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A Conceptual Framework for Information Society Measurement (An on-going D-Tech. Research Project)

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Abstract

The measurement of information society has become one of the important issues globally. The purpose of measuring information society is to provide metrics that provide basis for determining the standing of a nation in taking full advantage of opportunities offered by the present information age for social transformation and economic development. The goal of this study is to develop a generic framework for information society measurement with appropriate empirical and theoretical validation. This entails a critical analysis of the existing frameworks to identify the methodological gap, and development of an empirically and theoretically validated framework able to provide the level of semantic robustness necessary for information society measurement. The study will posit a model of information society measurement derived from the existing framework by the combination of web scraping and social network analysis discover relationships among the constructs. This will also use the degree of centrality of the constructs, closeness, betweenes and density to bring out the generic model that can be used as proxy for information society measurement of any nation. This study will provide baseline information that will enable societies, communities and organizations to determine where they stand in assuming an information society, mitigate the risk of failure in initiatives directed at Information Communication Technology (ICT) while it will enable social and economic transformation. The information resulting from this study can find its use in information society comparisons, monitoring, reporting and planning.

Keywords: Information society, generic framework, web scraping, social network analysis.

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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) (Menou & Taylor, 2006).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 process of monitoring and evaluating progress in achieving the goals of an information society is therefore crucial in actually realizing such a society.

Early and Current efforts at Quantification

Taylor and Zhang (2007) 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, Umesao (1963), Hayashi (1967) and Masuda (1981)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 Machlup (1962) and Bell (1973) 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) (United Nations, 2009).

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 (United Nations, 2005). Kivunike, (2007) 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 Gray (2006) 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.

Problem Statement

Review of literature has shown that the need to develop a generic framework for information society measurement is becoming an important phenomenon in recent years in the world information society. However there

are several indices and measurement instruments for information society from both academic and corporate sources. But the gap in these existing indices and measuring instruments can be explained by the fact that countries being measured vary immensely in their capacity and needs, and there are disparities among them in their ability to create and use ICT for development posing a number of challenges to information society measurement according to Grigorovici et al (2004). Also Taylor (2006); Menou and Taylor (2006) described "a grand challenge" posed to the determination of a generic metrics for information society measurement. Out of such are the challenge of determining an acceptable definition of what an information society really is and what is to be measured. They opined that achieving a universally accepted definition of an ISoc and its basic entities may be an open-ended challenge while this challenge has led to different understanding of an ISoc, differing methodologies of ISoc measurement in literature and measurement of different things; Also the challenge of determining appropriate indicators and metrics from a suitable framework which can stand as proxies for multiple factors and sectors, properly validated and capable of measuring the ISoc of any society are yet to be achieved (Taylor, 2006; WSIS, 2011). Then the challenge of data source, collection and analysis, bringing out the relationships between these metrics and ensuring instrument reliability. In this study attempt shall be made to bridge these gaps in knowledge.

Research Questions

Against the backdrop of the highlighted problems the key research questions motivating this study are:

1. What are the influencing factors that contribute to increased realization of an ISoc?
2. What is the unified framework for effective ISoc measurement in any country?
3. How can the ISoc be quantitatively scored?

Research Goal and Objectives

The main goal of this study is to develop a conceptual framework for ISoc measurement, developed from critical analysis of the existing frameworks bringing in the human and social cultural constructs capable of information society measurement of any country.

In order to accomplish the set goal, the following research **objectives** have been identified:

a) To identify the influencing factors that contributes to increased realization of an ISoc.

b) To develop a unified framework that incorporates all factors toward developing an effective ISoc measurement model.
c) To develop an effective quantitative scoring model for ISoc measurement

Previous Research

Models for Information Society Measurement and Analysis

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 United Nations (2009) 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 gaps they and other scholars left behind and build on it to suggest a new ISoc assessment framework that can be used generically for ISoc measurement. Thus a scoping review was conducted on these models and the result analysed.

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 (OECD and EC, 2008).
- 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 Taylor and Zhang, (2007) 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 (WSIS, 2012). One important reason for this according to Holbrook (1998) 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.

Hierarchy of Complexity of Information Society Indices

The framework for Information Society will be derived from the Gardin's proposed steps to realization of an ISoc (Gardin, 2002). A structure for analyzing what statistics and indicators are useful for "underpinning identification, formulation, monitoring and assessing the ISoc" has been proposed by Gardin (2002). 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 Heinderyckx (2003) and Fuchs et al (2010), has been modified with the addition of Adoption step. Thus the realization of information society measurement has been assumed to be in five steps which are Readiness, Adoption, Intensity, Impact and Outcome. This 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 Gardin (2002) and Fuchs et al (2010) 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 Grigorovici et al. (2004) as the best approximate classification for ISoc measurement and it is being applied by many organizations involved in ISoc measurement. But Taylor and Zhang (2007) 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, Ifinedo (2005) and Dada (2006) described the inadequacy of relying on readiness as a construct of ISoc measurement while Heideryckx (2003) described the reliability of intensity of ICT usage more than mere adoption of ICT. The explanation of the steps in hierarchy of complexity and classification of an information society as explained by Gardin (2002) and Fuchs et al (2010) are: Readiness, Adoption, Intensity, Impact and Outcome.

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(a) Intensity reflects the state of use of ICT applications within a society. This is the incidence, frequency of usage and different types of ICT usage. It is in correlation with the probability to innovate with set of potential indicators of ICT usage (Spiezia, 2010). This is triggered by the value creation around the ICT usage and its measurement is characterized by the frequency and variety of usage. Intensity indicators show the actual use and applications of ICT and describe, for example, the frequency and variety of ICT usage, and the purpose of that usage, for different sectors and groups.

(d) **Impact** refers to the results of ICT usage in terms of management re-engineering and value added creation of skill and new sources of wealth. In general, impact indicators relate to changes at the organizational level, namely, business, government and civil society. Its indicator is characterized by skill generation, job generation, improved job performance and simplification of job process.

(e) O**utcome** is the final result of what happens on the enterprise level in terms of productivity, economic and social impact and for the sake of this research the socio-cultural dimension shall be included at this level. Its indicator is characterized by income generation, generation of quality social capital, increased standard of living and globalization.

These are fundamental indicators in an information society measurement and provide the main basis for benchmarking the progress achieved by a given society in building their information society.

Mathematical Framework

Representing the three construct on a Venn diagram as an events representing Intensity as E_1, Impact as F_1, and Outcome as G_1 and the intersection between the two sets as EF_2, FG_2 and EG_2 while the intersection between the three sets can be represented with EFG_3 as in Figure 2.

Subtracting from P(E) + P(F) + P(G) the weights of elements (variables) in the region EF, FG and EG once and the weights of elements in the region labelled EFG twice. Subtracting the weights of the elements of each of E∩F, F∩G, and E∩G and more so as we subtract the weights of elements in EF, FG, and EG once but the weights of elements in EFG three times, leaving us with Figure 3.

Then the weights of elements in the E∩F∩G can be back into our sum. Thus we have a probability equation below:

$P(E \cup F \cup G) = P(E) + P(F) + P(G) - P(E \cap F) - P(E \cap G) - P(F \cap G) + P(E \cap F \cap G)$

From the equations above, we deduce the formula

$$\left(\bigcup_{i=1}^{n} \in_i\right) = \sum_{i=1}^{n} P(\in_i) - \sum_{i=1}^{n-1}\sum_{j=i+1}^{n} P(\in_i \cap \in_j) + \sum_{i=1}^{n-2}\sum_{j=i+1}^{n-1}\sum_{k=j+1}^{n} P(\in_i \cap \in_j \cap \in_k)$$

……(1)

as the mathematical generic model for information society measurement while i, j, k represents the main constructs Intensity, Impact and Outcome.

Summing over three element sets $\{i_1, i_2, i_3\}$, and for every possible set of indices (or factors) that we may choose from N={1, 2, 3,…….,n} correspond to the term of that sum. Thus if the set in the equation begins with positive sign then it odd in size, otherwise, if the set in the equation begins with negative sign then it is even in size.

Compacting the sum using abstraction notation. Given a set Intensity $I=\{i_1, i_2 \ldots\ldots i_n\}$of indices, thus we have $\bigcap_{i:ieI} E_i$ to represent one of the construct

Therefore, the intersection of all the sets E_i with i in I.

Is equal to $I=\{i_1, i_2, \ldots\ldots i_n\}$ then we have:

$$\bigcap_{i:ieI} Ei = Ei_1 \cap Ei_2 \cap \ldots\ldots\ldots \cap Ei_k$$

……(2)

as the mathematical generic model for just one of the constructs in the information society measurement.

Research Methodology

This research is best classified in a positivist paradigm in the sense that it will assume the characteristics described by Oates (2006) that a positivist shared world view is that the world is a social world that exists out there, not just in our minds, but to be studied, captured and measured; and discovered this world by making observations with objectivity and facts; based on empirical

testing of theories and hypothesis leading to confirmation or refutation; and measurements producing models of how it works often with strong preference for mathematical modelling and proofs and statistical analysis; looking for generalizations or universal laws, patterns or irrefutable facts that can be shown to be true regardless of occasion and can be assessed with objectivity, reliability and validity.

This research will involve two main stages, the creation and validation of a new framework for Information Society measurement. Thus Modelling research methodology will be duly applied.

Steps in the first stage will involve derivation of dimensions, indicators and model creation.

Steps in the second stage will involve data elicitation, data analysis and model validation.

Measurement

The first stage of the research will involve the derivation of dimensions and indicators at each step of the classification of ISoc indices:

Model Creation

The research model will be developed from the structural model of the relationships between the different steps of achieving an Outcome stage of an Information Society (figure 2) derived from the model of Gardin (2002) and the network graphical mapping of the constructs of information society using the network analysis approach. Because of the common core of basic variables and processes that are universal, or at least approach universality that will be involved (Bogazzi, 2007), this model will allows the realization of a unified or generic framework.

Research Area for Validation

South Africa as a country shall be adopted as an Information Society for validation and testing of the evolved framework which is constituted into Provinces. In these provinces we have the sectors of ICT initiatives in which shall be used for the validation.

Data Collection and Social Network Analysis

Data Collection

The validation of the proposed generic framework for information society measurement will be done in the nine provinces of South Africa. The University of South Africa (UNISA) will be used as the area of study and the students and staff of the university will be used as the unit of analysis. Data about how the students and staff of this university use ICT especially the internet will be crawled and interpreted to fit the constructs arrived at, using data mining approach with a suitable code or an appropriate web crawler and some useful search engines. Data mining is the process of extracting new knowledge hidden from large volumes of raw data to develop a model that can be used to predict values. The idea to use the UNISA database came up due to

the difficulty of getting appropriate ICT data in the country's databank. The idea to use university students and staff as unit of analysis can be supported by the assumption of Gay (2006), Nwosu and Ogbomo (2011) and Oye at al. (2011) that ICT adoption and usage today is highest among the university students and staff due to importance, diffusion and integration of ICT in to current teaching, learning and research. The choice of UNISA is based on their distant learning approach of education that makes their students to be distributed round the whole nine provinces of South Africa and beyond with learning centers. It is assumed that this will be a good ground to test a feel of ICT usage in all these nine provinces and therefore to compare their level of information society.

Social Network Analysis

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. Pajek is a program, for Windows (32 bit), for analysis of large networks. It is freely available, for non-commercial use. The main goals in the design of Pajek are to support abstraction by (recursive) factorization of a large network into several smaller networks that can be treated further using more sophisticated methods; to provide the user with some powerful visualization tools; and to implement a selection of efficient algorithms for analysis of large networks. The effect of causal relationship between the variables of the steps to realization of an information society cannot be overemphasized. This is what Doreian (2001) 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. Doreian (2001) concluded that causal relationship can be perfectly determined by social network analysis more than the regression and structural equation modelling while Fisher et al. (2010) describe the validity and reliability of data collected from the web. 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 with the Pajek software will present compact and systematic description 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.

Discussion and Conclusion

The influencing factors that contribute to increased realization of an ISoc are better generated from proving theories. It is assumed that these factors are precursors to reliable constructs. Subjecting data collected with these constructs to network analysis will definitely produce a generic framework for information society measurement. This after being validated can be a good instrument for information society measurement of any country.

In conclusion the process of monitoring and evaluating progress in achieving the goals of an information society in this approach can be used to make informed policy decisions and suggestions for decision makers.

References

Abdi, H. (2003). Partial Least Square (PLS) Regression: In: Lewis Black M., Bryman, A., Liao, T. F. (eds). The SAGE Encyclopedia of Social Sciences research Methods. SAGE Press,
Thousand Oaks, pp. 792-795.

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

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.

Bell, D. (1980). Sociological Journeys 1960-1980. In: Webster, F. (2002). Theories of The Information Society. London: Routledge pp. 6-29.

Bridges.org (2001). Spanning the digital divide: Understanding and tackling the issues. Cape Town: Bridges.org [online] Available at: http://www.bridges.org/ files/active/1/spanning the digital divide.pdf [Accessed August 20, 2011].

Bridges.org (2005). E-readiness assessment tools comparison. Cape Town [Online].

Available at: http://www.bridges.org/files/active/0/ereadiness tools bridges 10Mar05.pdf [Accessed June 14, 2011].

Barzilai-Nahon, K. (2008). Toward a theory of network gatekeeping: A framework for exploring information control. *Journal of American Society for Information Science and Technology* 59 (9) pp. 1493-1512.

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.

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

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

Economic Intelligence Unit (EIU) (2009). E-readiness ranking 2009: The usage Imperative. A report from the Economic Intelligence Unit. Written in co-operation with The IBM Institute for Business value. Available at: http://www.graphics.eiu.com/pdf.E-readiness%20rankings.pdf [Accessed August 10, 2011].

Fisher, D., MacDonald, D.,Brooks, A. L. and Churchill, E. F. (2010). Terms of Servive, Ethics and Bias: Tapping the Social Web for CSCW Research. Proceedings of CSCW 2010 Feb. 6-10 Savannah, Georgia, USA. pp. 603-606.

Gay, G.; Mahon, S.; Devonish, D.; Alleyne, P. and Alleyne, P.G. (2006) Perception of ICT among undergraduate management students in Barbados. *International Journal of Education using ICT (IJEDICT)* Vol 2, Issue 4 pp.6-17.

Oye, N. D.; Lahad, N. A. and Rabin, Z. A. (2011) A Model of ICT Acceptance and Use for Teachers in Higer Education Institutions. International Journal of Computer Science & Communication Networks Vol 1(1) September-October 2011.

Nwosu, O; Ogbomo, E. F. (2011) ICT in Education: A catalyst for effective use of information. *PNLA Quarterly* Vol. &5(4) (Summer 2011) pp. 38-49.

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.

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.

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

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

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

United Nations (UN) (2005). Partnership on Measuring ICT for Development: Core ICT Indicators. New York: United Nations,

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

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

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

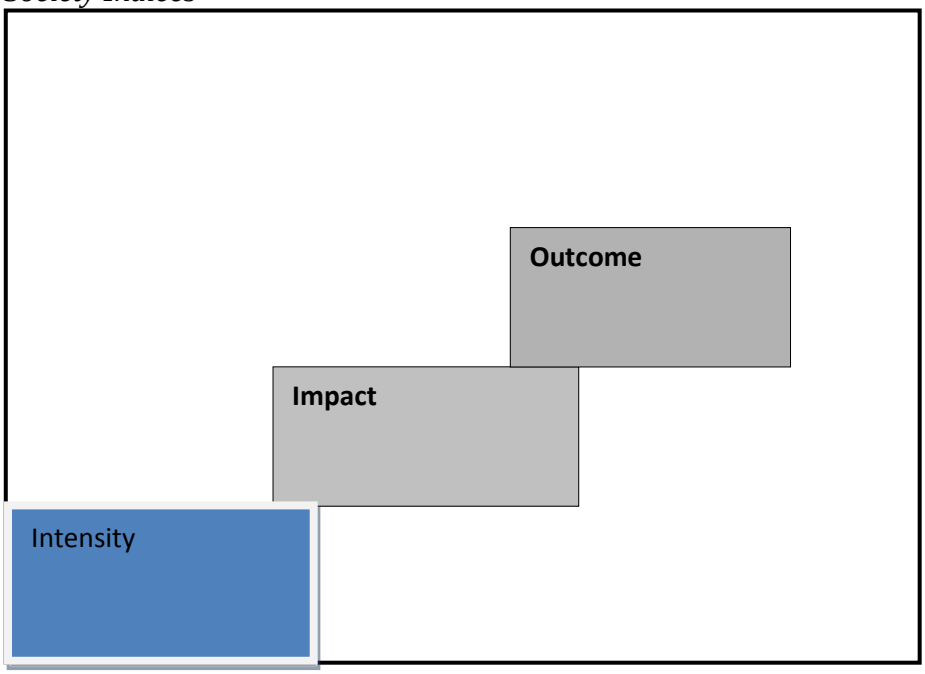
Table 1. *Research Work plan*

	TASK	START	DURATION
1	Preliminary Scan and Lit, Review	15 Feb **2011**	79days
2	Write and Submit Research Proposal	15 April	90days
3	Development of Conceptual Model	16 July	60days
4	Development of new Instrument	17 Sept	30days
5	Run pilot test and Main Survey	18 Oct	90days
6	Data collection	19 Jan 2012	90days
6	Data cleaning and capture	20 April **2012**	180days
7	Data analysis and synthesis	21Oct 2012	180days
8	Writing of thesis	20 April 2013	60days
9	Final editing	22 June 2013	30days
10	Submission	23July	1day

Table 2. *Research Budget*

	DESIGNATION	COSTS (SA RAND)
1	Data Collection - Air time for phoning and Internet access	10,000
2	Transportation	10,000
3	Consumables	6,000
4	Language editing	8,250
5	Photocopying	1,200
6	Soft Binding	270
7	Hard Binding	1,500
8	Miscellaneous	1,280
	TOTAL	**R39,500**

Figure 1. *Hierarchy of complexity and classification of Information Society Indices*



Source: Gardin, 2002 Modified

Figure 2. *Constructs and Intersections*

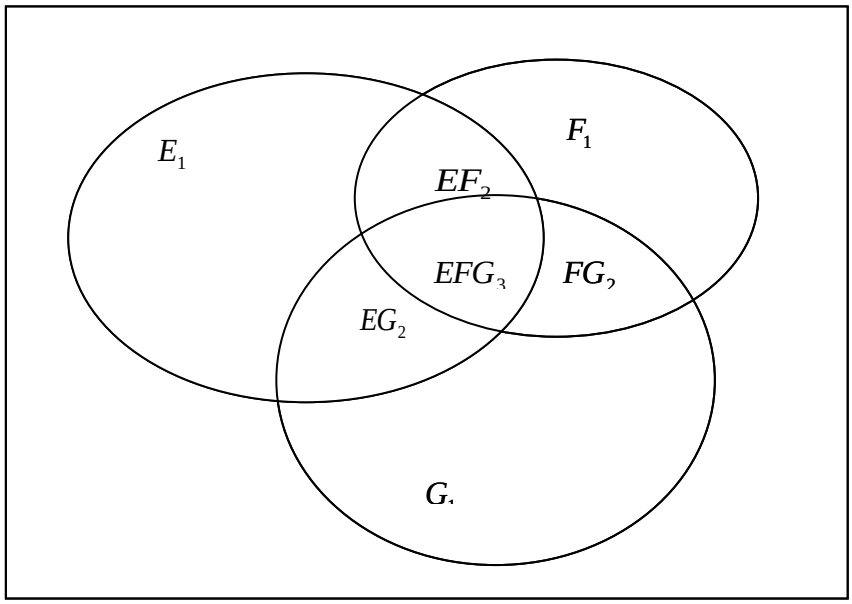


Figure 3.