

Full Length Research Paper

Comparison of E-readiness assessment models

Seyed Kamal Vaezi^{1*} and H. Sattary I. Bimar²

¹Ministry of Science, Research and Technology, Iran.

²Alzahra University, Iran.

Accepted 29 June, 2007

One of the most important challenges in e-government and e-commerce area which governments face is the low number of the initiatives initiated in this area. Another one is the failure (complete or partial) of these few initiatives. It is reported that the main reason for these challenges is the lack of e-readiness for e-government development in governmental organizations. It is important for them to understand what it means for a country or economy to be "e-ready" and conduct an evaluation based on objective criteria to establish basic benchmarks. In this paper the e-readiness assessment models found in literature have been studied and compared in some aspects such as definition of e-readiness, target point of model, and scope of application.

Key words: E-readiness, e-government, assessment, comparison.

INTRODUCTION

Over the last three years, a number of 'e-readiness' assessment tools have been developed. On the surface, each tool gauges how ready a society or economy is to benefit from information technology and electronic commerce. On closer examination, the range of tools uses widely varying definitions for e-readiness and different methods for measurement. For example, Harvard U are currently used in a society, while APEC's method focuses on government policies for e-commerce. This paper describes the various tools that are available and what they measure, to foster informed decisions about approaches to e-readiness assessment, as National Governments University's model looks at how information and communications technologies (ICTs) consider their information technology policies and undertake development initiatives.

For each assessment tool, this paper answers the following questions: What is the goal of the tool? What is measured? How is 'e-readiness' defined? How is the assessment carried out? What result is produced? Are there existing reports that have used this assessment tool? Who authored the tool and where can more information about the tool be found?

The number of tools that are ready-to-use to assess a nation's e-readiness is limited, as relatively few organizations have presented their assessment methods for use

by others. However, there is a wide range of reports and other resources that can be re-worked into 'assessment tools,' including position papers and survey results. This paper starts with those methods formally presented as assessment tools, and then goes on to look at assessment methods which can be garnered from other resources. Throughout this paper, the term 'assessment tool' is used in the wider sense to mean both ready-to-use questionnaires as well as other resources that can be adapted into assessment methods. Only a sample of the available tools could be covered in this paper, so those included are either the most widely known and used, or they provide a unique perspective or method.

E-READINESS TOOLS COMPARISON

The number of tools that are ready-to-use to assess a nation's e-readiness is limited, as relatively few organizations have presented their assessment methods for use by others.

However, there is a wide range of reports and other resources that can be re-worked into "assessment tools", including third-party reports, position papers and survey results. This list of e-readiness assessment tools starts with those formally presented as assessment methodologies with ready-to-use questionnaires, and then goes on to look at assessment methods that can be garnered from other resources. Some of the tools included measure access to and use of ICT as opposed to "e-readiness" per se, although most of the tools included here look at inter-

*Corresponding author. E-mail: vaezi_ka@yahoo.com.

net and other ICT use within a broader economic, socio-political context.

Many third-party assessments rank countries according to their measure of e-readiness, providing indicators for competitiveness by comparing countries using various measures. Some of these benchmarking reports have been included in this discussion of e-readiness reports, as the measures utilized in these reports are useful indicators for e-readiness, and contribute to a broader understanding of the field. Throughout this report, the term "assessment tool" is used in the wider sense to mean both ready-to-use questionnaires as well as other resources that could be adapted into assessment methods (Bridges, 2001; 2005).

Ready-to-use tools – questionnaires

There are few Ready-to-use Tools freely available on the web. In this discussion, three of such tools have been identified:

The Computer System Policy Project's (CSPP)'s Readiness Guide for Living in the Networked World. A Guide for Developing Countries, Asian Pacific Economic Cooperation's (APEC)'s E-Commerce Readiness Assessment.

Harvard University's Center for International Development (CID)'s Readiness for the Networked World. These tools produce scores or ratings from which communities or countries are supposed to identify where they fit according to each tool's definition of e-readiness (Bridges, 2001; 2005).

CSPP'S READINESS GUIDE FOR LIVING IN THE NETWORKED WORLD

The Computer Systems Policy Project (CSPP) developed this guide. It was published in 1998, and is available at www.cspp.org. CSPP is a "public policy advocacy group, comprised of the Chairman and Chief Executive Officers" of US information technology companies.

This self-assessment tool is designed to help individuals and communities determine how prepared they are to participate in the "Networked World." The guide measures the prevalence and integration of ICTs in homes, schools, businesses, health care facilities, and government offices, with additional focus on competition among access providers, speed of access, and government policy. Measurements are divided into five categories:

- i. infrastructure
- ii. access
- iii. applications and services
- iv. economy; and
- v. "enablers" (policy, privacy, security, ubiquity).

The CSPP Readiness Guide provides a series of 23 questions, for community members to ask about the community itself. For each question, the users choose from a

set of answers, which represent four progressive "stages" of development. The 23 questions are divided into the five categories listed above. For example, "chose the level of access to network services provided in homes in your community. a) 25% of homes have a computer / access device."

The assessment produces a rating that indicates which of four progressive stages of development the community is at for each of the five categories listed above. "An overall 'score' for the community can be estimated by simply averaging the scores across the criteria" (Bridges, 2001, 2005; CSPP, 1998).

How does it define 'e-readiness'?

An 'e-ready' society is one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices); integrated current ICTs throughout businesses (e-commerce, local ICT sector), communities (local content, many organizations online, ICTs used in everyday life, ICTs taught in schools), and the government (e-government); strong telecommunications competition; independent regulation with a commitment to universal access; and no limits on trade or foreign investment.(Bridges, 2001; 2005).

APEC'S E-COMMERCE READINESS ASSESSMENT

The Asian Pacific Economic Cooperation (APEC) Electronic Commerce Steering Group developed this guide to help governments develop their own focused policies, adapted to their specific environment, for the healthy development of e-commerce."

Six categories are measured for "readiness for e-commerce:"

- i. Basic infrastructure and technology (speed, pricing, access, market competition, industry standards, foreign investment).
- ii. Access to network services (bandwidth, industry diversity, export controls, credit card regulation).
- iii. Use of the Internet (use in business, government, homes).
- iv. Promotion and facilitation (industry led standards).
- v. skills and human resources (ICT education, workforce).
- vi. Positioning for the digital economy (taxes and tariffs, Industry self-regulation, government regulations, consumer trust).

Participants are asked 100 multiple-choice questions grouped into the six categories listed above. The possible answers indicate progressive levels of e-readiness for a country. No overall scoring occurs.

The product of the assessment is the answers to the 100 questions. Countries are supposed to work on areas with less than optimal answers, since they are "impediments...to the deployment of e-commerce" (APEC, 2000;

Bridges, 2001, 2005).

How does it define 'e-readiness'?

A country that is 'ready' for e-commerce has free trade, industry self-regulation, ease of exports, and compliance with international standards and trade agreements (Bridges, 2001; 2005).

CID'S READINESS FOR THE NETWORKED WORLD

The Center for International Development at Harvard University developed this guide. It was published in 2000.

The guide systematically organizes the assessment of numerous factors that determine the networked readiness of a community in the developing world." This assessment is meant to serve as a basis for further analysis and planning.

It measures 19 different categories, covering the availability, speed, and quality of network access, use of ICTs in schools, workplace, economy, government, and everyday life, ICT policy (telecommunications and trade), ICT training programs, and diversity of organizations and relevant content online, and provides a grid with descriptions of four stages of advancement in each of 19 categories (placed into five groups). Communities estimate their current stage of development in each category. No prescription is given on how that estimate should be made. The guide rates the 'stage' a community is in for each of the 19 categories, and descriptions are given of what is required to be in a particular stage. "The guide does not offer prescriptions for improved readiness" (Bridges, 2001, 2005; CID, 2000).

How does it define 'e-readiness'?

An 'e-ready' society is one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices); integrated current ICTs throughout businesses (e-commerce, local ICT sector), communities (local content, many organizations online, ICTs used in everyday life, ICTs taught in schools), and the government (e-government); strong telecommunications competition; independent regulation with a commitment to universal access; and no limits on trade or foreign investment (CID, 2000).

CASE STUDIES

There are numerous case studies assessing specific countries' e-readiness, and many of these could be used as bases for e-readiness tools. Some bodies and organizations conduct assessments of a number of countries, utilising their specific tool, and thus enabling comparison or ranking of countries. The case study of e-readiness assessments featured in this discussion are the Interna-

tional Telecommunications Union's (ITU)'s Internet Country Case Studies, the ASEAN e-readiness assessments, and case-studies conducted or funded by USAID, infoDev and SIDA (Bridges, 2001; 2005).

INTERNATIONAL TELECOMMUNICATIONS UNION'S (ITU'S) INTERNET COUNTRY CASE STUDIES (REPORT)/MOSAIC METHODOLOGY

What does it measure?

ICT infrastructure, use of ICT, legal and regulatory frameworks and macroeconomic and local business environments are measured in these very detailed case studies, which seek to examine the Internet in different economies around the world and are based on the methodology developed by the Mosaic group (Bridges, 2005; www.itu.int/ITU-D/ict/cs/).

What result does it produce?

The case studies provide an analysis of the factors affecting Internet use, along with recommendations. The ITU also includes a statistical ranking based on Mosaic's methodology (Bridges, 2005; www.itu.int/ITU-D/ict/cs/).

USAID (TOOL AND REPORT)

What does it measure?

These case studies are produced using a framework of "Pipes (Access), Public Sector (Government Policies, E-Government), Private Sector (Usage), People (Training), and existing development Programs." The data upon which the analysis is based is from the ITU's World Telecommunications Indicators. (Bridges, 2005; http://www.usaid.gov/regions/europe_eurasia/eeresources.html#IT; <http://www.usaid.gov/regions/>).

What result does it produce?

Detailed case studies describing countries' progress, along with detailed action plans for countries to pursue in the future (Bridges, 2005; http://www.usaid.gov/regions/europe_eurasia/eeresources.html#IT; <http://www.usaid.gov/regions/>).

INFODEV'S FLAGSHIP E-READINESS INITIATIVE AND COUNTRY DEVELOPMENT GATEWAY PROGRAMS

What does it measure?

The e-readiness assessments conducted under the auspices of the Country Gateway initiative seek to evaluate the level of preparedness of stakeholders to participate in

the gateways, such as NGOs, development partners, the private sector, learning.

Institutions and policy and regulatory authorities. The assessments conducted under the flagship e-readiness initiative measure according to the choices made by the grantees. Nevertheless, the far majority of both groups of these assessments make use of CID's (Bridges, 2005; <http://www.developmentgateway.org/node/137849/>; http://www.infodev.org/html/programs_ereadiness.html).

What result does it produce?

Although the CID's guide does not offer prescriptions for improved e-readiness, some of the Country Gateway e-readiness assessments produce e-needs evaluations, based on the survey and issues identified by stakeholders, as well as the various 4. This tool is referred to as Mosaic in the tools comparison study ratings that result through the CID method. Some of the assessments produced under the flagship initiative make recommendations and are the basis for action plans (Bridges, 2005; <http://www.developmentgateway.org/node/137849/>; http://www.infodev.org/html/programs_ereadiness.html).

SIDA

What does it measure?

The country case studies examine ICT infrastructure, use, human resources, and the legal and regulatory framework in given countries using survey methodology, interviews and CID's Readiness for the Networked World guide (Bridges, 2005; http://www.sida.se/Sida/jsp/polo_poly.jsp?d=1265&a=17798&f=Result.jsp&depth).

What result does it produce?

Descriptions of the country's ICT landscape, as well as "a basic analysis of factors of major interest for the promotion of use of ICT for development purposes" (Bridges, 2005; <http://www.sida.se/Sida/jsp/polopoly.jsp?d=1265&a=17798&f=Result.jsp&depth>).

ASEAN E-READINESS ASSESSMENT

What does it measure?

Data was gathered on six indicators of readiness for the digital economy and the development of the ASEAN Information Infrastructure: e-society, ecommerce, e-government, liberalizing trade in ICT goods and services and infrastructure. (Bridges, 2005; <http://www.itu.int/asean2001/documents/pdf/Document-28.pdf>; <http://www.aic.or.jp/conference/28th/pdf/address%20at%20opening/Mr.Romulo.PD>; <http://www.itu.int/osg/spu/ni/security/workshop/presentations/cni.24.pdf>).

What result does it produce?

10 countries within the ASEAN region were clustered according to their readiness status according to four stages of development identified by IBM: Emerging, Evolving, Embedding and Extending. Common challenges and potential focus areas were highlighted (Bridges, 2005; <http://www.itu.int/asean2001/documents/pdf/Document-28.pdf>; <http://www.aic.or.jp/conference/28th/pdf/address%20at%20opening/Mr.Romulo.PD>; <http://www.itu.int/osg/spu/ni/security/workshop/presentations/cni.24.pdf>).

THIRD PARTY SURVEYS AND REPORTS

These reports aim to rank and rate countries on various measures held to indicate e-readiness or e-competitiveness. Although some of the reports included here are not fundamentally e-readiness-specific, their inclusion is owing to the fact that they measure important aspects of e-readiness, and contribute to an understanding of the field. While some utilise questionnaire methodology, many rely on statistical indicators garnered from other sources. The third party surveys and reports included here are: McConnell International's Risk E-Business: seizing the opportunity of global e-readiness; mosaic's global diffusion of the Internet project; WITSA's International Survey of E-Commerce; Crenshaw and Robinson's Cyber-Space and post-industrial transformations: A cross-national analysis of Internet development; CIDCM's negotiating the net model; the Economist Intelligence Unit (EIU)'s e-readiness rankings; Statistical Indicators Benchmarking the Information Society (SIBIS); Metric-Net's Worldwide IT Benchmarking Report; the World Bank's Knowledge Assessment Methodology (KAM); the World Times/ IDC Information Society Index (ISI); World Economic Forum (WEF)'s Networked Readiness Index (NRI), infoDev and Pyramid Research's Information Infrastructure Indicators (III), Kenny's prioritizing countries for assistance to overcome the digital divide; Orbicom's monitoring the digital divide and beyond the world telecommunications indicators and the ITU's Digital Access Index (DAI) (Bridges, 2001; 2005).

McCONNELL INTERNATIONAL'S RISK E-BUSINESS

McConnell International prepared this report in collaboration with World Information Technology and Services Alliance (WITSA), and it was released in August 2000 to assess a national economy's e-readiness, or "capacity to participate in the global digital economy." The report measures five areas:

- i. Connectivity (infrastructure, access and pricing).
- ii. E-leadership (government policies and regulations).
- iii. Information security (intellectual property, privacy, electronic signatures).

- iv. Human capital (ICT education, available skilled workforce).
- v. e-business climate (competition, political and financial stability, foreign investment, financial infrastructure).

For each country and each category, the report performs a "dynamic evaluation of the relevance and accuracy of available quantitative data with an understanding of myriad cultural, institutional, and historical factors." These general ratings and their narratives can then be used as a starting point for further planning.

Countries are rated in the five categories listed above on a scale of one to three ('blue,' 'amber,' 'red'), and extensive analysis and recommendations are given.

The report rates 42 countries, and analyzes the results by region of the world. Overall, the report describes a complex picture of e-readiness: most countries are reasonably 'ready' in some categories, but not in others. McConnell International creates similar country specific reports as part of its private practice (Bridges, 2001; 2005; McConnell, 2000; 2002).

How does it define 'e-readiness'?

An 'e-ready' country has extensive usage of computers in schools, businesses, government, and homes; affordable reliable access in a competitive market; free trade; skilled workforces and training in schools; a culture of creativity; government-business partnerships; transparency and stability in government and an evenly enforced legal system; secure networks and personal privacy; and regulations allowing digital signatures and encryption (Bridges, 2001; 2005).

MOSAIC'S GLOBAL DIFFUSION OF THE INTERNET PROJECT

The Mosaic Group created this framework. Mosaic's framework has evolved over time, and there are a number of variants. For clarity, this report will examine one use of the framework:

It created "to measure and analyze the growth of the Internet throughout the world." The research captures the state of the Internet within a country at a particular point in time," by measuring six dimensions:

- i. pervasiveness (per capita usage).
- ii. geographic dispersion.
- iii. sectoral absorption (usage within major sectors of the economy).
- iv. connectivity infrastructure.
- v. organizational infrastructure (the state of the Internet service market).
- vi. sophistication of use.

A country's movement along these dimensions is shaped by a set of determining factors that includes such metrics

as teledensity, PC density, per capita GDP, foreign and domestic investment, geography, educational system, and government policy. The analyses focus on major social, economic, and political events and the legal and regulatory environments as they affect the countries' Internet.

The report uses a combination of statistics, narrative description and comparison to explain the growth of the countries' Internet, focusing on the six Internet statistics described above. The two countries (in this case, Turkey and Pakistan) are compared and contrasted for each variable to provide a deeper understanding of their Internet growth. The report also gives detailed descriptions of the political and economic factors that have affected Internet growth and usage, and forecasts future Internet developments. Note: other Mosaic reports may conduct their assessments differently. Some include a questionnaire, and others focus more heavily on charting change over time. All reports use the same basic assessment of six Internet statistics and a range of factors that influence them.

The framework is used to describe, in depth, the relative growth of the Internet in the given countries. If the questionnaire is used, it also indicates the 'stages' of the country's Internet growth and usage (Bridges 2001, 2005; Mosaic, 1998).

How does it define 'e-readiness'?

The framework does not describe an 'e-ready' society per se, but the reasons behind and readiness for growth of Internet infrastructure and usage (which are, by most accounts, requirements of an e-ready society). Unique interactions among the government and businesses, aided by market competition, help cause the growth and distribution of the Internet (Bridges 2001, 2005).

CIDCM'S NEGOTIATING THE NET MODEL

The Leland Initiative Telematics for Africa project at the Center for International Development and Conflict Management (CIDCM) at the University of Maryland has developed this tool over the past year and will publish case studies and a book on it in 2001.

It was created to help advance the diffusion of ICTs in developing countries, especially Africa, by helping decision-makers improve the processes of negotiation through which ICTs are diffused by governments, NGOs and the private sector. The framework measures four categories of information for each country:

- i. Background and history – structural context (economy, education levels, existing infrastructure), political structure and culture (type of government, policy making style), cultural norms (religion, etc).
- ii. Key players in Internet development – responsibilities and objectives of relevant players in government, local

and foreign businesses, universities, NGOs, international financial institutions, research groups.

iii. Internet development and ICT policy over time – access, regulation and competition.

iv. Negotiations between players in developing the country's Internet - each aspect of Internet development and ICT policy is categorized into one of four stages (pre-commercial, commercial, competitive, and consolidated). 'Negotiation' between players is the focus of the framework – the rest is supporting information.

The assessment is conducted through interviews with key actors in the relevant institutions and draws upon a range of background statistics and information as outlined above.

A detailed narrative describing the processes and outcomes of negotiations between key players over the phases of development, identifying major contentious issues likely to remain problematic in the future (Bridges 2001, 2005; CIDCM, 2001).

WITSA'S INTERNATIONAL SURVEY OF E-COMMERCE

What does it measure?

The survey focused on the direct experiences of companies with e-commerce and their subjective views of what is needed to promote e-commerce. The questions cover a range of issues, including: barriers to technology Industry, role of consumer trust, problems with e-commerce technology, internal business practices that support e-commerce, workforce problems, taxes, public policy issues, and resistance from consumers.

What result does it produce?

A final report was published that compiled answers from survey participants. The report has charts and a narrative account of the answers (Bridges 2001, 2005; <http://www.ita.org/news/pubs/product.cfm?EventID=172>)

CRENSHAW AND ROBINSON'S CYBER-SPACE AND POST-INDUSTRIAL TRANSFORMATIONS: A CROSS NATIONAL ANALYSIS OF INTERNET DEVELOPMENT (C AND R)

What does it measure?

The authors focus on the role and interactions of the following factors in ICT development: level of existing technological development, political openness /democracy, mass education, presence of a sizable services sector, teledensity, foreign investments, ethnic homogeneity, sectoral inequality, population density, and the quantity of exports. Their later work includes consideration of individual property rights and local phone call costs, as well as global urbanization, economic and socio-political globali-

zation variables, calculated with indicators from various sources (Bridges 2001, 2005; robinson.47@osu.edu, Crenshaw.4@osu.edu).

What result does it produce?

Statistical metrics stating the probable relationship between the variables, and a narrative explanation of how these factors are likely to shape technology development (Bridges, 2001, 2005; robinson.47@osu.edu, Crenshaw.4@osu.edu).

How does it define 'e-readiness'?

An 'e-ready' society has an ISP market that has passed through three phases of development:

- (i) pre-commercial (access limited to a pioneer community).
- (ii) commercial (access is sold to consumers).
- (iii) competitive (the ISP market has multiple competing actors).

The negotiations between actors should be transparent, conclusive, speedy and inclusive of the major players in public, private and NGO sectors (Bridges, 2001, 2005; robinson.47@osu.edu, Crenshaw.4@osu.edu).

THE ECONOMIST INTELLIGENCE UNIT (EIU): E-BUSINESS READINESS RANKINGS

What does it measure?

The e-readiness rankings measure the extent to which a market is conducive to Internet-based opportunities, taking into account a wide range of factors, from the quality of IT infrastructure to the ambition of government initiatives and the degree to which the Internet is creating real commercial efficiencies. Nearly 100 quantitative and qualitative criteria are organized into six categories: Connectivity (30%), business environment (20%), e-commerce consumer and business adoption (20%), legal and regulatory framework (15%), supporting e-services (10%) and social and cultural infrastructure (5%). Since launching the rankings in 2000, EIU have repeatedly upgraded and refined their methodology. In 2003, the methodology is unchanged from the previous ranking, making direct annual comparison of scores possible for the first time (Bridges, 2001, 2005; http://graphics.eiu.com/files/ad_pdfs/eReady_2003.pdf; http://www-5.ibm.com/at/pdf/table_e-readiness.pdf; <http://graphics.eiu.com>).

What result does it produce?

The rankings cover the world's 60 largest economies, and suggest areas to focus government policy and funds.

They also provide a useful guide for multinationals seeking to invest in technologically innovative countries and tailor their Internet strategies to local conditions. The top sixty economies in the world are rated with an e-readiness score (out of ten), and are ranked from one to sixty (Bridges 2001, 2005; http://graphics.eiu.com/files/ad_pdfs/eReady_2003.pdf; http://www-5.ibm.com/at/pdf/table_e-readiness.pdf; <http://graphics.eiu.com>).

STATISTICAL INDICATORS BENCHMARKING THE INFORMATION SOCIETY (SIBIS)

What does it measure?

SIBIS measures benchmarking indicators in ten areas:

Telecommunication and access; Internet for research; security and trust; education; work, employment and skills; social inclusion; e-commerce; e-government; health and transport (Bridges 2001, 2005; <http://www.sibis-eu.org>).

What result does it produce?

23 Statistical indicators that measure and monitor the information society, for benchmarking and policy evaluation (Bridges 2001, 2005; <http://www.sibis-eu.org>).

METRIC-NET WORLDWIDE IT BENCHMARKING REPORT (TOOL AND REPORT)

What does it measure?

The Metric-Net Worldwide IT Benchmarking report measures IT performance and productivity by organizations worldwide through survey methodology. It also measures IT spending by industry (Bridges, 2001, 2005).

What result does it produce?

The survey results are analyzed to reveal "priorities" for IT companies. The results enable organizations to self-assess their IT performance, and to better align spending and performance with industry norms (Bridges 2001, 2005).

WORLD BANK'S KNOWLEDGE ASSESSMENT METHODOLOGY (KAM) (REPORT)

What does it measure?

The 2002 KAM uses 69 metrics including the "economic and institutional regime," "educated and skilled population," "dynamic information infrastructure," and an "efficient innovation system of firms, research centers, universities, consultants" (Bridges, 2001, 2005; <http://info.worldbank.org/etools/kam2004>).

[worldbank.org/etools/kam2004](http://info.worldbank.org/etools/kam2004)).

What result does it produce?

A detailed, interactive statistical assessment of how well 100 country economies are prepared for an information economy and society (Bridges 2001, 2005; <http://info.worldbank.org/etools/kam2004>).

IDC INFORMATION SOCIETY INDEX (ISI) (REPORT)

What does it measure?

The 2003 ISI report measures countries on four "infrastructure pillars" or sub-indexes: computer use, Internet and e-commerce, telecommunications and social factors, based on 23 indicators (Bridges 2001, 2005; <http://www.idc.com/groups/isi/main.html>).

What result does it produce?

53 countries are scored on each variable, and then ranked according to their ability to access and absorb information and IT in the future. It's designed for use by governments, as well as IT, dot-coms, and asset management and telecommunications companies to assess the market potential of the various regions and countries of the world (Bridges 2001, 2005; <http://www.idc.com/groups/isi/main.html>).

NETWORKED READINESS INDEX (NRI) IN THE GLOBAL INFORMATION TECHNOLOGY REPORT

What does it measure?

The NRI is defined as "the degree of preparation of a nation or community to participate in and benefit from ICT developments". The index is a composite of three components:

- (i) The environment for ICT offered by a given country or community.
- (ii) The readiness of the community's key stakeholders (individuals, businesses, governments) to use ICT.
- (iii) The actual use of ICT amongst these stakeholders. (Bridges, 2001, 2005; <http://www.weforum.org>).

THESE THREE COMPONENTS ARE DEFINED FURTHER

- (i) Environment is defined as 1/3 market + 1/3 political/regulatory factors + 1/3 infrastructure.
- (ii) Readiness is defined as 1/3 individual readiness + 1/3 business readiness + 1/3 government readiness.
- (iii) Use of ICT is defined as 1/3 individual use + 1/3 busi-

ness use + 1/3 government use.

(iv) And these subcomponents are based on a set of 64 variables (Bridges 2001, 2005; <http://www.weforum.org>).

What result does it produce?

Covering 104 countries, the NRI provides a quick and relative benchmark of the overall success of each in participating in and benefiting from ICT. The NRI permits business leaders and public policymakers to investigate the reasons leading to a nation's ranking and relative performance. It captures key factors relating to the environment, and the readiness and usage of the three stakeholders in ICT (individuals, businesses, and governments), and can be used to understand the performance of a nation or even a region with regards to ICT development. The component index and sub-index rankings serve to identify key areas where a nation is under- or over-performing (Bridges 2001, 2005; <http://www.weforum.org>).

INFODEV AND PYRAMID RESEARCH'S INFORMATION INFRASTRUCTURE INDICATORS, 1990 - 2010 (III)

What does it measure?

Indicators are based on actual data and "projections for total investment, infrastructure and traffic" for the period 1990 – 2010 (Bridges 2001, 2005; <http://www.infoDev.org/projects/internet/375pyramid>).

What result does it produce?

Pyramid research is developing a set of indicators and defined empirical data to assess the information infrastructure worldwide, with special emphasis on developing countries. The latest data is broken down by region (Bridges 2001, 2005; <http://www.infoDev.org/projects/internet/375pyramid>).

KENNY'S PRIORITIZING COUNTRIES FOR ASSISTANCE TO OVERCOME THE DIGITAL DIVIDE (WORLD BANK)

What does it measure?

Focusing on "the gap in access to quality information infrastructure", Kenny uses a measure of access that allows for the income per capita of a country, while building on previous econometric studies looking at determinants of information infrastructure penetration "allowing for, but going beyond, income" (Bridges 2001, 2005; http://www.idate.fr/an/publi/revu/num/n41/kenny_a.html).

What does it produce?

The report identifies countries that have "both a lower than expected level of ICT provision given their GDP level and a quality and cost of service that is less than satisfactory" according to four indicators of the determinants of access and quality (competition, rural needs, small economies and institutional investor). These are used to prioritize countries for donor intervention (Bridges, 2001, 2005; http://www.idate.fr/an/publi/revu/n41/kenny_a.html).

AT KEARNEY/FOREIGN POLICY MAGAZINE GLOBALIZATION INDEX (GI)

What does it measure?

The Index is generated through four over-arching indicators: political engagement (e.g.: number of memberships in international organizations, foreign embassies hosted and instances of UN council mission participation); technology (number of Internet users, hosts and secure servers); personal contact (International travel and tourism, international telephone traffic and cross-border transfers) and economic integration (trade, foreign direct investment and portfolio capital flows, and income payments and receipts) (Bridges 2001, 2005; http://www.foreignpolicy.com/story/cms.php?story_id=2493).

What result does it produce?

The Globalization Index tracks changes across 62 advanced markets and emerging markets, ranking them for 13 variables within the four indicators listed above (Bridges 2001, 2005; http://www.foreignpolicy.com/story/cms.php?story_id=2493).

WORLD TELECOMMUNICATION INDICATORS (WTI)

What does it measure?

Telecommunication data is collected from questionnaires sent annually to telecommunication authorities and operating companies. This data is supplemented by annual reports and statistical yearbooks of telecommunication ministries, regulatory agencies, operators and industry associations. The Indicators are also based on data from national broadcasting authorities and other demographic and macroeconomic data (Bridges 2001, 2005; <http://www.itu.int/ITU-D/ict>).

What result does it produce?

A comprehensive set of tables for 196 economies, including basic indicators (population, GDP, total telephone subscribers), data on local telephone networks, telephone tariffs, cellular subscribers, ISDN, International

telephone traffic, telecommunications revenue, equipment trade, IT, and network growth, among others (Bridges 2001, 2005; <http://www.itu.int/ITU-D/ict>).

ITU DIGITAL ACCESS INDEX (DAI)

What does it measure?

Eight variables, covering five areas (availability of infrastructure, affordability of access, educational level, quality of ICT services and Internet usage), provide overall country scores. The Index is based purely on quantitative indicators (Bridges 2001, 2005; http://www.itu.int/newsarchive/press_releases/2003/30.html).

What result does it produce?

Countries are classified into one of four categories: high, upper, medium and low. The results point to barriers in ICT adoption, and can be used to identify a country's strengths and weaknesses (Bridges 2001, 2005; http://www.itu.int/newsarchive/press_releases/2003/30.html).

ORBICOM'S MONITORING THE DIGITAL DIVIDE AND BEYOND

What does it measure?

As suggested by the title of their study, Orbicom's research breaks new ground in the realm of global ICT ranking reports by considering the issues from a "digital divide" perspective as opposed to e-readiness as it is traditionally understood. The approach's innovation lies in its inclusion of existing education data and thereby going beyond the usual indicators of ICT use and access (Bridges 2001, 2005; http://www.orbicom.uqam.ca/project_s/ddi2002/2003_dd_pdf_en.pdf).

What result does it produce?

The emphasis on developing countries is an important shift in focus for such "ranking reports", and results in a resource that is useful in assessing a country's comparative performance, relative strengths and weaknesses and, at a more detailed level, linking the changes to specific initiatives and policies. The measurements are explicit both across countries at a given point in time and within countries over time, in such a way that comparisons are not reduced to changing rankings from year to year (Bridges 2001, 2005; http://www.orbicom.uqam.ca/projects/ddi2002/2003_dd_pdf_en.pdf).

Other e-readiness assessment models

In addition to the formal tools and surveys described

above, there is a range of other frameworks that can be similarly used for e-readiness assessment. This section describes how the ideas expressed in digital divide reports, position papers and other kinds of models can be used to evaluate a society's readiness to adopt and use ICT. In most cases, these are not ready-to-go assessment tools nor completed surveys, but they could provide rich criteria for assessing e-readiness with some adaptation. Consideration of the various concepts out-lined below and the standards they set add depth to this discussion, especially where they include elements that are missing in traditional assessment tools (Bridges 2001, 2005).

COMPARISON

E-Economy versus E-Society

E-readiness assessment tools and models can be divided into two main categories: those that focus on basic infrastructure or a nation's readiness for business or economic growth, and those that focus on the ability of the overall society to benefit from ICTs. These two categories – which this report describes as 'e-economy' assessment tools and 'e-society' assessment tools – are not mutually exclusive. However, 'e-society' tools incorporate business growth and use of ICTs as part of their larger analysis, and consider business growth necessary for society's e-readiness. E-economy focused tools also include some factors of interest to the larger society, such as privacy and universal access. These rough categorizations are as follows:

E-Economy

- i. WITSA E-Commerce Survey
- ii. APEC's E-Commerce Assessment
- iii. McConnell International's E-Readiness Report
- iv. Mosaic's Global Diffusion of the Internet Framework
- v. Crenshaw and Robinson's Cross-National Analysis of Internet Development

E-Society

- i. CID's E-Readiness Assessment Guide
- ii. CSPP's E-Readiness Assessment Guide
- iii. The various models for evaluating e-readiness from 'digital divide' reports
- iv. CIDCM's negotiating the Net Model

Another, similar, way to look at the e-readiness assessment models would be to consider them in terms of E-Society, E-Economy, and 'E-Systems,' where E-System models examine the underlying technology infrastructure that is a prerequisite for both E-Economy (including e-commerce, ICT sector jobs, etc), and E-Society (use by the general population, etc). For the purposes of this

comparison however, that level of detail is unnecessary (Bridges 2001, 2005).

Assessment methodology

The tools discussed here use four main methods to assess countries' e-readiness:

- i. Questionnaires ask a set of direct questions about information technology and policy in a country, and the same set of questions is asked for any given country.
- ii. Statistical methods mathematically analyze prior data on the country to test for relationships between the individual factors, for example, by looking for a casual relationship between Internet access and political democracy.
- iii. Best practices use experience learned in other countries or direct comparison with other, similar, countries.
- iv. Historical analyses of the unique political, economic and social events in the country use these unique events to explain or forecast information technology in the country (Bridges, 2001, 2005).

RESULT OF ASSESSMENT

The tools described here have three basic results: description, diagnosis, and proscriptio. Descriptive tools explain or describe what happened. Diagnostic tools identify problem areas, but do not indicate how to address the problems. Proscriptive tools urge action along a clearly defined path (Bridges 2001, 2005).

Analysis

The answer to this question is an ongoing debate and is beyond the scope of this report, but a few thoughts are outlined here to aid such a discussion. First and foremost, it should be noted that all assessment tools have an underlying standard of e-readiness. This standard will necessarily shape the results of the tool; that is, there is no objective test of e-readiness. This standard may or may not fit the prospective user's personal views. These tools appear to derive their definitions of e-readiness through four means:

- i. end user surveys,
- ii. statistical analysis,
- iii. best practices, and
- iv. the author's personal experience.

No standard definition for e-readiness is perfect. WITSA's method of asking participants for their subjective opinions, and generating a plan of action from them seems problematic to use for e-readiness recommendations. The other models simply state what factors are necessary for e-readiness, but do not provide a detailed rationale. It seems likely that the bias of these models came

from their authors' individual experiences and knowledge of 'best practices' in their field. In sharp contrast, Crenshaw's model relies on a statistical analysis. The statistical analysis is a tempting method to get beyond subjective standards of e-readiness, but also has problems. A cross-national statistical analysis is invalid if the unique circumstances of individual countries are more important than generic measurements (as the considerable deviation in measurements would hint in Crenshaw's work). In that case, a country-specific tool such as Mosaic or McConnell, or case studies would be better suited.

What assessment tool is the best? The right tool depends on the user's goal

As the descriptions above have shown, e-readiness assessments are, in fact, very diverse in their goals, strategies and results. The right tool depends on the user's goal. The user should choose a tool that measures what they are looking for, and does it against a standard that fits their own view of an 'e-ready' society. The tools do not always indicate how they developed their definition of e-readiness, but often the source can be reasonably guessed (Bridges 2001, 2005).

If the goal is to gauge the readiness of a particular company or group of companies to participate in e-commerce, the WITSA study would seem to be best suited. However, one possible critique is that the participants' answers on what they believe they need to work on to make their companies ready may not be accurate, because if they knew, they might not need the assessment tool (Bridges 2001, 2005).

If the goal is to assess a country's preparedness for e-commerce, APEC might have the best-suited tool. The survey is quite detailed with 100 questions, and straightforward to use. However, the digital divide reports suggest that wide-scale e-commerce is doomed if technology is not also spread throughout the society, a topic that the APEC survey gives only minimal coverage. Moreover, consumers would need locally relevant content and products, and training to use the computers to buy e-commerce products (in the business-to-consumer field). Also, unlike its stated goal, the APEC survey is not geared to specific environments. It measures specific environments against a single standard of how a country should be in order to promote e-commerce. This method implies that the same structure of e-commerce is needed for any country (Bridges 2001, 2005).

If the goal is to assess the current level of technology in a region as a basis to forecast future technology levels, there are a number of options. The Mosaic method provides a detailed and deep understanding along six different axes. There are also a number of sources of raw statistics (see the resource section) that the user could employ in this process. Questionnaires such as the CID and CSPP guides measure a slightly wider set of statistics, such as bandwidth, reliability, pricing, and usage in

homes, schools, businesses, and government. However, these are very rough measurements – and the granularity is low for answers – since users choose from one of four multiple choice answers (Bridges 2001, 2005).

If the goal is for a quick but rough gauge of technology usage, then CSPP and CID are useful (with CID being the more detailed of the two) (Bridges 2001, 2005). If the goal is to understand the relative roles of political, economic, and social factors in technology's growth and usage, then Crenshaw's model seems to fit best. This statistical method would help prioritize what elements (and sets of elements) in a society are most important for e-readiness. This method could be combined with a detailed survey of the current state of these factors (such as with McConnell's method) to identify key areas to work on, and prioritize them. On the other hand, the Mosaic framework provides a detailed narrative analysis of these factors (though with less focus on the social factors), and conceptualizes the analysis with respect to another country. (Bridges 2001, 2005)

If the goal is to understand the why particular countries progress differently, the case-study method used by Mosaic and CIDCM is appropriate (Bridges 2001, 2005). If the goal is to assess the effects of the technology on the lives of real people, and consider how widely the technology is really being used, then it would be helpful to look to the digital divide reports – specifically to the group of digital divide reports that focus on education, local and relevant content, and effective use of technology throughout society (Bridges 2001, 2005).

Conclusion

Two overarching lesson can be drawn from this comparison: First, the chosen e-readiness assessment tool must fit the user's goal. Each assessment tool or model has a different underlying goal and definition of e-readiness. The user should choose carefully and with a clear understanding of the kind of results that any particular tool is likely to lead them toward. This report aims at providing a foundation for that choice.

The second lesson is that there is a wide range of e-readiness assessment models available, but each has limitations. Every model evaluated would require re-designing to make it a comprehensive assessment tool. The tools that are ready-to-use are either limited in scope or lack detailed description on how to use the tool in practice. Of course, no tool will fit every user's needs. However, one could envision a tool that gave the user control over what was measured, and provided the resources to measure the various aspects of e-readiness.

What would a more comprehensive, flexible tool include? Drawing together the perspectives of the existing tools:

i. It should provide (optional) measurements for the range of factors that influence e-readiness. Such as:

- a. Existing technology infrastructure.
- b. Information technology policies (trade, encryption, digital signatures, privacy, etc.).
- c. Distribution, pricing, and usage of the technology in schools, business, government, and throughout society.
- d. Basic 'enablers' in society (basic literacy, quality of educational system, political stability, etc.).
- e. Social and cultural factors the influence technology's diffusion and use.
- f. Market conditions (monopolies, regulation, etc.).

ii. It should describe how these measurements could be used for.

- a. Economic growth.
- b. Wide social use of technology.
- c. Economic growth in the context of social issues such as consumer protection, privacy.

iii. It should clearly describe how to use the tool:

- a. When a policy assessment is needed.
- b. How the information is to be gathered, and what standards are to be used.
- c. Who is needed to complete the assessment (diverse range of experts knowledgeable about issue, oversight of process to make sure accurate, etc).
- d. How long it should take.
- e. What the outcome should look like, including a narrative assessment of the policies, guided by or directly answering the survey questions, with recommendations on what to change.
- f. How to recognize majority and minority opinions and leave room for dissent.
- g. What factors are usually under government control, and which are not.

iv. It should indicate how to use the results, including identifying potential difficulties with implementation, such as balancing consumer rights, business and labor issues (Bridges 2001, 2005).

REFERENCES

- APEC, (2000), "APEC Readiness Initiative", http://www.ecommerce.gov/apec/docs/readiness_guide_files/readiness_guide_5.pdf
 "E-commerce Readiness Assessment Guide"(2000).
http://www.info.gov.hk/digital21/eng/ecommerce/ec_assessment.html
<http://www.ecommerce.gov/apec>
http://www.ecommerce.gov/apec/docs/readiness_background.html
 ASEAN (2001). "E-Readiness Assessment Guide ASEAN Secretariat",
<http://www.e-asean.info/eread-guide.html>
<http://www.itu.int/asean2001/reports/index.html>
 Bridges (2001). "Comparison of E-Readiness Assessment Models",
www.bridges.org/ereadiness/report.org
 CID (2000). "Readiness for the Networked world: A Guide for the developing Countries",
<http://www.readinessguide.org>,
http://www.cid.harvard.edu/cr/gitr_030202.html
<http://www.readinessguide.org/guide.pdf>
<http://www.readinessguide.org/examples.html>
 CIDCM, (2001), "African Telematics Project: Leland Initiative",
<http://www.cidcm.umd.edu/Projects/index.html>
<http://www.cidcm.umd.edu/Projects/neo.html>
 CSPP, (1998), "The CSPP Readiness Guide: For Living in the Net-

- worked World",
<http://206.183.2.91/projects/readiness/assessments.htm>
<http://www.cspp.org>
- McConnell, (2000), " Risk E-Business: Seizing the Opportunity of Global E-Readiness",
<http://mcconnellinternational.com/readiness/default.cfm>
<http://www.mcconnellinternational.com/ereadiness/ereadiness2.pdf>
- McConnell (2002). "Defining and Achieving Your E-Fitness Goals"
<http://mcconnellinternational.com/>
- Mosaic (1998). "An Internet Diffusion Framework", Communications of the ACM, Vol. 41, No. 10, pp 21-26, October, 1998.
<http://www.agsd.com/mosaicgroup.html>
<http://mosaic.unohama.edu/gdi.html>
<http://som.csudh.edu/facc/lpress/gdiff>
<http://som.csudh.edu/fac/lpress/gdiff/question.htm>
- SADC (June, 2002). "SADC e-Readiness Review and Strategy", Budhiraja, Renu; Sachdeva, Sameer; (2002). "E-Readiness Assessment"
- APEC, 'e-commerce Readiness Assessment' , The Asian Pasific Economic cooperation(APEC),Electronic Commerce Steering Group,2000)<http://www.apecsec.org.sg> (
- WITSA,'International Survey of E-Commerce', The World Information Technology and Services Alliance(WITSA),2000.
- CSPP,'Readiness Guide for Living in the Networked World', Computer systems Policy project, 1998.
<http://www.cspp.org/projects/readiness/index.htm>
www.witsa.org/papers/EComSurv.pdf
- McConnell,'Risk E-Business:Seizing the Opportunity of Global E-Readiness', McConnel International LLC.,2000.
<http://mcconnellinternational.com/ereadiness/ereadinee.pdf>
- Bridges (2005). E-readiness Assessment Tools Comparison 28 February 2005 (updated).