

A “Grand Challenge”: Measuring Information Societies

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Even though there has been a proliferation of e-society measures in recent years, analyses of the metrics of the “information society” are still far from responsive to the needs of many stakeholders and continue to suffer from a number of serious limitations. Issues in eight critical areas are briefly presented. They include: definition of the universe to be measured; definition of the objects and phenomena to include in the universe; need to establish measurements based upon solid theories; units of measurements; data sources and collection; methods of analysis and construction of indicators; target audiences; and purpose and utilization of measurements. An organized collective effort, which could provide the impetus for the development of a coherent academic field of study, is called for to address this “grand challenge.”

Keywords e-metrics, e-readiness, information indicators, information policy, information society, measurement, theory

INFORMATION SOCIETY POLICIES NEED OBJECTIVE BASES

The 20th century has witnessed the rise of a perception of a major social transformation. Called the “information revolution” since the 1950s, it has increasingly been described as the advent, if not the existence, of an “information” or “knowledge” society. This discussion continues in many forums, including the World Summit on the Information Society (WSIS) (ITU, 2005). Beyond the fuzziness of

observations, concepts, and representations (e.g., are we talking of an information society or an Internet enabled economy?), a general agreement seems to exist regarding the need for public policies to guide, expand, and/or correct this evolution and broaden the reach of its eventual benefits. The WSIS thus stated:

Governments have a leading role in developing and implementing comprehensive, forward-looking and sustainable national e-strategies. The private sector and civil society, in dialogue with governments, have an important consultative role to play in devising national e-strategies. (ITU, 2005, Plan of action, 3 a, p. 27)

In spite of a sustained public policy discourse over last several decades, the information society-related policies tend to be mushy products of an odd mix of futurology, social forces, aspirations, ideology, and interest-group politics, among other things. It is rarely admitted that they should be informed by reliable observations and data. Apparently, the WSIS was more concerned about the ex post use of these observations and data for “evaluation” purposes but nevertheless called for “coherent indicator systems”:

A realistic international performance evaluation and benchmarking (both qualitative and quantitative), through comparable statistical indicators and research results, should be developed to follow up the implementation of the objectives, goals and targets in the Plan of Action, taking into account different national circumstances. (ITU, 2005, Plan of action, 28, p. 52)

It is difficult to entertain a sense of progress since similar calls were made in the 1960s, 1970s, and early 1980s. As Vladimir Slamecka stressed:

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The planning of national and international information services and markets, and the introduction of appropriate technology to them, would be considerably aided if ways were available to characterize more accurately the situation existing in individual sectors, countries or regions. Current approaches to categorizing and estimating the level of application of information technology are either inaccurate or incomplete, and they do not permit us to gauge the degree of appropriateness of particular types of technology, or that of the hospitality with which information technology will be received. (Slamecka, 1979, p. 13)

A quarter of a century later this warning remains unheeded. All we have is a plethora of flimsy “e-something” measures that make the front pages of business magazines from time to time.

GENESIS AND SCOPE OF THIS SPECIAL SECTION

The four papers in this special section were selected by the editor-in-chief of *The Information Society* for further review from the contributions to a workshop on “Measuring the Information Society: What, How, for Whom, and What For?” that was organized as part of the 2004 conference of the Association of Internet Researchers (AoIR) and cosponsored by the European Chapter of the American Society for Information Science & Technology (ASIS&T/EC) (Menou et al., 2004). It entailed an online preparation a few months before the event and a half day of face-to-face discussion at the conference. There were 24 proposals (abstracts, comments or references, and/or text of other relevant documents, and any combination of these), of which 10 were developed into original papers with authors from 13 countries. Extensive revisions based on feedback from reviewers brought the four selected papers into their present form.¹

The selected papers share a frustration with the quality and significance of the measures that have emerged in the past few years, the flaws in data quality, and the simplistic approach to standardization and construction of indicators. More importantly, they stem from a recognition that the tautologies that serve as theoretical foundation for the construction of the e-society measures (e.g., “an information society is a society which makes intensive use of information and communication technologies”) are not illuminating. Each paper, according to its particular focus, further proposes alternative concepts, theoretical frameworks, and methods that may lead to more accurate representations.

Karine Barzilai-Nahon explains why in her view the two types of measures that are currently used to depict the digital divide at the international level, focused monotypical indices and comprehensive indices, in her terminology, are ineffective. She proposes a model in which interac-

tions among six sets of factors are used to depict the digital divide: social and governmental constraints/support, affordability, use, accessibility, infrastructure/access, and sociodemographic factors. This approach departs from the common linear combination of specific indices and seeks to find a way to preserve comparability without sacrificing contextuality.

Vasja Vehovar, Pavle Sicherl, Tobias Hüsing, and Vesna Dolnicar similarly highlight the limitations of current measures and propose three methods that can radically improve the validity of results using the first digital divide, specifically Internet usage, as an example. They show how a multivariate loglinear modeling might correct the misleading representations resulting from bivariate analysis, as for instance in the case of urban versus rural use. While acknowledging the improvements brought by compound measures, they stress that the picture they offer cannot be exact until intracountry variations are accounted for. They further demonstrate how the use of a specific time–distance measure can result in a meaningful representation of the relative dynamics in information and communication technology (ICT) deployment.

Gregor Petrič investigates how an analytical framework based on the concepts of communicative and strategic action as defined by Habermas can provide a yardstick for discriminating between positive and negative uses of the Internet (Habermas, 1984). Five types of social intents compose the framework: interpersonal use, informational use, self-presentation, misrepresentation of self, and instrumental use. Replies to a web questionnaire by some 1700 Slovenian owners of a single personal web site provide the empirical basis for validating the framework.

Pille Pruulmann-Vengerfeldt, using different sets of data provided by extensive national surveys in Estonia, shows how social and cultural components, such as lifestyles, can be brought into information society measures. This improvement, however, hinges on the usage of appropriate theoretical constructs. The paper demonstrates that Layder’s (1997) notions of psychobiography, situated activity, social setting, and contextual resources offer an effective framework.

This special section is not intended to provide a thorough account of the many instruments that have been developed, or even of only those currently in use, discussing their respective conceptual backgrounds and methods, the issues that are not yet properly addressed, and ways to do so, as this would require several volumes. It is set to show that alternative approaches to measuring the information society are necessary and feasible and possibly to spark interest in a broader and more systematic effort. We hope that the originality and diversity of perspectives, theoretical backgrounds, and methods, as well as the insights they generate, will indeed work to that effect.

WHAT IS NEW WITH INFORMATION AND INFORMATION SOCIETY MEASURES

Everything related to ICT is affected by a novelty syndrome. Global measures follow the pattern. The claim by Kirkman and coauthors that they “present the Networked Readiness Index (NRI), a major international assessment of countries’ capacity to exploit the opportunities offered by ICTs, and the first global framework to map out factors that contribute to this capacity” (Kirkman et al., 2002, p. 10) may, however, sound somewhat excessive, or else symptomatic of the effects that clever alliances between scientific and political circles generate.

Even if one does not go back as far as the first Alexandria Library, which was in its own way the first attempt at taking stock of human knowledge in the Western world and beyond, or more recently to the Institut International de Bibliographie,² attempts at measuring the information in society or the information society can be traced back at least to the 1960s to the work of Fritz Machlup (1962).

Earlier studies have reviewed information society measures (e.g., Menou, 1985; Bridges.org, 2005; Grigorovici et al., 2004); the recent proliferation of the new measures and their specificity make it impossible to offer in this introduction even a brief overview. A retrospective look at this history might however offer some useful insights.

The second half of the 20th century witnessed a mostly unsuccessful struggle by information scientists to bring the strategic importance of information to the fore of the policy agenda. This movement was initially focused on what was then called “scientific and technical information,” considered as a key resource for innovation and competitiveness. The scope progressively expanded to cover all types of information and its use. Although mostly driven by competition between governments to preserve their national advantage or resist that of the dominant country, the concern for international comparisons was present and became prominent in the 1970s in particular with the UNISIST program of UNESCO and the work of the Organization for Economic Cooperation and Development (OECD) Committee on Information, Computers, and Communications Policy. Information policies and plans enjoyed growing and spreading attention up to the nineties and slowly vanished for reasons yet to be analyzed though arguably linked to the neo-liberal dogma. Toward the end of the 1990s as the Internet assumed center stage, studies and plans for the information, networked, or e-society emerged and rapidly gained momentum.

A somewhat similar and parallel cycle can be observed with information measures. If the composite indexes initiated in the early 1970s by the Japanese Research Institute of Telecommunications and Economics (Okada, 1978) had little success beyond academic circles, measures of the information economy following Porat and Rubin’s study

(1977) flourished in many countries in the 1980s. It is worth noting that the Nora–Minc report was published in 1978. In the 1990s, however, they had all but vanished. The rise of the Internet gave birth to specific measures and quite suddenly all sorts of information society measures appeared and proliferated. In the last update of their review of E-readiness assessments Bridges.org notes that “68 countries have been assessed between five and ten times by different organizations, while a further 69 countries have been assessed over ten times” (Bridges.org, 2005). This wave is still going on. For how long?

From this retrospective look we might infer that information metrics is subject to cyclical movements apparently linked to the volatile perception of technological developments and strategic challenges. A special feature of this field in the 21st century is, however, the vast number of studies undertaken by, or in cooperation with the private sector. The migration of the Networked Readiness Index from Harvard University to the World Economic Forum is perhaps worth meditating on.

SO, HAPPY?

Considering the wealth of methods currently proposed and actual measurements being carried out in a more or less regular and systematic fashion, one would expect that those who have for a long time lamented the scarcity of efforts in this area would be satisfied. On the contrary, it appears that most authors are frustrated not only by the overall picture and the achievements of their fellow investigators, which is natural, but even by the limitations of their own work, or the conditions under which it had to be carried out. Papers in this special section are no exception.

Since e-readiness measures are one of the most represented types of information metrics, Ernie Wilson’s recent criticism might illustrate the present state of affairs:

The dominant tradition of e-readiness reports, descriptions of policy intentions, and discussions of institutional arrangements tends to undervalue the very factors that most drive the policies that affect access to knowledge, and suffer from serious shortcomings. The dominant tradition tends to be static, techno-determinist, a-political, macro-oriented and avoids identifying winners and losers. (Wilson, 2006, p. 1)

The fact that most of the fundamental drawbacks, such as lack of theoretical background, inadequacy of raw data, superficiality of calculation methods, and dispersion of efforts, to name a few, that have been noted since the inception of social information metrics in the 1960s are still with us is probably the most vexing aspect of the scene.

The launch of the “Partnership on Measuring ICT for Development” in June 2004³ might have raised excessive expectations in view of its exclusive focus on raw statistical data, their collection by official statistical offices, national

or international, and its membership of almost exclusively international organizations of the United Nations family.

AN AGENDA FOR THE "GRAND CHALLENGE"

The notion of a "grand challenge" for the information field was first proposed by Richard Taylor in an earlier paper (2006). We concentrate here on one of the considered domains, information metrics, and more specifically on its social dimensions. The space available only allows for a quick presentation of the key issues, which include:

- Definition of the universe to be measured.
- Definition of the objects and phenomena to include in the universe.
- Background theories.
- Units of measurements.
- Data sources and collection.
- Methods of analysis and construction of indicators.
- Target audiences for measurements.
- Purpose and utilization of measurements.

The first challenge is to determine what it is that one is measuring. Is it information in society or an information society? Is it information or knowledge, or both, or ICT? Is it present state, or readiness, or potential, or outcomes? Beyond the intentions and definitions, there is often not much difference in the various measurements and even less in their interpretation and utilization especially in policy making. Achieving a universally accepted definition of the basic entities, that is, information, knowledge, wisdom, and related societal forms or manifestations, may be an open-ended challenge close to the punishment of Sisyphus. However, pursuing some clarity and rigor is not beyond reach, and is even an elementary requirement. If one adheres to Richard Taylor's notion that information and mind are fundamental constituents of reality, along with time, space, energy, and matter (Taylor, 2006), then the question might be, if one may say so, simplified in specifying information forms or states, and attributes or dimensions (see, e.g., Buckland, 1991; Menou, 1994).

Whatever the selected universe might be, a subsidiary question is: What does it comprise? More often than not, "information" measurements tend to exclude whatever is not "informational" per se, or at least not directly related to information resources and activities. They overlook the constant interaction between the real and the cyberworld, both being populated by human beings. Unless all exchanges are dematerialized, ground, sea, and air transport will continue to play a key role in the "networked" economy. Until all spots on the planet can cheaply reach relays for broadband radio connections, the distance from and capacity of international backbone telecommunications infrastructures will be of paramount importance—no

less will their ownership.⁴ Requirements for a meaningful and comprehensive coverage were proposed long ago (Borko & Menou, 1980, especially pp. 48, 49). The legitimate concern for simplicity is, however, no excuse for shortsightedness.

Framing information society measures within established or "in progress" theories is another challenge. We hope that the examples provided in this special section of the benefits that can be derived from a systematic construction informed by social theories will engage more scholars in this effort. No social theory so far has either won universal approval or lasting recognition. Thus the challenge is to test those theories that seem more relevant and promising, and to elaborate new versions or even new theories so as to iteratively arrive at the most articulate model possible. This does not mean that formal adherence to odd theories that manage to explain any social phenomenon, present or future, by the "network effect" is to be encouraged. Theorizing the difference between today's globally networked businesses and the Companies of the Indies may take a while.

Units of measurements relates to the general use of large geographic areas, such as countries or regions, or particular sociodemographic groups, as the basis for presenting data. A country does not necessarily equal another country; there are fundamental differences between the Maldives and Denmark that need to be taken into account. Age group, education level, income and needs are not identical in 100 people; or any multiple, in Burkina Faso and Ireland. There might be as much difference between Boa Vista and São Paulo, Brazil, as between Brazil and Swaziland. National "means" do not mean much unless they can be disaggregated. Most studies rely on an individualist and consumerist model of society that is manifested in figures like the number of persons who used the Internet over a given time. In a particular group one may find that 70% of the people in one group did, against only 2% in another group. But if the latter is a tighter community, with a tradition of intermediation, and those 2% acted on behalf of the rest of the population, the difference might not be that wide. That without a proper ethnographic knowledge of the population under study the use of any standard measure might be grossly misleading was penetratingly illustrated in the case of Nicaragua by Maria Edith Arce and Cornelio Hopmann (2002).

Data sources, at least for what concerns "basic" ICT indicators, make up an area where some progress has been made recently, even though one may question the level of pertinence of such data as "proportion of individuals who used the Internet (from any location) in the last 12 months" (Partnership, 2005, p. 22). However, the periodicity of nationwide household surveys is in general not aligned with the pace of transformation of ICT and their use. In 5 years significant changes might occur. The need

for more specific and often qualitative observation, combined with group and locale variations, raises the question of designing suitable sampling methods. Use of monetary values, for instance to measure ICT investments, might be misleading for international comparisons when considering the use of open source software, the spread of piracy or the arbitrary value of donated hardware and software, as John Daly (2004) pointed out. Things become a bit more tricky when it comes to mixing within composite indexes data, especially qualitative, from different sources that might have been collected by widely different methods. While the opinion of a panel of CEOs (chief executive officers) of multinational companies about government's friendliness to "business" is one element of appreciation, it is not the only, nor the most objective, one. The many aspects that are not yet covered by any reliable data, for instance, availability of appropriate contents, should deserve special attention.

Regarding methods of analysis and construction of indicators, a first issue arises with the use of scaling across all countries of the world as a means of standardization of the data. This is quite questionable with such heterogeneous sets. Weighting raises even more problems even though arbitrary weights might be perfectly acceptable as part of initial trials, as long as they are properly justified. Rankings or variations in scores from one year to the other that are widely used are even more questionable. Except for electoral speeches, whether or not country A will surpass country B from one year to the other is hardly offering insights into the evolution of an information society. More sophisticated methods such as structural equation modeling (see, e.g., Constantin et al., 2006), or LISREL (e.g., Vaughan & Tague-Sutcliffe, 1997), or those presented in this section especially by Vehovar, Sicherl, Hüsing, and Dolnicar, may indeed offer a way to extract meaningful facts from the data.

As far as one can see, information society measures so far have been targeted at policymakers, though often in simplified versions such as overall rank in the Networked Readiness Index, following a pattern of mutual intoxication similar, and related, to the one described by Benoît Godin (2003) in the case of the knowledge-based economy. At the same time, they were produced by and directed at what may be called the techno-militaro-mediatico complex, or else by power geeks who feed the former when not directly in charge. Some academics and civil society representatives also took part in the feast, though in small numbers,⁵ which may partly explain the perpetuation of certain misconceptions and uncertain practices. The big absentee, as usual, is the ordinary citizen who is supposed to benefit from all these innovations and experience a brighter life thanks to them. Except for references to the information society in marketing campaigns, the citizenry has little understanding of the transformations underway

so that informed choices could be made. Finding ways to bring back the beneficiaries as key players in the process of observation, analysis, and assessment of the transformations taking place is a major challenge. It is particularly critical with regard to assessing the impact of ICT, at least when the latter are not confused with change in market share.

Last but not least is the question of the purpose of these measurements. Although specific and reliable observation as an aid to decision making is often advocated, one may wonder how far present measures do actually respond to that need and conversely what features they should present in order to satisfy the needs of the various stakeholders. If one accepts the notion that ICT are indeed engineering deep social transformations, it then would seem natural that measures be designed and carried out in such a way that all stakeholders can understand better what is going on and learn from the accomplishments or misaccomplishments.

WHERE DO WE GO FROM HERE?

We feel that information societies metrology deserves a higher profile, especially in the information research community, and should constitute a unique and coherent research front. Its recognition as a coherent academic field with an interdisciplinary core⁶ would facilitate the setting up of research teams and formulation of projects. A more urgent first step is to establish mechanisms by which the relevant documents and data sets could be more easily accessed, the various approaches systematically mapped, those interested could meet and exchange ideas and develop cooperative ventures, and stakeholders could discuss their needs and appraisal of the instruments and findings.⁷

From there one would hope that those interested could weave a web of interaction and collaboration that would proceed with the traditional activities of a vibrant research community: for example, periodic conferences, workshops, regular publications, an online journal, paper contests, catering for the recognition of the field and its outstanding contributors, attracting attention and support, and so on.

Ultimately one could hope that these interactions would result in the formulation of coherent research protocols, suitable for all societies; ongoing state-of-the-art standardization of methods and data collection; development of testable hypotheses; and models that could be continuously applied and refined in real-world environments.

In short, to lay the ground for serious scientific work that may advance our understanding and allow for enlightened actions that ensure that the information revolution does not lead to more damage than benefits, as might have been the case with the industrial revolution, is the "grand challenge" to the field.

NOTES

1. A fifth paper by Sara Hyder (2005) was published in the *International Information and Library Review*.

2. International institute of bibliography, founded in 1895 by Paul Otlet and Henri La Fontaine, which is considered by many scholars as a precursor of the Internet. For more information see, for instance, Rayward (1997).

3. See the web site of the Partnership, <http://measuring-ict.unctad.org> (accessed 14 June 2006).

4. For an illustration of this phenomenon see IDRC's Map of "The Internet: Out of Africa," which shows the international bandwidth in bits per capita (BPC) available in Mid 2002 from publicly accessible IP networks http://www.idrc.ca/en/ev-6568-201-1-DO_TOPIC.html (accessed 17 June 2006).

5. A search on Google Scholar on 18 June 2006 for "information society measures" yielded 17 results, versus 281 for "webometrics."

6. It intersects with computer science, economics, mathematics and statistics, telecommunications, political science, ethics, sociology, among others.

7. This was in part and with a slant toward development the aim of the Bellanet "LEAP" initiative some years ago, which did not get the expected support; see http://home.bellanet.org/activities.php?op=showactivity&act_id=9. The Development Gateway maintains a web site on "Monitoring and Evaluating (ICT Projects)," which is extremely useful but might not exactly offer a neutral home nor the specific scope considered here; see <http://topics.developmentgateway.org/evaluation>

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