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NATIONAL STATISTICAL SYSTEM AT CROSS ROAD AGAIN: MIGRATING TOWARDS INFO-AGE STATISTICAL SYSTEM

Keynote paper

Mr. Ramasamy Ramachandran, MIMOS Berhad, Technology Park Malaysia

I. INTRODUCTION

1. This paper briefly expounds the need to migrate into information age statistical system before any attempt is being made measuring emerging society dimensions. In the current borderless phenomena primarily characterized by the contemporary information and communications technology (ICT) the society, economy and politics are undergoing structural changes (Howkins & Valentin, 1977). The way individuals and organizations communicate, learn, share information, knowledge and resources, network with one another, participate in governance processes, perform business and social transactions and experience delivery of public goods and services are dramatically changing (Turner 2000, Azzman Shariffadeen, 2000). Moreover, the changes are increasingly becoming ubiquitous and unprecedented in the

human history (Howkins et al, 1997). The profound impact, effects and affects of the emerging borderless phenomena have warranted the attention of policy formulators, strategic planners and development practitioners worldwide. They are currently reviewing and realigning the development policies, programmes and implementation strategies to harness the emerging changes towards ensuring sustainable development that is crucial for enhancement in quality of life of people. Being an integral player in development endeavours, the statistical community too has a role and responsibility as well as moral obligation in embracing and harnessing the emerging societal changes. Like it was in the past when society, economy and politics evolved from primitive lifestyle to agricultural revolution and subsequently to industrial revolution the national statistical systems are once again at crossroads in dealing with the current information age developments.

II. CONTEXT: THE KEY PARAMETER OF CHANGE

2. The first major industrial revolution of eighteenth century registered the replacement of hand-tools by machines with the invention of steam engine and metallurgy process. A century later the second wave of industrial revolution occurred with the development of electricity, the internal combustion engine, science based chemicals, efficient steel casting and early communication technologies of telegraph, telephony and postal systems.(Castel, 1996). The first wave gave rise to agricultural revolution while the later resulted in industrial revolution, which gave rise to systematic and organized scientific reasoning and methodology. Now the current era is parameterized and characterized by the advent of Internet Technology. Specifically, the changing societal features and characteristics as well as system is giving rise to emergence of information and knowledge rich societies in an explicit manner. Therefore, the development challenge today is to formulate and implement policies, programmes and strategies in building the new society and economy and measure its progress appropriately.

3. Focusing on the measurement aspect, in particular migrating from agro-industrial based to info-age based statistical system, the paper discusses the following:-

(i) Fundamental determinants of information era;
(ii) The “big picture”: Value chain from industrialization of ICT to creation of knowledge society;
(iii) Challenges of current statistical measures meeting Info-Age demands;
(iv) Malaysia’s Experience: The 2002 Internet Subscriber Study;
(v) A need for holistic approach in migrating towards Info-Age Statistical System;
(vi) Info-Age Statistical System is a pre-requisite for measuring information age parameters: Information Society, Knowledge Society, Information Economy, Knowledge Development including developing any index in time series et cetera.

III. FUNDAMENTAL DETERMINANTS OF INFORMATION ERA

4. Today, almost all countries in the world including war torn countries Afghanistan and Iraq embrace Internet Technology, indicating its undisputable significance. Internet registered

its commercial introduction worldwide in early eighties. Prior to that, it was ARPANET confined to research domain, Local Area Network (LAN) and Wide Area Network (WAN) in business domain; however, these technologies were limited to geography and time. In the present Internet technology the phenomena is global, irrespective of geography, time, culture, traditions and values as well as commercially driven. Therefore, before framing any development or measurement activity it is imperative to have a basic understanding about the new age features, which can be seen from three aspects, namely ICT technology features, people elements and socio-economic consequences including governance – a socio-technology model (Ramachandran, 1998).

5. The key technology features (Behan & Holmes, 1990; Lauden et al., 1995;;April, 2000; Nurmela, 1997; Dickenson & Ellison, 1999; Statistics Finland 1997, 1999 & 2001; Statistics Canada 2001) that have given rise to contemporary information communications technology include :

- **Microelectronic** technology driven since mid 1940s;
- **Data conversion** from analog to digital and vice versa through MODEM;
- Emergence of **high-end software** such as JAVA, C++, HTML in multi-media content development by replacing the low end programming languages such as COBOL, PASCAL etcetera that only capable of generating basic texts and graphics;
- **Technology convergence** of computing and telecommunication systems (telephony, broadcasting and transmission) mediated through MODEM applications;
- **Web-based content** development employing audio, visual, multi-dimensional and animation features and characteristics;
- **Data communication** multi-facet (e-mail, cellular phone, fax et cetera), multi-dimensional (video conferencing, web based radio and television programmes et cetera) and multi-content (integration of audio, video, animation, still, flexible, versatile and can be manipulated) and multi-points (on-line, real time, borderless of geography)

6. In tandem with the technological change the information communication system that includes people and institutional elements is giving rise to a number of contemporary societal and economic features (Azzman Shariffadeen, 2000; Mansel & When, 1998; as follows:

- **Communications** have become efficient and effective enabled through online connectivity, real time interactivity, irrespective of geography, time, traditions, values and cultures and multi-facet;
- **New business** delivery and transaction modes are emerging through e-commerce, borderless trading and marketing;
- **New economy** emphasizes production, manipulation and distribution of information and knowledge driven products and services;
- **New social fabrics** deliberate virtual networking, borderless social and human interactions, and online and real-time delivery of services et cetera.

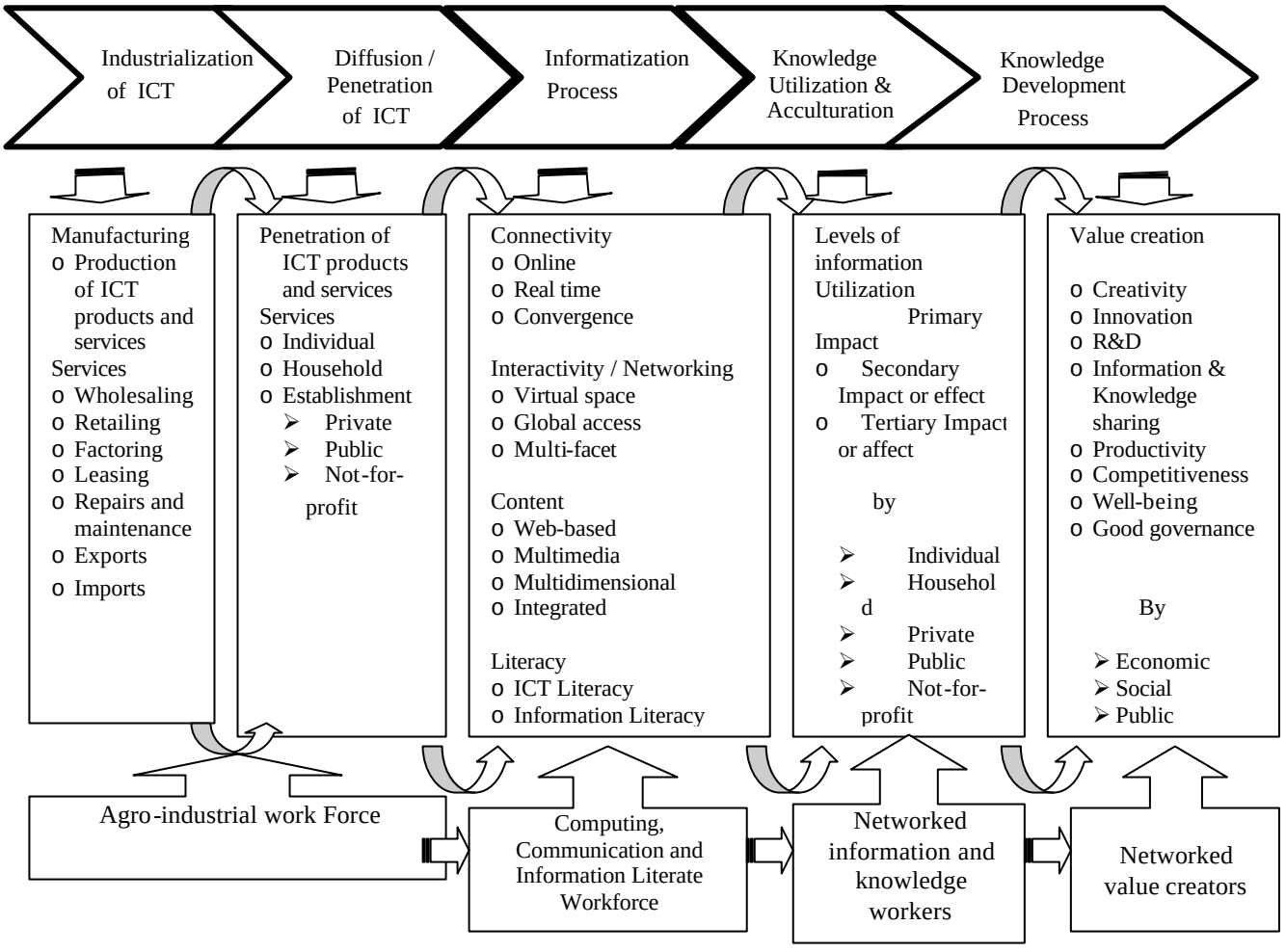
7. In the new phenomena people and institutions are inter-wined with technology and can be described as “people-chip” simply because information flows in and out of a person or an institution irrespective of geography and time when connected to a online and real time modes and means (cellular phone, Internet, fax et cetera). At the same time people and institution have become an integral aspect of contemporary information and communications system and giving rise to a number of changes in all spheres of society. These include:-

- **Governance** in social, economic and political realm is changing. Increasingly, the Internet impact has prompted concerns about the relevance and validity of traditional, rules, roles, rights, regulations, processes, procedures, institutional hierarchies and divisions of responsibility of individuals and institutions. The governance parameters such as responsibility, accountability, participative, inclusive, responsive, efficiency and effectiveness of decision making processes in public policy domain and delivery of public services and goods, in business transactions and social interaction are under going structural changes;
- Emerging **social cohesion and human dimension** and giving rise to borderless communities of varying degree of interest and chat groups ranging from Formula One forum to sophisticated ALQeda Network, constituting multi-nationals and “net-citizenry” characteristics, social digital inclusion elements et cetera;
- In the economic realm productivity at firm level and competitiveness of a nation in borderless environment being challenged through globalization phenomena and market liberation activities;
- Emerging **work force and culture** entailing concepts such as teleworking, “work travels” on contrary to people travel or migrate, rise of networked information and knowledge worker in comparison to information worker that Peter Drucker mooted in the sixties et cetera;
- The traditional learning parameters are also taking new shape through the life **long learning** concept which become viable and meaningful through Internet driven opportunities such as distance, online and open education systems;
- Emerging **information and knowledge divides** are accentuating the existing socio-economic disparity that is usually characterized as urban rural or income differential issues and thus posing new threats and challenges in narrowing the societal gaps;
- The **knowledge and resource sharing culture** also becoming a way of life among individuals, institutions and organizations as well as private corporations by promoting web-based information system, virtual networking complementing face-to-face meeting and networking;
- The integration and aggregation of technology, people and institutions globally has given rise **information explosion** and its proliferation is unprecedented in human history.

IV. THE BIG PICTURE: VALUE CHAIN FROM INDUSTRIALIZATION OF ICT TO CREATION OF KNOWLEDGE SOCIETY

8. It has been duly acknowledged that "soft factors" such as information, communication, knowledge and networking have been an integral aspect of any civilization and over the ages these factors have been crucial for societal progress. However, a fundamental question is raised why is it that the formation of information and knowledge society has become so profound in the current era in comparison to the preceding agro-industrial era? What is the relationship between ICT and data-knowledge chain (Raman, Azzizur 1990), information and knowledge society? The diagram below briefly attempts to answer these two questions by illustrating the five major stages in the value chain ranging from industrialization of ICT to information and knowledge development activities that becomes the basis for the creation of information and knowledge society. The diagram also depicts the essential features of each stage in the value chain. With the advent of modem and Internet, the scope, form and shades of ICT has dramatically has changed. The parameters depicted in the illustration below are crucial for formulating conceptual, measurement and methodological framework including concepts and definitions crucial to developing the Info-Age Statistical System.

VALUE CHAIN: INDUSTRIALIZATION OF ICT TO KNOWLEDGE DEVELOPMENT



V. ADEQUACY OF CURRENT STATISTICAL SYSTEM

9. The current statistical system, which is based on agro-industrial setting, is limited in scope and coverage in providing the requisite statistical data for the full-range of parameters depicted in the value chain above. Indeed, most of the data requirements are new to the official statistical database. Nonetheless, the paper intends to explore the extent of data availability of the various components of the value chain above, mainly by citing the Malaysian experience.

First Stage of Value Chain

10. The current statistical system worldwide including developing countries likely to provide data on production, export, import, repairs and maintenance, distribution, retailing, wholesaling, leasing and factoring values of industrialization of ICT. It is not feasible for this paper to present all the ICT data available in the current system. However, the paper pertinently would like to highlight that in recent years OECD has defined ICT components as a distinct sector (Jeskanen-Sundstrom 2001/2003; Parjo, L 2001; Wyckoff A.W. 2001/2003) and similarly the North American Industrial Classification System (NAICS) has defined ICT as "information sector" (NAICS, 1997). Following these initiatives countries like Malaysia too have begun to carve out ICT components from the current industrial classification system (Chellam 2001). The Table 1 below provides explicit definition of ICT viewing from manufacturing and service aspects; indeed, a first attempt by the Department of Statistics (DOS) of Malaysia (Economic Census, 2000). However, it must be recognized that the current statistical systems are not adequately and comprehensively representing the ICT or information sector, as the on-going data collection and collation system lacks the mechanism to capture new industries, products and services that are mushrooming with fast changing ICT technological phase.

Table 1: Principal Statistics of the Information as Communication Technology Industries (ICT), 2001

Industry	Establishment	Employment	Output	Input	Value-Added	Salaries & Wages	Fixed Assets As at 31 Dec
	Numbers		*Values (RM'000)*				
ICT Manufacturing	637	402,131	172,138,124	133,141,046	38,997,078	7,170,738	30,842,154

ICT Services	Establishment	Employment	Revenue	Expenditure	Salaries & Wages	Fixed Assets as at 31 Dec
	Numbers		*Values (RM'000)*			
Computer and Related Activities	281	10,704	2,776,804	2,608,580	480,838	518,837
Telecommunication Services	36	45,503	16,096,165	15,772,525	757,670	3,430,799
Telephone Services	*16*	*38,402*	*14,425,118*	*13,915,469*	*566,685*	*2,446,135*
Television and Radio Transmission Services	*8*	*3,014*	*938,423*	*1,107,478*	*140,560*	*407,665*
Data Communication Services/ISP	*6*	*1,326*	*670,632*	*687,246*	*35,239*	*541,816*
Paging Services	*6*	*761*	*61,992*	*62,332*	*15,186*	*35,183*

Source: Preliminary Report Economic Census 2001, Department of Statistics, Malaysia.

Second Stage: Malaysia's Experience in Conducting the Internet Subscriber Study

11. The second stage in the value chain is the penetration of ICT products and services at household and establishment level. A preliminary investigation showed that only selected member countries of OECD (specifically Australia, Canada, Japan and Korea) European Union members, and US have begun collecting and compiling data on various penetration rates of ICT products and services. Similarly, in Malaysia, the last Population and Housing Census of 2000 attempted canvassing availability of ICT for use by household members. The ICT items covered in the Census include radio, hi-fi, television, video, VCD, DVD, fixed telephone line, cellular phone, personal computer and Internet subscription. But, the data collection scope and coverage is limited to only technological perspective and lacked the people perspective on how efficiently and effectively individuals and organizations are utilizing the accessed information and virtual networking and borderless communication opportunities. Moreover, the data collection activity on ICT penetration has not become a regular statistical activity in the mainstream of official statistical system. The reason could be partly due to lack of organized and systematic approach and "buy-in" and institutional support from the mainstream strategic planners as well as bureaucracy complexities.

12. Despite the sluggishness, MIMOS Berhad being the first Internet Service Provider (ISP) in the country on its own made an independent attempt to collect and collate the profile information of new applicants seeking Internet dial-up connectivity via JARING services. Till mid 2003, MIMOS being the secretariat to the National Information Technology Council (NITC) chaired by the Prime Minister and deputized by the Deputy Prime Minister of the country, had the mandate to research and develop the statistics for the new age. As a recommendation in this R&D endeavour, the 11th NITC meeting endorsed the implementation of K-Measures Framework, which envisages a number of national level studies towards

realizing the Info-Age Statistical System. The suggested studies include Internet Subscriber & User Study, Impact of ICT On Household / Business Establishments / Public Sector and Academic Sector (Ramachandran, 2001 and 2003). Besides that the framework also articulates the necessity to do research on emerging concepts pertaining to networked workforce, lifelong learning, teleworking, governance, sovereignty et cetera. Despite strong political will, commitment and 'thought leadership', the resources are not only forthcoming in terms of allocation and institutional support but also expertise and know-how.

13. Recognizing the enormity and complexity of the task as well as bureaucratic difficulties, the MIMOS Berhad initiated the Internet Subscriber Study (Ramachandran & Asha, 2003; Ac Nielson 2002) as the foundational work towards building the Info-Age Stat System. The ISS was confined to JARING counter, which constitute the pioneer and major player in the provision of Internet connectivity of the country; currently there are five licensed ISPs. For the conduct of the study MIMOS / JARING provided the requisite administrative, logistic and technical support especially for the web-based methodology of data collection. Before resorting to web-based approach, initially the traditional mailing questionnaire approach was adopted but the response netted from the JARING Service Outlet (JSO) nation wide especially from developed states was very poor. The study covered both Individual Dial-Up and Corporate Dial-Up customers. The leased line customers usually the large corporations were not covered in the study. The main objective of the study was to assess the profile of new Internet applicants both individuals and small business establishments. Indeed, this is the fundamental question that the policy formulators in the mainstream are raising before they want to proceed to formulate and implement any information age related programmes and projects.

14. Interestingly, the ISS revealed a number of societal and business characteristics that the current statistical system could not cater for regarding the emerging information society. In particular, the ISS revealed only 29 percent of Malay ethnic group who constitute 65 percent of the national population composition subscribe to Internet services, indicating emerging societal disparity. Similarly, 73.5 percent of the total Jaring subscription confined to five states, namely WP Kuala Lumpur, Selangor, Penang, Johor and Sarawak. The first four are traditionally developed states and Sarawak being laggard surprisingly taking a leading position in the information era. Besides that, the ISS showed that bulk of the Internet subscription is predominantly male, high-income and urban dominated, indicating widening societal disparity. Being a multiracial country, it is imperative for government of Malaysia to take a serious view of emerging societal and regional disparities that ISS revealed.

15. An examination of corporate dial up subscription, the ISS indicated that 26.5 percent of the total establishments netted in the sample study were engaged in information and communication business. This followed by transport and storage accounting 20.3 percent. The Internet uptake among wholesale and retail, finance, insurance, business services and hotels are low unless these service sector establishments opted for leased lines. The average employment size of dial-up Internet seeking outlets was 32 of having annual revenue size RM819, 095. These figures would be meaningful for comparison if ISS had covered leased line subscribers who are usually big industry players. The ISS also revealed that, 53.4 percent of the total establishments netted reported that they have computerized finance and accounting system; 44.4 percent were using computers in sales and marketing; 38.3 percent in

operations and productions; 37.4 percent in human resource activities, 34.5 percent in inventory control; 26.2 percent in order entry and 24.8 percent in research and development. Indeed, such new official statistics could be useful for private sectors in planning and implementing fast growing e-commerce activities and telework practices.

Stages Three to Five

16. Data collation activity on informatization process, knowledge utilization and acculturation and knowledge development and value creation or value-adding aspects to products and services, as required from stage three to five in the value chain is very limited. As mentioned earlier the limitation is partly the approach to the new age dimension lacked people perspective and partly could be lack of mainstream "buy-in" and inadequacy of requisite subject matter knowledge and experience. Despite that, MIMOS Berhad attempted on its own to collect data on some aspects of informatization phenomena from the exhibition visitors of INFOSOC and MMA, hosted annually by the National Information Technology Council (NITC). The target respondents were exhibition goers who generally have specific interest and affinity to such events and therefore, do not represent the population at large for any meaningful data collation exercise. However, the INFOSOC and MMA platforms served well to test ICT and informatization concepts and definitions by fielding questions to the selected exhibition visitors.

17. The private sector statistical agencies such as IDC, DATAQUEST, NUA SURVEY et cetera have collected statistical information on information age developments but those measures were questionable from validity, reliability and statistical integrity that official statistics demands (Wyckoff,2001). A preliminary investigation showed that the data published by the private agencies were lacking content structure, public policy context, limited in scope and coverage and questionable sampling schemes, methodology and estimation procedures

VI. EMERGING CHALLENGES TO CURRENNT STATISTICAL MEASURES IN MEETING INFO-AGE DEMANDS

18. The foregoing paragraphs have briefly outlined the on-going statistical work and challenges faced, particularly in Malaysia in an attempt to develop a full-fledged Info-Age Statistics System. However, in the due process it is also realized that the information age phenomena is also affecting the validity of on-going surveys that the national statistical agencies are regularly engaged in. For illustration purposes this paper also has identified a number of issues that warrant the attention of statistical community worldwide. The issues are discussed under four broad aspects as follows:-

a) Inappropriate and Inadequate Statistical Concepts and Definitions

19. As indicated above the impacts and implications of contemporary ICT on society and economy including politics are bringing about major structural changes to the extent the statistical concepts and definitions (Asha, R.P. & Ramachandran, R 2001) that have been in practice since modern statistics started are becoming obsolete. For instance, in Labour Force

Survey “worked at least one hour for economic gain during the reference week” criterion used in measuring unemployment, full employment, under employment participation rates is being challenged for its validity especially in countries like in Malaysia where the unemployment is very low. Like many developed blocs, Malaysia is importing labourers from its neighbouring countries in Asia and friendly nations from African continent to meet its labour demands in agriculture, industrial and low value adding service sectors.

20. The current measurement criterion may be suitable for predominantly agricultural economy where farmers or landowners regularly work for their subsistence needs and one-hour employment probe aptly fits. In fact, when the measurement concept was introduced in the first Malaysian Labour Force Survey in 1974, the agriculture sector constituted about 54 percent of the total economy and now it stands at 15 percent after going through aggressive industrialization policy over the past three decades; the manufacturing sector alone grew from 8 percent to 28 percent over this period. Due to spectacular economic growth the unemployment rate in Malaysia has been consistently below five percent in the past decade, indicating full employment status by standard economic definition. Indeed, the measurement criterion used to study the employment pattern in the Labour Force study should have been reviewed sometime ago upon realizing its ‘over’ sensitivity as a measurement canon.

21. The labour force measurement criterion becomes more questionable in the current information era where the employment pattern is going through serious structural changes again. For instance, it is not uncommon to find students, housewives, retired people, elderly folks after mid sixties engaged in employment especially using flexi-hours via Internet driven teleworking modes. Such emerging work practices not only pose challenge to the fundamental measurement criterion discussed earlier, but also challenges the concept and definition of labour force age group as 15 to 64 or 10 to 64 as adopted in many countries worldwide.

22. Similar examples also can be cited from economic surveys. Malaysia started its explicit industrialization programme in early 1970s in view of expanding employment opportunities to solve the grave unemployment problem that was plaguing the nation’s social and political stability. Having attained a reasonable success, Malaysia in the mid 1980s embarked on capital-intensive economy towards increasing the enhancing nation’s competitiveness and sustainable growth and so as to increase its wealth to meet the ever expanding socio-political needs. However, the economic strategy could not stand the test of time when by early 1990s the economic situation worldwide have begun to change following adoption of free market system by ex-socialist countries, increasing globalization phenomenon, market liberalization pressures, borderless phenomena et cetera. Like many newly industrialized economies, Malaysia too faced the pressure and was compelled to shift its development strategy. In response, the Malaysia’s Third Outline Perspective Plan (OPP3 2000-2010) has adopted the knowledge driven economy as the major strategy to address the economic challenges arising from increasing domestic labour costs, the availability of cheap labour from outside the country, a poorly performing service sector, elusive capital, knowledge flight et cetera; the OPP1 1970-1990 and OPP2 1991-2000 emphasized industrialization strategy and prior to these two periods the diversification of agriculture economy was the focus. In tandem with these policy strategies, however, the national statistical system in the country did not undergo any major structural changes.

23. Specifically, the employment cut-off for carrying out economic census, revenue size group, output size group, employment size group and fixed assets size group has become less meaningful to policy work especially when the economy has begun to focus on heavy industries. In particular, the lower end of employment size group 'below 5', 5-10, et cetera needs revisiting when employment sizes in secondary sector establishments have grown into size of hundreds under heavy industrialization efforts. Similarly, the upper end of revenue, output and fixed assets value of "more than a million" also requires review in capital intensive economies when per establishment transactions runs into couple hundreds of million per year. Besides that, meaning of principal activity in defining an establishment, business merger towards becoming big conglomerates, increasing shopping popularity in mega malls in preference to retail outlets or supermarkets, emergence of structurally and hierarchically flatter organizations, cashless or business transactions using credit cards, employment of large pool of foreign workers, promotion for rank and file officers et cetera are further affecting traditional survey concepts. The measurements in the economic surveys are becoming more complex and complicated in the wake of new information age work practices such as such as e-commerce, borderless marketing, teletrade, teleworking, networked knowledge workers, virtual organization and small office small home (SOHO).

b) Emerging Technology Driven Data Collection Methodology

24. Data collection methods have been for ages. In ancient civilizations the tax collectors were fundamentally used for collecting population number and taxes to determine a country's strength and wealth. As human society progressed especially during the period of Renaissance modern methods of data collection using printed questionnaires, enumerators, mailing questionnaire approach, observation techniques and data extraction from administrative records emerged. In the recent years, in developed countries where the telephone penetration is very high, Computer Aided Telephony Interview (CATI) system became very popular in selecting samples and conducting household interviews in comparison to field enumerator system as being practiced in most of the developing countries. Indeed, prior to CATI the developed blocs also used the Population & Housing Census driven household listing for sampling and data collection purposes. The developed countries resorted to CATI upon realizing cost effectiveness and convenience merits. Similarly, now in the current information era with the introduction of Internet the statistical community again especially in the developed West are increasingly experimenting the web-based methods of data collection. Malaysia too, gained experience of collecting data using web-based approach when the Internet Subscriber Study 2000: At Jaring Counter switched from traditional mailing questionnaire approach to web based method. The web method registered a number of advantages. These include cheap in terms of no printing, mailing, fielding enumerators and training as well as data preparation and data entry cost; online mode provided a convenient way to gain access to target respondent; respondent able to filling in the form at his or her convenience and time and as such avoided 'interviewer harassment and botheration'; less time consuming from data collection to data entry; automatic web-based data entry; built-in system ensured secured transaction of filling in the questionnaire; automatic transportation from one question to the next relevant and technologically efficient and effective (Asha, R.P. 2002). The only factor that warranted attention is technical specification and preparation in developing replicable type of questionnaire and this required deployment of technical staff.

25. While countries experimenting the web-based techniques, Malaysia is planning to pilot test the application of SIMPUTER technology in the survey preparation and data collection activity using research grant. SIMPUTER is an intelligent mobile computing unit. Unlike desktop and laptop, the SIMPUTER is handheld gadget equivalent to Personal Digital Assistants (PDA). From its nomenclature, SIMPUTER connotes a Simple Computer but its computing and processing power can be nothing less than that of typical desktops or laptops. According to the manufacturer, the SIMPUTER devise can be programmed to replicate questionnaires and data can be entered simultaneously while interview conducted. The SIMPUTER also can be Internet driven so that data can be uploaded from remote location where dial-up connectivity is available. In other words he application of SIMPUTER technology eliminates printing of questionnaires and upgrades the work of field enumerators by replacing traditional data coders, editors, validating clerks, checkers and data entry operators. Perhaps, the system may require reviewed job function for system administrators who manned the data processing environment in large-scale data collection and collation activities. In particular, through the application of SIMPUTER technology the national census timeline can be reduced by one-third of traditionally scheduled duration, effectively can cut down large number of office staff and efficiency in staff mobilization can be improved by upgrading field enumerators technologically savvy. Consequently, the application of the proposed new technology can give rise cost effective and timely statistics without compromising statistical integrity that official statistical system demands. Like in the case of web-based technology, SIMPUTER technology also demands knowledge on technical specifications, capability and capacity. In other words, the emerging technologies of the current era increasingly exerting demands and pressures on statistical community worldwide to embrace and harness the changes so that the profession and its standards are being continued for relevance and existence in the public policy domain.

c) New Challenges Posing Sampling Frame

26. Traditionally, household listing, registered business entities under company or business registrations, yellow pages, association and business directories and telephone listings constitute the sampling frame. The type of sampling frame used for a survey work is determined by the nature of the study, proposed sampling scheme whether probability or non-probability, cost effectiveness, field work convenience et cetera. However with the advent of Internet technology and with prolific adoption rate the structure of sampling frame and sampling design poised to undergo change. The ISS, mentioned earlier did not employ any probability sampling techniques as the study was not in anyway intend to provide estimation of totals for any characteristics under study; in fact, the study aimed at distribution of key characteristics at national level. However, in future if web-based methods were to be employed as the primary mean for data collection activity, then method of sampling and data collection modes will become crucial issue for consideration. If the current trend of 'Internatization' process of society and economy continues, it will not be surprising in a decade the sampling frame will constitute web addresses and e-mail contacts. Therefore, in coping with such trends and changes the sampling statistician have daunting task of improvising the existing sampling designs and estimation procedures. In particular, the sampling statistician may have to take into account of issues such as multiple ISP account holders and overlapping samples selected from traditional lists and as well as from the web-

based lists. Besides that the survey statisticians need to re-strategize the training modes and modules in developing a technologically savvy enumerators and supervisors.

d) Need for New Aggregated Measures at National and International Level

27. The policy formulators have been expressing that there is a need for new aggregated statistical measure to depict national development characterized by information age phenomena. The on-going composite measures such as Gross Domestic Product (GDP) or Gross National Product (GNP) or Consumer Price Index (CPI) or Producer Price Index (PPI) et cetera are characterizing the agro-industrial settings and these measures are lacking elements of new age characteristics. Therefore, the current measures need to be reviewed and redeveloped. However, some organizations have realized the need for new statistical measures and have initiated some work, namely Digital Divide Index (DDI – Sciadas, George 2002) by ORBICOM-CIDA, Knowledge Imperative Index (KIX- KJ John, 1996, Ramachandran, 2001) by National Information Technology Council (NITC) / MIMOS Berhad of Malaysia, Information Society Index (ISI) of World paper, Network Readiness Index (NRI) of World Economic Forum et cetera. The common problem faced by these indexes is lack of adequate data. The appropriate data only can be generated regularly in a meaningful and a comprehensive way when national statistical system takes initiative to do so. Hence, it is imperative for statistical community worldwide to network and collaboratively undertake research in developing info-age statistical system and the associated composite measures. The collaboration among statistical community worldwide is very crucial so that common parameters and variables can be identified for developing composite measures for international comparisons like Human Development Index (HDI), Gender Empowerment Measure (GEM) et cetera.

VII. NEED FOR HOILISTIC APPROACH TOWARDS DEVELOPING INFORMATION AGE STATISTICAL SYSTEM

28. From the foregoing, it can be seen that age of electronics is having profound impact on national statistical system and has placed statistical community worldwide at crossroads and demanding for a direction. Recognizing the problems and issues, the paper proposes six-prong strategy in migrating from agro-industrial to information age statistical system. The strategies are as follows:-

- Review the current statistical concepts and definitions to incorporate the information age elements;
- Define “Information Sector” by restructuring the current industry, product, trade and occupational classification system and also incorporate emerging new products and services;
- Institute new national level statistical surveys that depicts information age developments such as Internet Subscriber / User Study, Networked Workforce Survey, ICT Impact on Learning Sector et cetera;
- Review the validity of sampling frame, design and estimation procedures in the light of emerging web-based directories;

- Explore new methods of data collection and collation activity that will employ new technological tools such as web-based, SIMPUTER application et cetera;
- Formulate conceptual and measurement framework towards developing new composite measures that can depict the information age development.

VIII. CONCLUSION

29. It can be realized that the statistical community is at crossroad in the current information era for its continuing relevance and existence. Specifically, “buy-in” from mainstream policy formulators, developing new age parameters, concepts and definitions, identifying appropriate statistical studies at national level and implementation strategies warrants due attention of statistical community at international level. The International Statistical Institute (ISI) and its affiliate International Association of Official Statisticians (IAOS) have taken some initiative in organizing knowledge sharing sessions on the development of information age statistics but the effort has not been adequate for the inception into the official statistical system of countries around the world. Therefore, the time has come for the statistical community worldwide to leverage on the World Summit on Information Society (WSIS) event to develop a vision, systematic and strategic approach towards realizing the Information Age Statistical System (Info-Age Stats). With regard to this, this paper suggests that the United Nation Statistical Division (UNSD) to embark Info-Age Statistical Research and Development Programme to streamline all activities pertaining to information age statistical compilation. The proposed programme, besides exploring some of suggested issues and statistical activities also to incept explicit training and knowledge sharing sessions as well as collaborative initiatives especially for the benefit of the developing countries.

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