Survey of Information Society Measurement

[1]Ajala, E. B; [2]Ojo, S. O.
[1,2]Department of Informatics, Tshwane University of Technology
Pretoria. South Africa
e-mail: tundeajala {at} yahoo.com

[3]Olugbara, O. O.
[3]Department of Informatics, Durban University of Technology
Durban. South Africa

Abstract—**The main objective of this paper is to survey the existing information society measurements instruments with an aim of proposing a conceptual framework which is generic and can be used in any sector. For each measurement tool, the paper addressed the issue of Information Society definition, what is measured, what Measurement Framework used, methodology used, perceived strength and the gaps. The analysis of these models shows that: there is lack of consensus operational definition of the concept of information society; reliability of the indices and data used are not ensured; and there is no conceptual agreement on what to measure among all the models. Derived from extensive literature the operational definition of an information society in this study is "a society in which the interactive potential of its ICT, economic and socio-cultural element are tapped generating knowledge and skills for the human and other development of the society according to their goals and action". The Hierarchy of complexity and classification of information society indices proposed by Gardin (2002) and the social network analysis is suggested to conceive a generic framework for information society measurement. It is assumed that this study apart from throwing a great light to the efforts of the current models on information society measurement through its survey will be a good instrument in the hands of policy makers in assuming an information society. The suggested methodology will also ensure the reliability of the framework and the measuring indices.**

Keywords- Information society; Measurement framework; Social network analysis; and Generic framework.

I. INTRODUCTION

Even though there has been proliferation of Information Society (ISoc) measures in recent years, identification of metrics capable of being used for generic ISoc measurement are still far from being achieved.An information society is a society which makes intensive use of information and communication technologies(ICTs) [1].Information Society (ISoc) has become a global term which is
the current concept used for a society in which people have equal opportunities for application of knowledge and the use of Information Communication Technology (ICT) for sustainable development leading to a new way of life, develop a better economy, have a higher standard of living and play a higher role in society.

Definitely the emergence of ICT and a new ISoc has also brought about digital divide, which is one of the ways in which inequality is measured in a society. A great disparity is being noticed between the developed, developing and underdeveloped nations of the world in the access to and use of emerging innovations to create a standard ISoc. Least developed countries are typically looking for the basic access to information and basic telephone services while developed countries are addressing the information security, ecological transparency, digital switchover, privacy and broadband applications. Some developing countries, called the dynamic adopters are desirously looking for ways of using electronic commerce and developing laws to enhance the economy of the country. It is therefore obvious that there are different classes of information societies. One of such effect is that some country cannot compete favourably with their counterparts worldwide in the "ICT Development Index IDI ranking". The leading African country, which is Seychelles, is just 66th in the "world 2008 IDI ranking" of International Telecommunication Union (ITU) [2] while the leading countries in the world come mostly from Europe and America.

But it is imperative that the potential of this more recently, converging technologies that have come to be known as ICT forms the current driver of national development of any nation today and is radically transforming the intellectual and other social space of any ISoc generally. The dynamics of ICT has indeed become one of the major driving forces for productivity, competitiveness, collaboration, and superposition of resources on both national and international level [3]. However, to benefit from the advantages of information society, on one hand, and to be afraid of being left further behind by Global Society and the increase in the digital divide, on the other hand, stimulate countries to be part of Global Information Society [4]. The process of monitoring and evaluating progress in achieving the goals of an information society is therefore crucial in actually realizing such a society.

II. EARLY AND CURRENT EFFORTS AT QUANTIFICATION

[5] reviewed the past efforts in information society measurement and declared that "measurement and quantification has been part of information society studies from their earliest days. The idea of a society moving away from heavy industries into knowledge-intensive ones was in circulation in the U.S. and Japan in the 1960s and 1970s.In Japan, [6], [7] and [8] were early popularizes of the idea of the joho (or johoka) shakai or "informationalized society". These academic inputs were implemented by the Japanese

government, which formulated as early as 1971"*a new national target, 'Realization of the Information Society'*." They paralleled in some ways the work of [9] and [10] in the U.S., who attempted to quantify the size of the "knowledge industry" and its work force (the "Post-industrial Society"), and relate them to Gross National Product (GNP).

Noteworthy in that regard is the "Johoka Index," probably the first formalized effort, which was composed of a simple, summed index of indicators in four categories: Amount of information; Distribution of communication media; Quality of information activities; and the Information Ratio of each country. But in recent years the World Summit of Information Society has led a grand initiative incepted under the patronage of the Secretary-General of the United Nations. The Summit aimed at reducing the digital divide by increasing awareness regarding the benefits of the information society, and by presenting mechanisms to help developing countries advance towards such a society within the context of the global knowledge-based economy. The WSIS was divided into two phases. Phase I was held in Geneva in December 2003 and resulted in a Declaration of Principles and a Plan of Action which specifically called for a realistic international performance evaluation and benchmarking methodology for measuring the "Information Society" through comparable statistical indicators and research results. The second phase was held in Tunis in November2005 and focused on the implementation of the Plan of Action, recognized that the development of ICT indicators is important for measuring the digital divide, called for periodic evaluation, stressed that indicators must take into account different levels of development and national circumstances, and must be developed in a collaborative, cost-effective and non-duplicative fashion. In line with the commitments of the first phase of WSIS, serious work, spearheaded by international and regional organizations, was carried out to develop a methodology for measuring the digital divide, ICT and the information society. In this regard, a global Partnership on Measuring ICT for Development was launched in Geneva in 2004which proposed a common set of core ICT indicators. The Partnership on Measuring ICT for Development is one of the most comprehensive initiatives dedicated to developing, collecting and disseminating globally relevant indicators to measure the information society. Launched in June 2004 following the first phase of WSIS, it exemplifies the success of international and multi-stakeholder partnerships by providing an open framework for coordinating ongoing and future activities, and for developing a coherent and structured approach to the development of ICT indicators. It includes a number of such international and United Nations organizations asInternational Telecommunication Union(ITU), United Nations Conference on Trade and Development (UNCTAD), the Organisation for Economic Co-operation and Development (OECD), United Nations Educational, Scientific and Cultural Organization (UNESCO),Institute for Statistics (UIS), United Nations Department of Economic and Social Affairs (UNDESA), the World Bank, Eurostat, and four United Nations Regional Commissions (including ESCWA). The Partnership serves as an indispensable channel for exchanging expertise and advice between National Statistical Offices (NSOs) from developed and developing countries. During the second phase of WSIS, two composite indices were launched: the ICT Opportunity Index (ICT-OI) and the Digital Opportunity Index (DOI), both were based on the common set of core ICT indicators proposed earlier by the Partnership. Continuous work on information society measurement during the past five years has led to the development and adoption of additional measurement models and indices, most notably is the ICT Development Index (IDI), Digital Access Index (DAI), Digital Opportunity Index (DOI), all developed by the International Telecommunication Union (ITU) [11].

III. IMPORTANCE AND REASONS FOR INFORMATION SOCIETY MEASUREMENT

Without some indication of how all elements of society are adapting there can be no way of understanding whether the shift towards an information society is actually taking place, or indeed, working in positive ways. Moreover an understanding of where each country currently stands vis-a-vis the information society must be achieved. At the same time, the status of each country must be analysed to encourage movement towards a future. The use of measures or constructs to monitor these objectives is then critically important.

Attempts had been made in recent years by various groups and organizations using various constructs, dimensions and indicators for information society measurement. Prominent among them are the ITU, OECD, UNESCO and UNCTAD. These measures are aimed at tackling the digital divide: including implementing policies to eradicate or at least minimize the deleterious impact of new technologies, and have the potential to enable less developed countries to contribute to forging a global information society [12]. [13] explained that these organizations developed tools for measuring information society based on major importance and purpose which includes: determining the current status of each country in assuming an information society; International comparison for monitoring and narrowing digital divide; Tracking progress towards an information society; Research related purpose leading to improved framework, indices and methodology; and Value-judgement purpose aiming at evaluating how improved ICT penetration has translated to improved economic, human capacity and social benefit in a society. But [14] reiterated the Tunis Agenda of the World Summit of Information Society (WSIS) of 2005, calling for periodic evaluation, using an agreed methodology: to develop a common set of core ICT indicators; to increase

the availability of internationally comparable ICT statistics as well as to establish a mutually agreed framework for their elaboration; to promote capacity building especially in developing countries, for monitoring the information society; and to assess the current and potential impact of ICTs on development and poverty reduction.

This paper therefore intends to survey the existing information society measurements instruments with an aim of proposing a conceptual framework which is generic and can be used in any sector. For each measurement tool, the paper will address the issue of ISoc definition, what is measured, what Measurement Framework used, methodology used, perceived strength and the gaps.

It is intended that this study will come out with suggestions of how a new framework for ISoc measurement can be derived, established on sound generic definition and proper perspectives of information society, bringing in the socio-cultural constructs suitable for the information society measurement of any sector or society.

The list of these ISoc models is not exhaustive in this study, there are many national, regional and organizational established model that has been used for information society measurement but in this study the focus will be on the prominent ones earlier mentioned ie. ITU, OECD, UNESCO and UNCTAD. It is glaring according to [11] that these have long been collecting various data measuring information society and because of their popularity, recency of measurement, and using some relevant constructs for their information society measurement, they are being considered for this study. The focus is to determine the limitations they and other scholars noticed and build on it to suggest a new ISoc assessment framework that can be used generically for ISoc measurement.

IV. DEFINITION

Many ISoc assessment tools have been established by various groups and organizations. At the same time there are numerous attempt and approach in measuring the ISoc by many organisations using various indices and methods but [15] and [11] noticed that the lack of consensus operational definition of the concept of information society which was born out of lack of an overarching theory of an impacts of ICT on development that can guide research as well as development of measurement instruments is likely the reason for proliferation of different indices among these organizations in measuring the same ISoc. These different indices will definitely measure different things. [15] emphasized that the public discourse has seen a proliferations of poorly defined terms such as "Information Society" while [4] posited that "what is badly defined is likely to be badly measured". [15]; [1], explained that lack of consensus operational definition and proper perspective of the concept of "Information Society" `has resulted in the application of plethora of constructs in information society measurement. [16] argued the usage of e-readiness as a sole construct for Information society measurement and concluded that e-readiness cannot be assumed to be the definition and measure for information society but can best be seen to serve as a useful starting point for developing nations. He stress that the assumption that development will be achieved only if initiatives are built under situation of e-readiness causes serious issues because it measures the nations preparedness for ICT implementation which involves the socio-cultural dimensions and not the intensity, impact and outcome of ICT application. However Dada posited that e-readiness drives other construct and every model available would require re-designing in order for it to be a comprehensive assessment tool.

ITU assumed that there is no universal definition for information society but proposed a partial definition taking into account only specific problems or effects but believe that "*information society is a society in which every lives, cell of society and sector of activities are being affected by three elements namely: information and knowledge, proliferation of information and communication technology (ICT) and access to and use of ICT*" [17].

[18] also declared that there is no agreed comprehensive definition of information society but presented "*information society as the effect and impact of ICT on economic, social, political and cultural life of the people".*

[19] defined information society as "*the community that can use ICT for their industrial and economic development".*

While [20] presented information society as *"a society with equality of opportunity to benefit equally from ICTs for network strengthening, information sharing, creating knowledge resources and develop skills necessary for life/work in the new digital environment".*

Efforts had been made by individuals, group of people and organizations in defining information society, particularly the contributions of [21], [22], [23] and [24]. But notable is the analysis of Webster (2002) and [25] on the definitions of an information society derived from some information society theories ie Technological theories; Economic and occupational theories; and Cultural theories, in which they present five primary perspectives for identifying an information society. These are: technological, economical, occupational, spatial and cultural. [24] described the **technological** as "the most common definition of the information society" and suggests that its primary premise is that "information processing storage and transmission have led to the application of information communication technologies in virtually all corners of society".

The **economic** perspective, according to Webster considers issues of the information economy. The information economy was described by [25] as the fastest growing sector in the economy. Tied in closely with the information economy is Webster's category of occupational perspectives. Webster distinguishes this perspective from the economic perspective by suggesting that an information society occurs "when the predominance of occupations is found in information work" [24]. For the purpose of this research work, Webster's economic and occupational

categories will be collapsed into one, the economic, which [25] described as subsumes the occupational; the spatial and cultural will be collapsed in to one, cultural which according to [25] also subsumes the spatial; the cultural will be perceived as **socio-cultural**; while the technological will be perceived as the convergent technology which according to [18] have come out to be known as **ICT.** But some scholars has observed that to assume that information society is just an interaction of its ICT, economic and socio-cultural element, tapped for the human and other development of the society will be mere overlooking the fallacy of simplicity of this definition. [26] promoted the concept of knowledge society with a view that, enhancing information flows alone is not sufficient to grasp the opportunities for development that is offered by knowledge and therefore suggested that skill generation and a more complex, holistic and comprehensive vision with a clear developmental perspective are needed, thus the issue of knowledge and skill was considered to be germane to any consideration of an information society. Further, [11] has explained that regardless of the choice of information society model, including its definition, the process of selecting indicators must be governed by the goals of the task at hand. This is sequel to [27]; [28]; [29]; [30]; [31]; [32]; [33]; and [34] attributing that goals and action share a focus on a specific outcome (or outcomes) that consumption can produce. Since consumption of ICT innovation is important to emerging information Society this attribute has a lot of relevance and implication to the assumption of an information society. Thus the operational definition of an information society in this study will be "*a society in which the interactive potential of its ICT, economic and socio-cultural element are tapped generating knowledge and skills for the human and other development of the society according to their goals and action*". It is assumed that the relationship between these concepts brings out the real meaning of an ISoc.

The understanding according to [18] is that ICT in the last decades touches on nearly every known economic and socio-cultural aspect of many nations of the world having significant economic implications while there are socio-cultural dimensions to readiness, to ICT adoption, intensity of usage, its impact and outcome on the society.

V. MODELS FOR INFORMATION SOCIETY MEASUREMENT AND ANALYSIS

Examples of frameworks analysed include ITU, OECD, UNESCO and UNCTAD.

Model	**Developer**	**Sectoral Focus**	**What is measured/ Target Audience**	**Measurement Framework/Units of Measurement**	**Methodology/ Data Source/ Method of Data Collection**	**Perceived Strength**	**The gap to be Bridged**
ITU-D [35]	International Telecommunication Union (ITU)	Information Society	ICT-Development Index (IDI)-Access Sub-Index Use Sub-Index Skill Sub-Index ICT-Price Basket(IPB) – Fixed Telephone Mobile cellular Fixed broadband **Target Audience:** -Policy makers	Three stage model in evolution towards an Information Society applied- ICT-readiness ICT-Intensity ICT-Impact	Combination of IDI-Derivation of Sub-Indices Selection of Indicators- (use of PCA) Preparation of complete data set Normalization of data Rescaling of data Weighing of sub-Indices and IPB	Usage of composite indicators helps in creating parameters that are easier to use for comparison. Composite Indices raises awareness on future policy decisions among policymakers. Use of PCA helps to eliminate indicators with less	From the limitations of this model according to [35] Generic indicator becomes so difficult to derive due to the non homogeneous nature of the countries. Composite indices used are always subjected to questioning [36]. Framework used does not explain all the applied indices and provide explanation for causal linkages ie.

			-ICT industry -Academia		methodology	influence on the Index calculation. Inclusion of IPB helps to measure affordability. IDI captures digital divide	does not measure affordability.
OECD [54]	Organization for Economic Cooperation and Development (OECD)	e-Commerce	e-Readiness e-Intensity e-Impact **Target Audience:** -Policy makers -Market Analysts	S-Curve of the three stage development of e-Commerce – Readiness Intensity Impact	Aggregate of – Macroeconomic data Industry data Individual firm or Establishment data(Secondary Data)	Examining performance of Macro economy, Industry, Individual and Establishment points to the role of ICT in economic aggregate. Measurement of economic impact at aggregate level is relatively straight forward	From the limitations of this model according to [54]. Measures of ICT investment are not always available and some are not comparable across countries. Output in some services are measured on relatively simple indicators since the prices of some services are hard to establish. Cross country quantitative empirical analysis of price and productivity impacts on e-Commerce are scarce.
UNESCO [51]	United Nations Educational, Scientific and Cultural Organization	Information and Knowledge Society	Basic Infrastructure Basic access and Use Information Literacy Digital Literacy ICT and Culture **Target Audience:** -Policy makers	Cross National ICT Data on- Infrastructure Access and use ICT and Education/Skill generation ICT and Culture Information/Knowledge Chain-	Collection of – Cross-National comparable data (Secondary data)	Examines Literacy and Skill generation which are strong prerequisite to change and development. Cross-National comparable data used provides valuable	From the limitations of this model by [51] There are non uniformity of data collected from cross-national data aggregate due to different definition of indicators. No conceptual agreement on what to measure due to non availability of data on some

			-Educational planners	Information Literacy ICT/Digital literacy ICT/Digital Skill		information for monitoring international goals	important indicators in some countries Data quality of Cross-National data is not ensured.
UNCTAD [52]	United Nation Conference on Trade and Development	Information economy	Use of ICT for Business Use of Internet for Business Other Information about Business. **Target Audience:** -policy makers -Market analysts -Economic planners	The S-Curve for Maturity of e-market- e-Readiness Intensity Impact Conceptual Framework for Measurement of Information Economy- ICT Supply ICT Demand Economic impact of ICT Social impact of ICT	Sources of data- Administrative sources Business registers Sample surveys	Framework and methodology used has allowed benchmarking of economies and social situations Framework and methodology has helped countries to calculate their investment to provide business with access to ICT. Useful for policy makers to make informed decisions	From the limitations described by [52] Data from Admin sources or Business Registers from some countries are not coherent, relying on non-transparent methodologies thus not reliable. Metadata of data used are not presented eg. Accuracy, precision, sampling error etc.

Table 1. Assessment Models for Information Society Measurement

A. What is the Gap found?

From the analysis of the above models and their described limitations, what is observed missing are: the lack of consensus operational definition of the concept of information society among the organizations involved in ISoc measurement. This led to proliferations of definition of ISoc due to different perspectives of the concept of ISoc and probably caused the measurement of different things. Some focused on one perspective of ISoc while some focused on other things;

Reliability of the indices and data used are to be ensured e.g.

- Composite indices used by some models are subjected to questioning [36].
- Also the uniformity of data collected from cross-national data aggregate due to different definition of indicators is to be ensured.
- The choice of indicators are subjective; while the variable chosen, the methodologies and the logical process of arriving at a choice of an index do not have common conceptual ground. This is what [5] referred to as lack of concurrent validity.
- Metadata of data used e. g. accuracy, precision, sampling error etc. is not always presented.
- There is also no conceptual agreement on what to measure among all the models probably due to non-availability of data on some important indicators that may be available in some countries but not available in other countries [38]. One important reason for this according to [39] is that many of the developing nations are service-based economies rather than resource-based economies, peculiar of the developed or industrialized nations.

Therefore preparing indicators for policymakers in a developing nation where the national goal is to develop the service sector will be different to that of the resource-based economies thus making the platform for comparison with the existing model not reliable.

Given the above limitations of the existing models for measuring ISoc, it stands a reason to conclude that these existing tools need to be improved upon for objectively measuring ISoc across nations and be used as generic model.

VI. TOWARDS A GENERIC FRAMEWORK

Since none of these models can be used as a generic framework for ISoc measurement, the importance of considering a generic framework was explained by [15]; [40]; and [5]. [15] described the perspectives of a generic framework and posited that it should contain a comprehensive and flexible tool which should be able to measure the information society of any sector in any society. It is clear that there is yet no single model for indicators, measurement or weighting and [5] explained that the variables and methods are determined by the particular goals of each project but declared that this is strongly due to lack of integrating theory which could be tested, not relying on subjective judgements, but based solely on empirical data. [41] therefore, suggested a "bigger picture" in information society measurement which includes consideration of cause-and-effect relationships in the information society, pointing to:

- Factors which influence ICT use and development and
- The influences which ICT has on society ie on the economy, etc

For some time, it is ITU's intention to develop a single ICT index [41]. This is also part of the mandate of the WSIS process [38]. But the importance of hypothesis-testing for suggesting causal relationships between variables is a critical factor that cannot be ignored.

From a conceptual level, a structure for analyzing what statistics and indicators are useful for "underpinning identification, formulation, monitoring and assessing the ISoc" has been proposed by [42]. He proposed four steps to realization of an ISoc which are Readiness, Intensity, Impact and Outcome, but due to the importance of adoption to the realization of an information society as described by [43] and [44], has been modified with the addition of Adoption step which illustrates the general hierarchy of complexity connected with indicators for an ISoc – starting from the basic facts to more intricate indicators for capturing the emerging phenomena developing from an ISoc. The steps also illustrate the different domains the indicators should bring light to. The explanation of the steps in hierarchy of complexity and classification of an information society as explained by [42] and [44] are: Readiness, Adoption, Intensity, Impact and Outcome. The Gardin's analysis was based on what statistics and indicators are useful for measuring the information society. This model is described by [15] as the best approximate classification for ISoc measurement and it is being applied by many organizations involved in ISoc measurement. But [[5] explained that "more recent efforts, using advanced statistical tools, have begun to tease out the relationships between the many variables involving information and information technology. While these approaches steadily improve, they can approach, but not achieve, certainty, as they are all dependent on a vast number of critical initial conditions, so that as each analysis becomes more precise, it becomes a case unto itself. However, for pragmatic social and economic applications, some useful general rules and relationships must be, developed". Apart from the fact that many countries in the world has passed the stage of readiness, [45] and [16] described the inadequacy of relying on readiness as a construct of ISoc measurement while [43] described the reliability of intensity of ICT usage more than mere adoption of ICT. Therefore in this study Intensity of ICT usage, Impact and Outcome will be adopted for the measurement.

The definitions, dimensions and the measurement items of these constructs are therefore presented in table 2 below, derived from the existing models considering new indicators associated with the emerging ICT innovations.

A. Social Network Analysis and Data Collection

ISoc constructs can be seen as social actors (which can be represented as points, nodes or agents) that may have relationships (which can be represented as edges, ties) with one another. This type of network created can have few or many actors, and one or more kinds of relations between pairs of actors. Factors to be included in a heterogeneous society of the world may be endless. Managing these enormous data and manipulating them that we can see patterns of structure and relationship may be tedious and complicated. But using mathematical and graphical techniques in social network analysis presents compact and systematic descriptions of the relationships. The metrics in social network analysis will help us to determine the:

- Betweenness- of a node to other nodes. This is the extent to which a node lies between other nodes in the network. This can be interpreted as the measure of connectivity of one measurement item to another.
- The closeness- which is the degree a node is near all other individuals in a network (directly or indirectly). This may refers to the degree a measurement item is near all other items
- Degree- which is the count of the number of ties to other actors in the network. This may refers to the count of the number of ties to other measurement items in the network.
- Centrality- which is the measure that gives a rough indication of the social power of a node based on

how well they "connect" the network. "Betweenness", "Closeness", and "Degree" are all measures of centrality. This may reveal the most central measurement item in the midst of other items

- Eigenvector centrality- which is the measure of the importance of a node in a network. It assigns relative scores to all nodes in the network. Having a high score contribute more to the importance of the node in question. This determines the degree of importance of the measurement items.

B. Data Collection

It is assumed that the generic framework for measuring the information society will be realized using the social network analysis with the new Pajek software. This framework can then be validated empirically with data. Since these types of data cannot be collected with questionnaire or interview, data mining technique is suggested using web crawler or some useful search engines for eliciting data for this type of analysis. The effect of causal relationship between the variables of the steps to realization of an information society cannot be overemphasized. This is what [47] described as statistical causality which he expressed as the change in the value of one variable associated with a change in the value of another variable. [47] concluded that causal relationship can be perfectly determined by social network analysis more than the regression and structural equation modeling while [59] describe the validity and reliability of data collected from the web.

Construct	**Definitions/ Characterization**	**Characterization of Dimensions**	**Characterization of Measurement Items**
Intensity	This is the incidence and frequency of usage and different usage of ICT. This is in correlation with the probability to innovate with set of potential indicators of ICT use [48].	-Frequency of ICT Usage -Variety of ICT Usage	-Amount of time spent per day to access the web -Amount of time browsing per day -Amount of time searching per day -Number of email messages sent per day -Number of email messages received per day -Number of email marketing transacted per day -Number of internet call per day -Number of website visited per day -Amount of downloaded bytes per day -Amount of uploaded bytes per day -Amount of online procurement per day -Number of online banking transaction per day -Number of social network sites subscribed for -Number of social network sites visited per day -Number of ecological information searched for on the web per day -Number of digital switchover applications -Number of business organization using Pcs for business per day -Number of business organization using internet for per day -% of Primary and Secondary schools using PCs for learning purpose -% of Primary and Secondary schools using internet for learning purpose -% of tertiary education institute using Pcs purpose -% of tertiary education institute using internet for learning purpose -Number of Health institutions using Pcs for medical record -Number of digital medical diagnosis -Number of tele-medical care transacted -% of government staff using Pcs for government services -% of government staff using internet for government services. [55]; [18]; [56].

Impact	This is the realization of benefits of ICT on the skills, innovation, economics, social and other developmental aspect of a society [5].	-Skill generation -Job generation -Improved job performance -Simplification	-% Population with PC Usage skill -% of women with PC usage skill -% Population with Internet usage skill -% of women with Internet usage skill -% Population with Web browsing skill -% Population with email usage skill -%Population with online marketing skill -% Population with online call skill -% Population that can download from the web -% Population that can upload to the web -% Population of private ICT jobs created per year -% of ICT job opportunities per year -% Population with online banking skill -% Population on the Social network sites -% Population on more than one network sites -% Population on Professional blogs -% of business organizations with a website % of tertiary educational institutes with ICT courses -% of students enrolled in tertiary educational institutes in an ICT fields -Number of Digital Switchover application -Numbers of hectares of forest protected using ICT -% of online government services -% of Medical Practitioners with ICT skill -% of health institutions with ICT equipments -% of Maternal clinics with ICT equipments -% of Paediatrics clinics with ICT equipments -Number of Remote digital diagnostic centres - Availability of adequate and uninterrupted power generation [55]; [56]; [57].
Outcome / or Attainment of Information Society	This is the final result of what happens on the enterprise level in terms of productivity, economy, globalization and social outcome of the application of ICT. It is the degree of success of achieving the set goal of assuming an information society. (This is a comparison with the WSIS draft plan of action) [58].	-Income generation -Generation of quality social capital -Increased standard of living -Globalization	-Number of global partnership for development -% increase in Communication Network per year -Number of National Economic empowerment programmes per year -Number of Government websites -Number of ICT research and policy implementation per year -Number of online government services -Number of Patients treated with digital diagnostic equipments -% of Patients treated with Tele-medical equipments -Number of ethnic and cultural representation on the web -% increase in Gross Domestic Product (GDP) per year -% increase in Gross National Income (GNI) per year -% Poverty reduction rate per year -% increase in life expectancy per year [57]; [49].

Table 2. Constructs, definitions, Dimensions and Measurement Items of Information Society Measurement

VII. CONTRIBUTIONS

It is assumed that this study apart from contributing to the effort of finding the appropriate definition of an information society, bringing out the real meaning of an ISoc from theoretical derivations , also throw a great light to the efforts of the current models on information society measurement through its survey. The gaps in their approach and suggestions on how these gaps can be bridged can be a template on which a new valid framework can be built while through the network analysis approach the generic

framework can be achieved. The suggested methodology will also ensure reliable data upon which a dependable information society measurement can be made. The result of this finding may be a good instrument in the hands of the countries policy makers in preparation and assumption of an information society

VIII. CONCLUSION

Assumption of information society is purely an ICT adoption and consumption process. Consumers and adopters behaviour is much of intensive and innovative usage generating skill that can bring a developmental impact and a global outcome. Established on appropriate theoretical and empirical validation, it can be assumed that Gardins Hierarchy of complexity and Classification of Information Society can be used to achieve a generic framework for information society measurement.

REFERENCES

[1] Menou, M. and Taylor, R. (2006). A "Grand Challenge": Measuring Information Societies. The Information Society Vol. 22 No.5 pp.261-278.

[2] International Telecommunication Union (ITU) (2010). Measuring the Information Society ITU-D 2010. Geneva: ITU. 108pg.

[3] Popova, I., Popov, O., & Dallin, R. (2005). ICT Knowledge for ICT Diffusion. Information and Communication Division. Department of Information Technology and Media, Mid Sweeden University.

[4] Hanafizadeh, P., Hanafizadeh, M. R. and Khodabakhshi, M. (2009). Taxonomy of e-readiness assessment measures. International Journal of Information Management 29, pp. 189-195.

[5] Taylor, R. and Zhang, B. (2007) Measuring the Impact of ICT: Theories of Information and Development. Proceeding of Telecommunications Policy Research Conference held at Washington DC. 26-28 September 2007. 39pg.

[6] Umesao, T.(1963). Introducing the Information Industry Debate. In Taylor, R. and Zhang, B. (2007) Measuring the Impact of ICT: Theories of Information and Development. Proceeding of Telecommunications Policy Research Conference held at Washington DC. 26-28 September 2007.

[7] Hayashi, (1967). "Informationalized Society" In Taylor, R. and Zhang, B. (2007). Measuring the Impact of ICT: Theories of Information and Development. Proceeding of Telecommunications Policy Research Conference held at Washington DC. 26-28 September 2007. 39pg.

[8] Masuda, Y. (1981). The Information Society and Post-Industrial Society. Washington: World Future Society. pp. 31–33.

[9] Machlup, F. (1962). Production and Distribution of Knowledge in the United States. Princeton: University Press.

[10] Bell, D. (1973). The coming of Post-Industrial society: A venture in Social Forecasting Harmondsworth: Penguin pp. 6-29.

[11] United Nations (UN) (2009). Manual for the Production of Statistics on the Information Economy. New York: United Nations. pp. 1-188.

[12] United Nations (UN) (2005). Economic and Social Commission for Western Asia (ESCWA) Information Society Indicators. New York: United Nations. 65pg.

[13] Kivunike, F., Ekenberg, L., Danielson, M. and Tusubira, F. (2007). Measuring the Information Society: An Explorative Study of Existing Tools. Proceeding of the European Conference on Information Management and Evaluation held in France, 20-21September 2007

[14] Gray, V. (2006). Importance and Challenges of measuring the Information Society: ITU and Partnership Advances and Perspectives. Proceeding of the 3rd Workshop of Information Society Measurement in Latin America and the Caribbean held at Panama City. 22-24 November 2006. pp. 1-23.

[15] Grigorovici, D. M., Schement, J. R. and Taylor, R. D. (2004). Weighing the intangible: Towards a theory-based framework for information information society indices. In Global Boston: economy and digital society, eds. E. Bohlin, S. Levin, N. Sung, and C.-H. Yoon, pp. 169–202. Elsevier Science. Guilford

[16] Dada, D. (2006). E-Readiness for Developing countries: Moving the Focus from the Environment to the Users. Electronic Journal on Information Systems in Developing countries 26 (6) pp. 1-14.

[17] International Telecommunication Union (ITU) (2005). ITU Internet Rport 2005: The Internet of Things. Executive Summary. Geneva: ITU. 28pg.

[18] Organisation for Economic Co-operation and Development (OECD) (2009). Guide to Measuring the Information Society 2009. Available at http://www.oecd.org/dataoecd/25/52/43281062.pdf [Accessed August 10, 2011].

[19] UNCTAD (2007). World Information Society Report 2007: Beyond WSIS. Geneva: ITU. pp.1-175.

[20] UNESCO (2002). Information and Communication Technologies in Teacher Education: A Planning Guide. Paris: UNESCO. 237pg.

[21]. Bell, D. (1980). Sociological Journeys 1960-1980. In: Webster, F. (2006). Theories of The Information Society. London: Routledge pp. 6-29.

[22]. Masuda, Y.(1980). The Information Society and Post-Industrial Society. Washington: World Future Society. pp.31–33.

[23]. Castels, M. (1996). The Rise of the Network Society Vol. 1 of The Information Age: Economy Society and Culture. Oxford: Blackwell

[24 Webster, F. (2006) Theories of the Information Society. 3rd ed. London: Routledge. 323pg

[25]. Albright, K. S. (2005) Global Measures of Development and the Information Society. New Library World 106 (1214/1215), pp. 320-331.

[26]. UNESCO (2003). UNESCO's Basic Texts on the Information Society. Paris: UNESCO Publications for the World summit on the Information Society. pp. 1-16.

[27]. Howard, J. A. and Sheth, J. N. (1969). The Theory of Buyer Behavior. New York: John Wiley and Sons

[28]. Bettman, J. R. (1979). An Information processing Theory of consumer Choice. Reading, MA: Addison Wesley

[29]. Huffman, C. and Houston, M. J. (1993). Goal Oriented Experiences and the Development of Knowledge.

Journal of Consumer Research Vol. 20 (September), pp.190-207.

[30]. Ratneshwar, S., Pechman, C. and Shoker, A. D. (1996). Goal derived Categories and the Antecedents of Across-Category Consideration. Journal of Consumer Research Vol. 23 (December), pp. 240-250.

[31]. Lawson, R. (1997). Consumer Decision Making within a Goal-Driven Framework. Psychology & Marketing Vol. 14 (August), pp.427-429.

[32]. Sjoberg, L., Bagozzi, R. P. and Ingvar, D. eds. (1998). Will and Economic Behaviour. Stockholm: Stokholm School of Economics.

[33]. Bagozzi, R. P. and Dholakia, U. (1999). Goal setting and goal striving in consumer behaviour. Journal of marketing Vol. 63 (Special Issue 1999), pp.19-32

[34]. Bagozzi, R. P. (2007). Explaining consumer behaviour and consumer action: from fragmentation to unity. Seoul Journal of Business Vol.12, No. 2, pp.111-143.

[35] ITU-D (2011). Measuring the Information Society: 2011 Executive Summary. Geneva: ITU. 28pg

[36] OECD and EC (2008). Handbook on Constructing Composite Indicators: Methodology and User Guide. Available at http://www.oecd.org/publishing/corrigenda

[37] WSIS (2012). WSIS Forum 2012 Outcome Document: Identifying Emerging Trends and a Vision beyond 2015. Geneva: ITU 357pg.

[38] World Summit on the Information Society (WSIS) (2012). WSIS Forum 2011: Outcome Document. Geneva: ITU. 181pg.

[39] Holbrook, J. A. D. (1998). Problems in Adopting the Frascati Manual for use in Resource-based Economies. CPROST Report, No. 98-08 pp.1-13.

[40] Mutula, S. M. & Van Brakel, P. (2006). E-readiness of SMEs in the ICT Sector in Botswana with Respect to Information Access. The Electronic Library, Vol.24 No.3. pp. 402-417.

[41] ITU (2007). World Information Society 2007 Report: Beyond WSIS Executive Summary. Geneva: ITU 30pg.

[42] Gardin, O. (2002). 'The new Economy: New Challenges for the Statistical System', Paper presented at the International Association for Official Statistics Conference on "Official Statistics and the New Economy", August 27-29, London, UK. 15pg.

[43]. Heinderyckx, F. (2003). Issues in Measuring Information Society adoption in Europe. The European Information Society: A reality check Edt by Bristol, J. S. Paris Intellect Books pp. 87-98.

[44]. Fuchs, et al. (2010). E-Business, Readiness, Intensity and Impact: An Austrian Destination Management Organization Study. Journal of Travel research 49(2) 165-178.

[45]. Ifinedo, P. (2005b). Measuring Africa's e-readiness in the global Networked economy: A nine-country data analysis, International Journal of Education and Development using ICT, 1, 1, 53-71.

[46]. De Nooy, W.; A. Mrvar; and V. Batagelj (2005). Exploratory Network Analysis with Pajek. Cambridge: Cambridge University Press. 362pg.

[47]. Doreian, P. (2001). Causality in Social Network Analysis. Sociological Methods & Research Vol. 30 No. 1 pp. 81-114

[48] Spiezia, V. (2008). Measuring ICT Impact on growth: a survey of recent findings. 2008 Global Event on Measuring the Information Society, Geneva, 27-29 May 2008.

[49] Zinnbauer, D. (2007). What can Social Capital and ICT do for Inclusion? Serville: European Commission. 42pg.

[50] International Telecommunication Union (ITU) (2012). Partnership on Measuring ICT for Development: Core ICT Indicators 2010. Geneva: ITU 81pg.

[51] UNESCO (2009). Information for All Programme: Information society Policies. Annual World report 2009. Available at http://www.unesco.org/new/fileadmin/MULTIMEDIA/HO/CI/pdf/ifap_world_report_2009.pdf

[52] UNCTAD (2003). Information Society Measurements: the case of E-Business. Background paper at the Commission on Enterprise, Business Facilitation and Development Exoert meeting on measuring Electronic Commerce as an Instrument for Development of the Digital Economy. Geneva, 8-10 Sept. 2003. 31pg.

[53] Webster, F. (2006). Theories of the Information Society. London: Routledge. pp. 23-59.

[54] OECD (2011). Guide to measuring the information society 2011. OECD Publishing. Available at http://dx.doi.org/10.178/10.1787/9789264113541-en

[55] ITU-D (2012). Measuring the Information Society: Executive Summary. Geneva: ITU 36pg.

[56] UN ICT (2009). Manual for the Production of Statistics on the Information Economy. New York: United Nations. 188pg.

[57] UN (2011). Information Economy Report 2011: ICTs as an Enabler for Private sector development. New York: United Nations 164pg.

[58] UN (2005). World Summit on the Information Society: Outcome documents. Geneva 2003-Tunis 2005. Geneva: ITU. 102pg.

[59] Fishers, D. et al. (2010). Terms of Service, Ethics, and Bias: Tapping the Social Web for CSCW Research. *CSCW 2010*, February 6–10, 2010, Savannah, Georgia, USA. Pp 603-606.