 full factorial experimental design were used to study the effect of fermentation and heat treatment (steaming) on some quality characteristics of maize-cowpea blend complementary foods. The four variables analyzed in the experiment were: cowpea level (0 & 33%); steam treatment (steamed and unsteamed); fermentation method (single and multiple component of which both are natural); and fermentation time with three levels (0, 24 & 48h). Therefore, using these variables with respective levels, full factorial design treatment was used for flour of maize-cowpea blends.

Cowpea flour was prepared by first cleaning and sorting the grains manually to remove broken seeds, extraneous materials, debris, husks, immature grains and other substance.

Then the cowpea grains were soaked in distilled water (1:2w/v) for 1h. It was washed repeatedly using distilled water, and the hulls were removed manually. The dehulled seeds were steamed by binding it using alumunium foil and put is boiling water at 100^{o}C for 15-20 min. The steamed grains were dried using oven dryer (Biosec dryer) at 65^{o}C for more than 10h until the moisture content reached 10 - 12%. Finally the seeds were milled (Retsch GmbH, West Germany, SK1) into flour to obtain smooth and consistent particle sizes and sieved through <1mm.

Maize (Zea mays), yellow maize, type called Melkassa 7 variety was processed to flour. The grain of yellow maize manually cleaned and sorted to remove husks, damaged grains, stones, dust, light materials, stalks, undersized and immature grains and other extraneous materials. The cleaned maize grains were soaked in distilled water (1:3; w/v) at room temperature for more than 18 hours. The steep water was drained and the grain was dried at a temperature of 65oC for 20-24h using oven to a moisture content of 10-11%. The dried grain was milled (Retsch GmbH, West Germany, SK1) and sieved (Retsch, AS 200) to particle size distribution of <1mm.

The data obtained from each experiment were analyzed by one way ANOVA (Analysis Of Variance) using JMP statistical analysis software version 5.0.1. Significance was accepted at 0.05 level of probability ($p<0.05$). Mean separation was performed by "Each Pair Student's t" for multiple comparisons of means. All chemicals and physical measurements were done in duplicate.

III. Result and Discussion

a) Proximate composition of maize, cowpea amd maize-cowpea blends flour

The proximate composition for different parameters of maize, cowpea and maize-cowpea blend flours are presented in the table below 1. Moisture content are significantly different among samples at ($P<0.05$). This might be releted to different processing methods which may affect the very natural properties like hygroscopic nature of flour. With respect to protein, significant difference are observed among samples at ($P<0.05$). blending high protein content cowpea as well as different processing methods (fermentation time and type) may contribute for theie differnce in protein content. The increase in protein content may be associated with the synthesis of protein from metabolic intermediate by microbial during their growth cycle. [6] reported that the observed increment in protein content after fermentation was probably due to shift in dry matter content through depletion during fermentation by action of the fermenting microorganisms. Similar observation of significant difference were aslo observed for fat content among samples at ($P<0.05$). Different researchers forward contradicting ideas up on effect of fermentation on crude fat content. According to [7], a significant decrease fat contents after four days of maize fermentation. Similarly [8], fermentation for 48hr had significantly ($P<0.05$) decreased the fat content of sorghum to 3.05 from 3.62%. The results of this project on effect of natural fermentation upon crude fat contents

are contradictory with the works of [9], who stated that fat as well as ash content remained unaltered during fermentation.

The carbohydrate contens of samples are also significantly different at ($P<0.05$) from one another because of mixing cowpea with maize that have different carbohydrate content and different proceesing effect specially fermentation. The decrease in total carbohydrates calculated by difference could be due to, particularly starch and soluble sugars are principal substances for fermenting microorganisms; therefore, degradation and a subsequent decrease in starch content are expected to occur [7].

The total ash content is also significantly different for different samples at ($P<0.05$) as shown table 1 because of the difference in ash content between maize and cowpea and different processing effect. The higher ash content may related to the higher minerals content. The increase in ash content with increasing fermentation time may due to the increased surface area of the flour and dry matter loss during fermentation. But [9] stated that fat as well as ash content remained unaltered during fermentation. Infant food should have little fiber content because of the indigestion in babies. From table 1 fiber contents are significantly different among samples at ($P<0.05$) which may be due all above mentioned reasons. The decrease in fiber content during fermentation may be due to the partial solubilisation of cellulose and hemicelluloses type of material by microbial enzyme.

Table 1: Proximate composition of maize, cowpea and maize-cowpea blend flours

Processing methods	Sample Id	% Moisture	% crude protein	% crude fat	% crude fiber	% ash	% carbohydrate	Energy (Kcal/100g)
I	CF	8.8 ± 0.02^{g}	26.98 ± 0.015^{a}	2.50 ± 0.04^{m}	1.48 ± 0.04^{j}	2.52 ± 0.02^{a}	57.82 ± 0.25^{m}	367.62^{l}
	Mf_0	9.65 ± 0.01^{c}	11.14 ± 0.005^{i}	5.35 ± 0.05^{a}	2.20 ± 0.01^{b}	1.13 ± 0.01^{m}	72.01 ± 0.15^{a}	389.50^{a}
	FMf_{24}	9.25 ± 0.01^{e}	11.27 ± 0.025^{h}	4.98 ± 0.02^{b}	1.72 ± 0.02^{f}	1.24 ± 0.01^{l}	71.5 ± 0.25^{b}	382.83^{b}
	FMf_{48}	9.30 ± 0.05^{d}	11.94 ± 0.005^{g}	4.64 ± 0.15^{c}	1.44 ± 0.01^{k}	1.38 ± 0.05^{k}	71.33 ± 0.08^{c}	380.56^{d}
II	$ScMf_0$	7.55 ± 0.01^{k}	15.93 ± 0.025^{e}	3.90 ± 0.03^{d}	1.75 ± 0.05^{e}	1.99 ± 0.01^{g}	68.86 ± 0.05^{d}	381.21^{c}
	$UcMf_0$	8.13 ± 0.01^{h}	15.84 ± 0.012^{f}	3.75 ± 0.05^{e}	2.38 ± 0.01^{a}	1.88 ± 0.01^{h}	67.51 ± 0.22^{g}	376.64^{f}
III	$ScFM_{24}$	7.85 ± 0.01^{i}	16.08 ± 0.023^{d}	3.64 ± 0.02^{g}	1.51 ± 0.02^{j}	2.11 ± 0.01^{d}	68.75 ± 0.05^{e}	378.09^{e}
	$ScFM_{48}$	7.75 ± 0.01^{j}	16.26 ± 0.025^{b}	3.63 ± 0.05^{gh}	1.24 ± 0.0^{m}	2.32 ± 0.02^{c}	68.17 ± 0.07^{f}	375.40^{g}
IV	$(ScMF)_{24}$	9.84 ± 0.05^{b}	16.29 ± 0.05^{b}	3.62 ± 0.06^{hi}	1.85 ± 0.02^{d}	1.95 ± 0.02^{h}	66.78 ± 0.25^{j}	372.22^{h}
	$(ScMF)_{48}$	9.84 ± 0.05^{b}	16.39 ± 0.05^{a}	3.57 ± 0.05^{j}	1.54 ± 0.01^{i}	2.07 ± 0.01^{e}	66.55 ± 0.35^{k}	370.09^{j}
V	$UcFM_{24}$	8.97 ± 0.01^{f}	16.08 ± 0.023^{d}	3.59 ± 0.01^{ij}	1.90 ± 0.01^{c}	2.02 ± 0.01^{f}	67.43 ± 0.42^{h}	375.34^{g}
	$UcFM_{48}$	8.71 ± 0.05^{g}	16.13 ± 0.003^{c}	3.46 ± 0.05^{k}	1.58 ± 0.02^{h}	2.38 ± 0.01^{b}	67.03 ± 0.52^{i}	369.52^{k}
VI	$(UcMF)_{24}$	9.89 ± 0.05^{a}	16.16 ± 0.01^{c}	3.68 ± 0.01^{f}	1.67 ± 0.01^{g}	1.84 ± 0.01^{j}	66.73 ± 0.62^{l}	371.33^{i}
	$(UcMF)_{48}$	9.81 ± 0.01^{b}	16.30 ± 0.025^{b}	3.38 ± 0.02^{l}	1.39 ± 0.01^{l}	1.91 ± 0.05^{i}	66.46 ± 0.34^{l}	367.12^{l}

Level not connected by similar letters under same column are significantly different at ($P<0.05$)

Where; I refers Unblended flour; **II** refers to Unfermented maize-cowpea blend; **III** -Single Fermentation of maize blend with steamed cowpea; **IV** refers to Co-Fermentation of both maize and steamed cowpea; **V** -Single fermentation of maize blend with unsteamed cowpea, and **VI** refers to Co-fermentation of both maize and unsteamed cowpea.

CF-Cowpea flour, Mf_0, FMf_{24} and FMf_{48} refers to Maize flour fermented for 0hr, 24hr and 48hr respectively. $ScMf_0$, $ScFM_{24}$ and $ScFM_{48}$ refers to fermented maize flour for 0hr, 24hr and 48hr blended with steam treated cowpea flour; $(ScMF)_{24}$ & $(ScMF)_{48}$ refers to Co-fermented maize-steamed cowpea blend for 24 & 48h respectively; $UcMf_0$, $UcFM_{24}$ & $ScFM_{48}$ refers to fermented maize flour 0, 24 & 48h blended with unsteamed cowpea flour; $(UcMF)_{24}$ & $(UcMF)_{48}$ refers to Co-fermented maize-unsteamed cowpea blend for 24 & 48h respectively.

b) *Mineral content of maize, cowpea and maize-cowpea blend flour*

The mineral content between maize flours and maize-cowpea blend flours are significantly different at ($P<0.05$) as shown in table 2. This is might be due to the higher or lower minerals content cowpea fortification into maize flour and the effect of different processing methods. In all samples weather it is maize or maize-cowpea blend flours, minerals contents are increased with increasing fermentation time and change in fermentation type from single fermentation of maize to co-fermentation of maize-cowpea blend flours. This is due to the minerals of the grain that are not readily available for microorganisms as they are complexed with phytate, at pH values of <5.5 the endogenous grain phytase hydrolyses phytate and minerals are released from the complex [10].

Table 2: Mineral contents of maize, cowpea and maize-cowpea blend flours

Processing methods	Sample Id	Minerals in (mg/100g)			
		Fe	Ca	Zn	P
Unblended flour	CF	5.84 ± 0.02^{j}	80.05 ± 0.05^{a}	2.85 ± 0.03^{l}	297.54 ± 0.35^{a}
	Mf_0	4.930 ± 0.03^{m}	42.57 ± 0.03^{n}	4.83 ± 0.02^{f}	186.11 ± 0.14^{l}
	FMf_{24}	5.040 ± 0.02^{l}	51.11 ± 0.05^{m}	5.20 ± 0.01^{e}	198.92 ± 0.25^{k}
	FMf_{48}	5.215 ± 0.15^{k}	56.63 ± 0.03^{l}	5.66 ± 0.01^{d}	218.99 ± 0.13^{j}
Unfermented maize-cowpea blend	$ScMf_0$	6.360 ± 0.01^{i}	64.45 ± 0.04^{k}	2.72 ± 0.04^{m}	229.91 ± 0.14^{g}
	$UcMf_0$	6.410 ± 0.01^{h}	65.03 ± 0.02^{j}	2.24 ± 0.01^{n}	225.71 ± 0.04^{i}
Single fermentation of maize blend with steamed cowpea	$ScFM_{24}$	6.395 ± 0.015^{hi}	67.64 ± 0.04^{h}	3.01 ± 0.15^{k}	230.71 ± 0.15^{h}
	$ScFM_{48}$	6.665 ± 0.015^{d}	69.23 ± 0.06^{f}	4.25 ± 0.02^{g}	238.94 ± 0.25^{e}
Co-fermentation of both maize and steamed cowpea	$(ScMF)_{24}$	6.555 ± 0.005^{f}	72.64 ± 0.02^{c}	3.83 ± 0.03^{hi}	231.06 ± 0.03^{g}
	$(ScMF)_{48}$	7.170 ± 0.02^{b}	67.98 ± 0.03^{g}	3.31 ± 0.02^{j}	261.89 ± 0.35^{c}
Single fermentation of maize blend with Unsteamed cowpea	$UcFM_{24}$	6.740 ± 0.01^{c}	67.04 ± 0.01^{i}	3.89 ± 0.02^{h}	249.84 ± 0.21^{d}
	$UcFM_{48}$	6.490 ± 0.01^{g}	71.45 ± 0.02^{d}	5.82 ± 0.03^{c}	235.24 ± 0.01^{f}
Co-fermentation of both maize and Unsteamed cowpea	$(UcMF)_{24}$	6.605 ± 0.005^{e}	69.36 ± 0.05^{e}	5.99 ± 0.01^{b}	275.70 ± 0.35^{b}
	$(UcMF)_{48}$	7.245 ± 0.015^{a}	74.11 ± 0.03^{b}	6.94 ± 0.05^{a}	278.14 ± 0.15^{b}

Level not connected by similar letters under same column are significantly different at ($P<0.05$)The phytic acid content are significantly different ($P<0.05$) among samples because of blending samples that have different phytic acid content as well as different processing methods specially fermentationas shown in table 3. It has been suggested that the loss of phytate during fermentation could be a result of the activity of native phytase and/or the fermentative microflora by different workers [3], [11], [12]. Specially significant decreament were observed for cofermentation for about 48hr. Steam treated samples have lower phytic acid content than and unsteamed samples. This shows the decreasing effect of steam on phytic acid content. According to [13], the phytic acid content of cowpea decreased from 29-51% due to steaming.

c) *Anti-nutrient contents of maize, cowpea and maize-cowpea*

The anti-nutritional factors content for samples are presented in table 3 below. Naturally, maize have lower in tannins content cowpea. The tannins content among samples are significantly different ($P<0.05$) as shown in table 3. This is may be because blending samples that have different tannins contents and different processing methods like fermentation and steaming. This may be due to fermentation might have been caused by the activity of polyphenoloxidase or tanniase of fermenting microflora on tannins [14].There difference in tannins contents may also be due to the decreasing effects of soaking, dehulling and steaming operations before milling the cowpea. [15] studied the effect of decortications on antinutrient content in cowpea. They reported 10%, 11% and 77% reductions in trypsin inhibitors, phytic acid and tannins, respectively.

Table 3: Ant nutrient contents of Maize, cowpea and Maize-cowpea blends

Processing methods	Sample Id	Ant nutrient	
		Phytic Acid (mg/100g)	Tannins (mg/100g)
Unblended flour	CF	194.55±0.707[a]	118.79±0.354[a]
	Mf_0	121.06±0.707[d]	46.585±0.629[k]
	FMf_{24}	71.88±0.141[j]	22.62±0.566[m]
	FMf_{48}	46.16±0.707[m]	BDL
Unfermented maize-cowpea blend	$ScMf_0$	142.445±0.658[c]	67.96±0.141[c]
	$UcMf_0$	143.84±0.778[b]	70.11±0.212[b]
Single fermentation of maize blend with steamed cowpea	$ScFM_{24}$	99.84±0.283[f]	57.85±0.240[e]
	$ScFM_{48}$	74.63±0.566[i]	49.36±0.467[i]
Co-fermentation of both maize and steamed cowpea	$(ScUM)_{24}$	92.44±0.636[g]	54.65±0.509[g]
	$(ScUM)_{48}$	64.82±0.283[l]	44.77±0.353[l]
Single fermentation of maize blend with Unsteamed cowpea	$UcFM_{24}$	107.94±0.495[e]	59.77±0.424[d]
	$UcFM_{48}$	82.05±0.354[h]	51.54±0.566[h]
Co-fermentation of both maize and Unsteamed cowpea	$(UcUM)_{24}$	100.77±0.495[f]	56.27±0.424[f]
	$(UcUM)_{48}$	68.33±0.566[k]	47.79±0.311[j]

Level not connected by similar letters under same column are significantly different at (P<0.05). BDL represents "below detection limit"

d) The phytate - minerals molar ratio (bioavailability)

Table 4 shows phytate-minerals molar ratio (bioavailability) of different samples under different processing methods. Except iron, others minerals are bioavailable according to the standard ratio. If the molar ratios phytate: iron is greater than 0.15, iron is not available according to [16]. In case of phytate: Ca molar ratios, >0.24 molar ratios indicates low bioavailability of Ca in diets [17]. When the phytate: zinc molar ratio >15, indicates low zinc bioavailability [16]. The high calcium content of food may jeopardize bio-availability of iron and zinc. High calcium levels in foods can promote the phytate-induced decrease in zinc bio-availability when the [calcium]x[phytate]:[zinc] millimolar ratio exceeds 0.5 [16]. Finally, bioavailability all minerals increase (phytate: minerals molar ratios decreased) with increasing fermentation time up to 48h even though some of minerals like iron (Fe) are not bioavailable. This may be due to decrease in phytate as a result of microbial activities during fermentation process. Fermentation enhances bioavailability of minerals by degrading phytate with microbial and native phytases that entangle macro and trace-elements [8].

Table 4: The phytate-minerals molar ratio (bioavailability) of maize and maize-cowpea blends

Processing methods	Sample Id	Phytate-minerals molar ratio			
		Phytate:Fe	Phytate:Ca	Phytate:Zn	[calcium*phytate]/[zinc](mol/Kg)
Unblended flour	CF	2.83[a]	0.175[ab]	6.70[a]	0.1330[a]
	Mf_0	2.07[b]	0.180[a]	2.49[g]	0.0265[gh]
	FMf_{24}	1.20[f]	0.100[cd]	1.38[j]	0.0182[i]
	FMf_{48}	0.77[i]	0.045[e]	0.81[l]	0.0120[j]
Unfermented maize cowpea blend	$ScMf_0$	1.90[c]	0.13[bc]	5.16[c]	0.0830[c]
	$UcMf_0$	1.90[c]	0.13[bc]	6.32[b]	0.1030[b]
Single fermentation of maize blend with steamed cowpea	$ScFM_{24}$	1.32[de]	0.09[cde]	3.27[d]	0.0550[d]
	$ScFM_{48}$	0.95[h]	0.06[de]	1.73[i]	0.0299[fg]
Co-fermentation of both maize and steamed cowpea	$(ScMF)_{24}$	1.19[f]	0.08[de]	2.83[e]	0.0432[e]
	$(ScMF)_{48}$	0.77[ij]	0.06[de]	1.93[h]	0.0328[f]
Single fermentation of maize blend with Unsteamed cowpea	$UcFM_{24}$	1.36[d]	0.10[cd]	2.73[f]	0.0458[e]
	$UcFM_{48}$	1.07[g]	0.07[de]	1.39[j]	0.0248[h]
Co-fermentation of both maize and Unsteamed cowpea	$(UcMF)_{24}$	1.29[e]	0.09[cde]	1.66[i]	0.0287[fgh]
	$(UcMF)_{48}$	0.80[i]	0.06[de]	1.01[k]	0.0180[i]

Level not connected by similar letters under same column are significantly different at (P<0.05)

As indicated in table 5, phytate-phosphorous and non-phytate-phosphorous (bioavailability) contents of all samples of maize, cowpea and maize-cowpea blends are decreased and increased with increasing fermentation time and change in fermentation type respectively. This may be due to decreased in phytic acid during fermentation by microbial activities which contribute to the bioavailability of phosphorous. All samples had phosphorous as phytate proportion below 60% except some samples. Generally, diets with phosphorous as phytate (%) < 60% are regarded as being adequate in bioavailable phosphate [16].

Table 5: Phytate and non-phytate phosphorous (bioavailability) content of maize and maize-cowpea blends

Processing methods	Sample Id	Phytate and non-phytate phosphorous (mg/100g)			
		Phosphorous	Non-phytate phosphorous	Phytate-phosphorous	Phosphorus as phytate (%)
Unblended flour	CF	297.54 ± 0.35^{a}	242.72^{c}	54.82^{a}	65.38^{a}
	Mf_0	186.11 ± 0.14^{l}	152.00^{k}	34.11^{d}	65.05^{b}
	FMf_{24}	198.92 ± 0.25^{k}	178.66^{j}	20.26^{k}	36.14^{h}
	FMf_{48}	218.99 ± 0.13^{j}	205.98^{f}	13.01^{n}	21.08^{m}
Unfermented maize cowpea blend	$ScMf_0$	229.91 ± 0.14^{g}	189.77^{h}	40.14^{c}	61.96^{d}
	$UcMf_0$	225.71 ± 0.04^{i}	185.41^{i}	40.53^{b}	63.73^{c}
Single fermentation of maize blend with steamed cowpea	$ScFM_{24}$	230.71 ± 0.15^{h}	202.58^{g}	28.13^{g}	43.28^{e}
	$ScFM_{48}$	238.94 ± 0.25^{e}	217.91^{d}	21.03^{j}	31.23^{j}
Co-fermentation of both maize and steamed cowpea	$(ScMF)_{24}$	231.06 ± 0.03^{g}	205.01^{f}	26.05^{k}	40.01^{f}
	$(ScMF)_{48}$	261.89 ± 0.35^{c}	243.62^{c}	18.27^{m}	24.75^{k}
Single fermentation of maize blend with Unsteamed cowpea	$UcFM_{24}$	249.84 ± 0.21^{d}	219.42^{d}	30.42^{e}	43.20^{e}
	$UcFM_{48}$	235.24 ± 0.01^{f}	212.12^{e}	23.12^{i}	34.88^{i}
Co-fermentation of both maize and Unsteamed cowpea	$(UcMF)_{24}$	275.70 ± 0.35^{b}	247.30^{b}	28.40^{f}	36.55^{f}
	$(UcMF)_{48}$	278.14 ± 0.15^{b}	258.88^{a}	19.26^{l}	24.55^{l}

Level not connected by similar letters under same column are significantly different at (P<0.05).

e) Viscosity of maize and maize-cowpea blends

The viscosity of maize and maize-cowpea blends under different processing methods are presented in table 6 below. The viscosities of unfermented flour maize and blend are significantly higher than all fermented flour samples at (P<0.05) as shown in table 6. This shows the significant decreasing effect of fermentation on viscosity specially the first 24hr. The decrease in viscosity may be associated with enzymatic breakdown of higher molecular weight polysaccharide and polypeptides to lower molecular weight during fermentation. This implies that gruels from the fermented flours would permit the addition of higher quantity of solid without a concomitant increase in apparent viscosity. This is very important in preparation high nutrient density infant food. [18], [19] had reported the reducing effect of fermentation on viscosity.

Table 6: Viscosity of maize and maize-cowpea blends

Samples	Viscosity (Pa.s)
Unfermented maize $(Mf)_0$	3.045 ± 0.0071^{c}
Fermented maize $(FMf)_{24h}$	2.135 ± 0.0028^{f}
Fermented maize $(FMf)_{48h}$	1.709 ± 0.0042^{h}
Unfermented blend $(UB)_0$	4.135 ± 0.0057^{a}
Single fermented blend $(SFB)_{24}$	3.102 ± 0.0075^{b}
Single fermented blend $(SFB)_{48h}$	3.102 ± 0.0075^{b}
Co-fermented blend $(CFB)_{24h}$	2.688 ± 0.0074^{d}
Co-fermented blend $(CFB)_{24h}$	2.016 ± 0.0084^{g}

Level not connected by similar letters under same column are significantly different at (P<0.05)

f) Sensory evaluation of developed product

Table 7 shows the sensory evaluation of developed products by different processing methods. In terms of color, samples have significantly different value at (P<0.05) which may be related to the differences in process that they came across. But all samples color values above 7 under 9 hedonic scale which may contributed by yellow maize blending that attract the panelist. The color rating of maize/cowpea ogi had 7.5 which was higher than that of millet/cowpea 6.5, sorghum/cowpea 4.6 [20]. The odor rating is significantly different among samples at (P<0.05). this

may be related to the difference in methods during samples preparation such fermentation, steaming. According to [20], the odor rating of 7.2 was obtained for maize/cowpea, and significantly ($P<0.05$) different from that of millet/cowpea (5.6) and sorghum/cowpea (5.7). Taste and overall acceptability attributes are also significantly different at ($P<0.05$) among samples which may be releted to the different processing methods used during these samples preparations. The value of taste for maize/cowpea was 8.04, 6.4 for millet/cowpea and 5.2 for sorghum/cowpea [20]. The general acceptability of different grain mixtures done by [20] was shows that maize/cowpea had 8.5, millet/cowpea 7.0 and sorghum/cowpea 5.8. Steam treated co-fermented for 24 hr sample (ScMg)24 secured best score in every aspects of sensory evaluation parameters like color, aroma, taste and overall acceptability. This may be due to steamed treated cowpea fortification and co-fermentation for only 24 hours.

The effect of different processing methods (Fermentation and steaming) and others on different functional properties such as pH, titrable acidity, water and oil absorbing capacities and dispersibility of flour samples are also significant differnt at ($P<0.05$).

Table 7: Sensory Analysis Values for Different developed products

Samples	Appearance /color	Odor / aroma	Taste	Overall acceptability
$(ScMg)_0$	7.25 ± 0.05^{c}	6.55 ± 0.05^{c}	7.35 ± 0.15^{bc}	7.15 ± 0.05^{cd}
$(ScMg)_{24}$	8.2 ± 0.1^{a}	7.7 ± 0.10^{a}	8.4 ± 0.10^{a}	8.1 ± 0.1^{a}
$(ScMg)_{48}$	7.65 ± 0.025^{b}	6.95 ± 0.025^{b}	7.45 ± 0.05^{b}	7.45 ± 0.15^{b}
$(UcMg)_0$	7.1 ± 0.1^{c}	6.4 ± 0.1^{c}	7.05 ± 0.05^{d}	6.95 ± 0.25^{de}
$(UcMg)_{24}$	7.7 ± 0.15^{b}	7.15 ± 0.035^{b}	7.15 ± 0.15^{cd}	7.35 ± 0.15^{bc}
$(UcMg)_{48}$	7.25 ± 0.025^{c}	6.45 ± 0.015^{c}	6.75 ± 0.05^{e}	6.90 ± 0.1^{e}

Level not connected by similar letters under same column are significantly different at ($P<0.05$) Where; (ScMg)0 means steamed cowpea maize gruel while 0 stand for unfermented; (ScMg)24 mean Steamed cowpea maize gruel; 24 stand for 24hrs fermentation; (UcMg)48 means unsteamed cowpea maize gruel; and 48 stand for 48hrs fermentation

IV. Conclusion

The study was aimed at developing complementary food from maize-cowpea blend. It is mainly investigat۽ the effect of processing like fermentation time (0, 24 and 48h), and type (single and co-fermentation) and blending steamed and unsteamed cowpea into maize flour. From the project it was observed that, fermentation and steaming have significant effect upon nutrient and anti-nutrient contents of the flour. Preliminary processing before blending such as soaking, dehulling highly reduced anti-nutrient especially tannins as it found on the coat of the seeds. The remaining anti-nutrient was further eliminated by steaming and fermentation.

High protein content cowpea fortification and fermentation increased the protein content of the flour by 32.03%, 15.08%, respectively. Further improvement in the minerals content like Fe, Zn, P, and Ca were also observed. This may be related to increment of ash content in flour as a result of fermentation and cowpea fortification. The fat content of blend flour decreased since less fat content cowpea fortification. From the study, the significant effect of fermentation and steaming were observed on pH, total titrable acidity, water and oil absorbing capacity and other physical and functional properties. It was also observed that the sensory analysis of the developed gruels was significantly affected by fermentation (time and type) and steamed cowpea fortification. The overall acceptability of 8.1 was scored for steamed cowpea fortified maize flour fermented for 24h (ScMF)24 which is better than other samples. Not only fermentation and steaming, but also the raw material used specially yellow maize affect the sensory analysis of the samples for instance as in case of color attribute.

This study provides relevant information on Maize-Cowpea Blends as a Complementary Food for infants and toddlers. Therefore, this food complement is highly nutritious, easily digestible and cost effective complementary food for lower and middle class society.

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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.

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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.

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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

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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:

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- 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.
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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.

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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.

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- 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
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- 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

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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."
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- 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
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- Submit to generally acknowledged facts and main beliefs in present tense.

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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

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