

Review on e-readiness assessment tools

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Abstract. *The purpose of this paper is to investigate and analyze an e-readiness assessment tools. In order to achieve this goal, 31 research papers have been selected and analyzed. Our review was divided into three steps: literature search, selection of eligible papers, data extraction and summarizing. Based on the literature analysis and authors' practical experiences, a review of e-readiness assessment tools and a list of e-readiness assessment factors were done and presented in the paper. The results of the study can support researches and practitioners in effectively adopting e-readiness assessment tools and provides an insight into its state of the art.*

Keywords: e-readiness, assessment tools, e-learning

1 Introduction

E-readiness is a relatively new concept that has been given impetus by the rapid rate of Internet penetration throughout the world, and the dramatic advances in uses of Information and Communications Technology (ICT) in business and industry (Choucri et al., 2003). Since the end of last century, developed countries have realized the importance of establishing strategy for developing and integrating new technologies in all areas of civil and economic life. In this context, e-readiness can be defined as a degree to which a community is prepared to participate in the Networked World, which is gauged by assessing a community's relative advancement in the areas that are most critical for ICT adoption and the most important applications of ICT's (CID, 2000), ability to absorb ICT and use it for economic and social benefit (The Economist Intelligence Unit (EIU)), the degree to which an economy or community is prepared to participate in the digital economy (APEC, 2000), measuring the access and use of ICT which is the status or quality of readiness for a society or an economy to use electronic technology (Bridges.org, 2005). 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 (McConnell, 2001) and requires consumer trust in ecommerce security and privacy; better security technology; more trained workers and lower training costs; less restrictive public policy; new business practices adapted to the information age; and lower costs for e-commerce technology (WITSA, 2000). E-readiness is the ability to pursue value creation opportunities facilitated by the use of the Internet (Choucri, 2003). According to Musa (2010), e-readiness has this diversity in order to offer different uses in different manners. E-readiness has generally been defined as the extent of readiness in accessing network infrastructures and technologies. It can also be seen as the degree to which a society is prepared to participate in the digital economy with the underlying concept that digital economy can help to build a better society (Nazaj et al., 2014) or e-readiness (electronic readiness) is a measure of the degree to which a country, nation or economy may be ready, willing or prepared to obtain benefits which arise from ICTs (Dada, 2006). Regardless of a country's level of development, e-readiness is assessed by determining the relative standing of its society and its economy in the areas (national policies, level of technology integration, and regulatory practices) that are most critical for its participation to the networked world.

The purpose of this paper is to present a review and classification of the e-readiness assessment tools, to summarize them into categories, to identify significant factors for e-readiness assessment and to recommend which one to use for specific purpose based on the review, analysis and authors' practical experiences. This study supports researches and practitioners in effectively adopting e-readiness assessment tools and provides an insight into its state of the art. Results of this review show diversity of approaches, methodologies and factors used in the e-readiness assessment tools which proves complexity of the topic and need for systematic review done in this paper.

This paper is divided into the following sections: an introduction of e-readiness assessment tools is presented in Section 1. The research methodology – systematic literature analysis used in this study is explained in Section 2. Section 3 and 4 focus on summarizing the previous related works focusing on e-

readiness assessment tools and finding the significant factors and characteristics respectively. Finally, conclusion is presented in Section 5.

2 Research methodology – systematic literature analysis

In our review three main steps based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) methodology were conducted: literature search, selection of eligible papers and data extraction and summarizing (Moher et al., 2009). In the phase of literature research three databases: EBSCOhost, Scopus and Science Direct were chosen to provide a review of e-readiness assessment tools. The literature search was performed according to the following descriptors: “e-readiness, e-readiness assessment tools, e-learning, higher education” and their combinations. Search results gave us more than four hundred papers which meet the selected criteria, especially when searching without search limitations (searched keywords in abstracts and paper keywords; period: last 15 years; categories: journal papers/proceedings/reports) was done. In the phase of selecting eligible papers, we have removed duplicated papers with redundant information and irrelevant studies based on the results of titles and abstract screening. After this removal, authors reviewed the rest of the papers and extracted papers based on two criteria: focus on e-readiness assessment tools and eligibility of papers.

Finally, we have selected 31 papers, books and reports presented in the continuation of this paper. These 31 sources were summarized and significant factors were found. Therefore, this study focuses on finding significant factors and calculating the frequency of their usage. The action of summarizing and categorizing e-readiness assessment tools enabled us to obtain several important recommendations and hints for adapting available e-readiness assessment tools or for development a new one.

3 Previous studies on e-readiness assessment tools

The e-readiness concept was originated by the intent to provide a unified framework to evaluate the breadth and depth of the digital divide between more and less developed or developing countries during the latter part of 1990s (Mutulaa & van Brakel, 2006). E-readiness assessment enables governments to set, measure and achieve realistic goals for an information society, information-based economy, or e-government. Computer Systems Policy Project (CSPP) developed the first e-readiness assessment tool known as Readiness Guide for Living in the Networked World in 1998. According to CSPP an e-ready community has

high-speed access in a competitive market with constant access and application of ICTs in schools, government offices, businesses, healthcare facilities and homes user privacy and online security and government policies which are favourable to promoting connectedness and use of the Network (Bridges.org, 2005). E-readiness assessment is a useful tool also for determining a country's starting point when it comes to a national strategy for sector, such as education, that needs ICT as a precondition for its implementation (Divjak, Begičević et al., 2011) and for understanding and identifying the most key and relevant ICT based development opportunities (Saesor, Liangrokapt, 2012). High level of e-readiness allows enterprises to transact business electronically in order to achieve less turn-around time, faster delivery of services, enhanced product choices, etc. (Mutula, Brakel, 2006). Many authors have compared existing e-readiness assessment tools. E-readiness assessment tools and models can be divided into two main categories (Brigde.org, 2001): 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. Bridge.org have compared nine e-readiness assessment tools, which are settled into two categories: e-economy assessment tools and e-society assessment tools. Ghavamifar et al. compared seven e-readiness assessment tools and proposed a suitable tool for comparing the e-readiness in developing countries (Ghavamifar et al., 2008). E-readiness assessment can diminish the process of change for stakeholders (individuals, institutions, society) to adopt ICT and avoid the possibility of failure. Since the development of the first e-readiness tool, several e-readiness tools have emerged through efforts of development agencies, research organizations, academia, business enterprises and individuals.

The e-readiness assessments are very diverse in their goals, strategies and results and it can be design for macro or micro level assessment (Mutula, 2010). The literature on macro e-readiness assessment has taken two approaches (Rizk, 2004). The first group of studies undertakes a quantitative assessment, whereby countries are assigned numerical scores depending on how well they have performed on specific components of the e-readiness measure. A weighted average is calculated based on the relative importance accorded to these components. This approach has been adopted by the EIU (E-Readiness Indices), the Centre for International Development at Harvard (Network Readiness Index), the International Data Corporation (Information Society Index), the United Nations Conference on Trade and Development (UNCTAD ICT Development Indices), and the United Nations Development Program (Technology Achievement Index) (EIU, 2010), (CID, 2003), (The World Bank, 2013). The second group of studies concentrates on qualitative measures, assessing components such as connectivity, human capital, applications,

sophistication of use, and geographical dispersion. Assessments often highlight suggestions for improvements in specific components. Among these are the studies undertaken by McConnell International, Mosaic and the Computer System Policy Projects Readiness Guide. Third group of studies concentrates on micro or macro e-readiness assessment tools.

4 E-readiness assessment tools

E-readiness assessment tools are meant to provide the best possible indication about measurable variables affecting e-government so as to help decision makers in deciding what to focus on and to what extent improvements should be made to the different aspects measured to enhance the overall e-readiness of the country or part of it or just an organization. There are a number of well-known tools for e-readiness assessment and they vary in its complexity and purpose. After summarizing selected papers, books and reports, in this section we have focused on giving short review of e-readiness assessment tools divided into two groups: macro e-readiness assessment tools and e-learning (ICT) readiness assessment tools. Each e-readiness assessment tool has its own privilege, purpose, strength and weaknesses for certain applications. In this review, most important and widely used tools are summarized and explained based on following characteristics: purpose of development, application of tools and factors (indicators) of e-readiness assessment tools.

4.1 Macro e-readiness assessment tools

Macro e-readiness assessment tools are meant for macro level assessment and it's not suitable for assessment of sectoral e-readiness. Macro e-readiness assessment involves assessment at national, regional and global levels. In this section twenty-one macro e-readiness assessment tools with its main indicators developed by various organisations are presented.

Readiness for the Networked World, also known as CID e-readiness tool, was developed by the Center for International Development (CID) at Harvard University in 2000 (CID, 2003). The CID e-readiness tool defined 19 indicators of the degree of e-readiness of a community (a country, province, city or village) ranking each indicator by levels of advancement in stages 1 through 4. It is targeted at communities in developing countries seeking to define a strategy to participate in the Networked World. The 19 indicators were split into five main categories: Networked Access, Networked Learning, Networked Society, Networked Economy and Networked Policy.

E-readiness Ranking Tool was developed by the Economist Intelligence Unit (EIU) in 2000 and since then it has assessed 70 world's largest economies on their ability to absorb ICT and use it for economic and social benefit. Nearly 100 quantitative and qualitative

criteria are organized into six categories (Connectivity and technology infrastructure, Business environment, Social and cultural environment, Legal environment, Government policy and vision, Consumer and business adoption) that reflect the broader themes of e-readiness. Each category is weighted differently.

Readiness Guide for Living in the Networked World was developed by the Computer Systems Policy Project (CSPP) in 1998 (CSPP, 2000). It is self-assessment tool that is designed to help individuals, organizations and communities determine how prepared they are to participate in the Networked World. The tool measures the prevalence and integration of ICTs in homes, schools, business, healthcare facilities and government offices with an additional focus on competition between access providers, speed of access and government policy (Mutula, 2010). Readiness Guide for Living in the Networked World tool has five categories: Infrastructure, Access, Applications and services, Economy and Enablers.

APEC E-Commerce Readiness Assessment Guide was created by Asia - Pacific Electronic Cooperation (APEC) in 2000. APEC's e-Commerce Readiness Assessment Guide provides a self-assessment tool that can be used by economies to assess their readiness to participate in the digital economy. The tool builds on six indicators of e-readiness: Basic Infrastructure and Technology, Access to Necessary Communications Services, Current Level and Type of use of the Internet, Promotion and Facilitation Activities, Skills and Human Resources and Positioning for the Digital Economy. These six broad indicators of readiness for e-commerce have been developed into 100 multiple-choice questions.

Risk E-Business Tool (Ready?Net.Go) was developed by McConnell International and World Information Technology and Service Alliance (WITSA) in 2000 (McConnel, 2001). Main goal of this tool is to measure the capacity of nations to participate in the digital economy. The framework is designed to assess a country's e-readiness, or capacity to participate in the global digital economy. It aims to evaluate who is e-ready: which countries are enabling businesses, governments, and citizens to flourish in the networked economy. It measures e-readiness in five categories: Connectivity, E-leadership, Information security, Human capital and E-business climate.

Mosaic's Global Internet Diffusion Framework was developed by the Mosaic Group as part of the Global Diffusion of the Internet Project (GDI) in 2001. The framework is based on an on-going inductive study of the Internet in a wide representation of countries around the world (Wolcott et al., 2001) used to describe, in depth, the relative growth of the Internet in the given countries. It measures e-readiness in six categories: The Pervasiveness of the Internet, The Geographic Dispersion of the Internet, Sectoral Absorption, Connectivity Infrastructure,

Organizational Infrastructure and Sophistication of Use.

The World Information Technology and Services Alliance (WITSA) conducted this survey in 2000. WITSA is a consortium of 38 IT industry associations from economies around the world. 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 survey identified eight issues that need special attention (WITSA, 2000): Trust, Technology, Workforce Issues, Public Policy, Taxation, Business Process, Costs and Consumer Attitude.

The Framework has been designed in 2013 to assist the World Bank and its clients to prioritize actions to initiate an Open Data initiative and where intervention can be most effectively applied. The purpose of the tool is to provide a basis for consultative dialogue among open government data stakeholders. In that sense, use of this tool is the beginning of a process and not the end or result of a process. This tool is also a 'living' document and will be subject to continuous updating and revision based on experiences from actual practice and further input from experts (The World Bank, 2013). The Assessment Framework is arranged as eight themes: Leadership, Policy/legal framework, Institutional structures, responsibilities and skills within government, Data within government, Demand for open data/citizen engagement, Open data ecosystem Financing and National technology and skills infrastructure.

The e-Readiness Task Force of the Southern African Development Community (SADC) developed an e-readiness assessment tool in 2001. The tool was developed to determine the level of e-readiness in SADC member countries according to competence in e-governance, e-services, e-business, ICT awareness, infrastructure, and policy and regulatory frameworks. E-readiness framework has three overlapping levels of e-readiness identified: Fundamental level, Middle level and Advanced level.

The Global Technology Index (GTI) was developed in 2002 by dr. Howard Rubin, an IT consultant of Metricnet.com (a research firm that provides information consultations and research). The tool covers more than 50 countries spread over all the important commercial zones of the world. It has an even mix of developing and developed countries. The tool is designed to be a measure of the economic dynamism and strength, as well as the technological capabilities and potential of a country (Dutta and Jain, 2004). GTI covers five main categories: Knowledge jobs, Globalization, Economic dynamism and competition, Transformation to a digital economy and Technological innovation capacity.

Negotiating the Digital Divide Guide tool was developed at the University of Maryland by the Centre for International Development and Conflict Management (CIDCM) in 2001. The goal of this tool is 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 assessment is conducted through interviews with key actors in the relevant institutions and draws upon a range of background statistics and information grouped in four categories (Bridges.org, 2005): Background and history, Key players in Internet development, Internet development and ICT policy over time and Negotiations between players in developing the country's Internet.

E-records Readiness Tool (IRMT, 2004) was designed in 2004 by the International Records Management Trust to be used in conjunction with existing e-government readiness tools. This tool uses a questionnaire that will provide a risk assessment of e-records readiness both at the government, national and at the agency-specific level. The questionnaire consists of twelve components of e-records readiness: Legal Mandate for the Government-Wide Management of Public Records and Information, Legal Framework for E-Commerce Activities, Freedom of Information and Protection of Privacy Legislation, Government-Wide ICT Infrastructure and Capacity, Government-Wide E-Records Management Standards and Guidelines, Government-Wide Digital Preservation Strategy, Policies and Responsibilities for Records and Information Management, Tools and Procedures for Records and Information Management, E-Records Management Products and Technologies, Resources and Training for Records and Information Management Personnel, Internal and Public Awareness of Records and Information Management, Monitoring for Compliance with Records and Information Management Policies and Procedures.

Global Competitiveness Index (GCI) define competitiveness as the set of institutions, policies, and factors that determine the level of productivity of a country. There are twelve pillars of competitiveness: Institutions, Appropriate Infrastructure, A Stable Macroeconomic Framework, Good Health and Primary Education, Higher Education and Training, Efficient Goods Markets Efficient Labour Markets, Developed Financial Markets, The Ability To Harness The Benefits Of Existing Technologies, And Its Market Size, Both Domestic And International, By Producing New Different Goods Using The Most Sophisticated Production Processes, Innovation.

The Knowledge Assessment Matrix (KAM) is an interactive benchmarking tool created by the Knowledge for Development Program to help countries identify the challenges and opportunities they face in making the transition to the knowledge-based economy. The KAM consists of 148 structural and qualitative variables for 146 countries to measure their performance on the Knowledge Economy (KE) pillars: Economic Incentive and Institutional Regime, Education, Innovation, Information and Communications Technologies. Variables are

normalized on a scale of 0- 10 relative to other countries in the comparison group.

The ICT Development Index (IDI) was developed in 2008. IDI is a composite index that combines 11 indicators into one benchmark measure that can be used to monitor and compare developments in ICT between countries and over time.

The Information Society Index (ISI) was created in the mid-1990s as the world's first measure of ability of 53 nations to participate in the information revolution. The ISI is unique study that combines 15 variables arranged in four infrastructures to calculate and rank nations in overall index and four subindexes. The index and subindexes establish a standard by which all nations are measured according to their ability to access and absorb information and information technology (Ghavamifar, et al., 2008). Main indicators are: Computer infrastructure, Information infrastructure, Internet Infrastructure and Social Infrastructure.

Statistic on country's technological sophistication and strength using metrics of knowledge jobs, globalization, economics dynamism and competition, transformation to digital economy and technological innovation capacity (Measuring the Information Society Report, 2015). Main indicators are: Knowledge jobs, Globalization, Economics Dynamism and Competition, Transformation to Digital Economy and Technological Innovation Capacity.

In order to improve USAID's effectiveness as a key foreign policy instrument, USAID will bring together programs and activities into three program pillars that cut across all USAID funding accounts. By aggregating current and new programs that are mutually reinforcing into these pillars, USAID will be able to use scarce budget and human resources more effectively (Soydal et.al, 2011). Main indicators are: The Global Development Alliance (GDA), Economic Growth and Agriculture, Global Health and Conflict Prevention and Developmental Relief.

The Index of ICT Diffusion is designed to evaluate ICT development using indicators of ICT diffusion across countries. The index consists of two categories: Connectivity and Access, each of which is measured by several variables (Press, Dumas, 2005.). Purpose of this index is to measure the overall ability of individuals in a country to access and use new ICT. The index consists of five categories: Infrastructure, Affordability, Knowledge, Quality and Usage, each measured by one or two variables (IDC's Information Society Index). This index was designed "as a tool for tracking progress in bridging the digital divide and the implementation of the outcomes of the World Summit on the Information Society." The index consists of three categories: Opportunity, Infrastructure and Utilization.

4.2 E-learning readiness assessment tools

E-learning readiness assessment is essential for institutions that want to implement e-learning and those that have the system in place. In sum, e-learning readiness assessment provides key information to supply solutions which can cater to the specific needs of each learning group. Institutional management support, ICT infrastructure, web content availability, alongside with skilled human resources are crucial in determining readiness for e-learning. For that, several organizations, academia and researchers have suggested different assessment models.

Chapnick (2000) designed a model which can be used to measure e-learning readiness of institutions. It looked at; psychological, sociological, environmental, human resources (HR), financial readiness, technological skill (aptitude), equipment, content readiness. The proposed model grouped different factors into eight categories. This model has been used by a variety of institutions in a number of countries to assess their own e-learning readiness.

Engholm and McLean (2001) stated that the model contains major factors of readiness that have been identified in this study, and aims to provide managers and persons in the field of training and development with a useful tool in the assessment of their respective organization's readiness for e-learning. The model shows that e-learning readiness is determined by five major factors.

Brotis and Poulymenakou (2004) presented 11 issues (Align with Business Objectives, Blend Instruction, Design and Develop the Content Carefully, Evaluate and Provide Feedback to Development on a Continuous Basis, Provide "E-learning Time Breaks, Establishing the Technology Infrastructure, Leadership, Managing the Project and Managing Change, Keep in Mind that E-learning is a Training Delivery Method, Motivate E-learners, Design Usable and Know Your "Customers") appearing as critical success factors for e-learning adoption and sustainability.

Aydain and Tasci (2005) developed a model with four categories: Technology, Innovation, People and Self-development. They argue that, as most companies purchase e-learning solutions from outside resources, the existence of sufficient numbers of e-learning vendors and/or consultants could be considered another predictor of whether or not e-learning would be adopted rapidly.

Psycharis (2005) suggested three categories, resources, education and environment, each of which contains unique criteria. In the category resources, technological readiness, economic readiness and human resources readiness are considered as the factors. Education means the readiness of content and the educational readiness. Environment includes entrepreneurial readiness, leadership readiness, readiness of culture.

Colle (2004) developed framework that consists of five categories: Human Resources, ICT Facilities,

Academic Programmes, Outreach Policies, Faculty Posture which are measured by variables. The purpose of developing this framework was to investigate and assess the current state and usage of ICT in some Ghanaian universities and to evaluate the potential effectiveness of these technologies for teaching, research, and outreach (Addom, 2004).

Machado (2007) developed an e-Readiness Model for Higher Education with aim of revealing “primary model of e-readiness for the specific context of higher education. Main categories are: Ability of HEI Stakeholders, Capacity of Learning Stakeholders, Facility by Learning Stakeholders and Key Stakeholders. E-readiness is defined as “the ability of HEIs and the capacity of institutional stakeholders to generate (e) learning opportunities by facilitating computer-based technologies.

Divjak and Begičević (2011) presented e-readiness assessment model in E-readiness report for e-learning implementation in Kosovo. They developed model with five main categories: Strategy and Policy, Learning, Access, Society and Economy. These categories are measured with 23 indicators.

5 Significant factors in e-readiness assessment tools

After summarizing e-readiness assessment tools, in this section we focus on finding the most significant factors used in the assessment of e-readiness (Table 1 and 2). It should be noted that factors (indicators) mentioned in previous section were in different assessment tools with different purpose and application. Therefore, this comparative analysis focuses on finding the significance of these factors by calculating the frequency of their usage. Summarization and signification of factors used in e-readiness assessment tools can help decision makers in the process of development or adoption of e-readiness assessment tools and in the process of e-readiness assessment.

E-learning readiness assessment is essential for institutions that want to implement e-learning and those that have the system in place. E-learning readiness assessment provides key information to supply solutions that can determine the specific needs of each learning group. The review of e-learning (ICT) readiness model (in section 3) identified that there are various factors that can be used to measure readiness for e-learning implementation in organizations or education institutions. The comparison of the e-learning readiness factors is shown in Table 1. Between the factors that are identified in the literature as the important factors to be considered in e-learning (ICT) readiness assessment, the factor with the highest frequency is *Technology*, followed by *Learners and Resources* (at the second highest frequency), and then *Equipment*, *Management*, *Human resources* and

Content (at the third highest frequency). The factor *Acceptance of e-learning* is at the fourth highest frequency. The factors of *Training procedure*, *Standards* and *Institution* are at the fifth frequency. *Social and cultural awareness* is recognized as important factor that influence e-learning readiness, but with low frequency.

Table 1. The significant factors in e-learning (ICT) readiness assessment

| Authors | Chapnick (2000) | Engholm and McLean (2001) | Borotis and Poullymenakou (2004) | Ayda and Tasci (2005) | Psycharis (2005) | Colle (2004) | Machado (2007) | Divjak and Begičević (2011) | Freq | Rank |
|-------------------------------|-----------------|---------------------------|----------------------------------|-----------------------|------------------|--------------|----------------|-----------------------------|------|------|
| Technology | + | + | + | + | + | + | + | + | 8 | 1 |
| Learners | | + | + | + | + | + | + | + | 7 | 2 |
| Resources | + | | + | + | + | + | + | + | 7 | 2 |
| Equipment | + | | | + | + | + | + | + | 6 | 3 |
| Management | + | | + | | + | + | + | + | 6 | 3 |
| Human resources | + | | + | | + | + | + | + | 6 | 3 |
| Content | + | | + | | + | + | + | + | 6 | 3 |
| Acceptance of e-learning | | | + | + | | + | + | + | 5 | 4 |
| Training procedure | | | + | | + | | + | + | 4 | 5 |
| Standards | | | | + | | + | + | + | 4 | 5 |
| Institution | | | | | + | + | + | + | 4 | 5 |
| Social and cultural awareness | | + | | | | | | + | 2 | 6 |

Table 2. The significant factors in macro e-readiness assessment

| Indicators | Information infrastructure | Network and Speed Quality | Enhancing Education with ICTs | E-government strategy | Digital development strategy | Laws covering the Internet |
|---|----------------------------|---------------------------|-------------------------------|-----------------------|------------------------------|----------------------------|
| Macro e-readiness assessment tools | | | | | | |
| Readiness for the Networked World | + | + | + | + | + | + |
| E-readiness Ranking Tool | + | + | + | + | + | + |
| Readiness Guide for Living in the Networked World | + | + | + | + | + | + |
| APEC e-Commerce Readiness Assessment Guide | + | + | + | + | + | + |
| Risk E-Business Tool (ReadyNetGo) | + | + | + | + | + | + |
| Mosaic's Global Internet Diffusion Framework | + | + | | | | + |
| WITSA International Survey of E-Commerce | | | | | + | + |
| Open Data Readiness Assessment Tool | | | | + | | |
| SADC e-Readiness Review and Strategy | + | | + | + | | + |
| Global Technology Index (GTI) | | | | | + | + |
| Negotiating the Digital Divide Guide | + | | + | + | + | + |
| E-Records Readiness Tool | | | | + | + | + |
| Global Competitiveness Index | + | + | + | | | |
| Knowledge Assessment Matrix | + | | + | | | |
| ICT development index | + | + | | | | |
| Information Society Index (ISI) | + | + | | | | |
| Metric-net | | | | | | |
| US Agency for International Development (USA ID) | | | | | | |
| ICT Diffusion Index | + | + | | | | |
| Digital Access Index by ITU | + | + | | | | |
| Digital Opportunity Index by ITU | + | + | | | | |
| Frequency | 15 | 12 | 9 | 9 | 6 | 7 |
| Rank | 1 | 2 | 3 | 3 | 5 | 4 |

Macro e-readiness assessment tools are meant to provide the best possible indication about measurable indicators (factors) affecting e-government so as to help decision makers in deciding what to focus on and to what extent improvements should be made to the different aspects measured to enhance the overall e-readiness of the country. According to Table 2, the first most important factor in macro e-readiness assessment is *Information infrastructure*. This factor was used in 15 macro e-readiness assessment tools. *Network and speed quality* is also recognized as very significant factor included in 12 macro e-readiness assessment

tools. These major factors are followed by factor *Enhancing Education with ICT* and factor *E-government strategy* where each of them are used in 9 tools, then factor *Digital development strategy* and factor *Laws covering the internet*, used in 6 or 7 tools.

6 Conclusion

In this review we have identified and analyzed seven e-learning (ICT) e-readiness assessment tools and twenty-one macro e-readiness assessment tools. This review is conducted to understand the importance of e-readiness assessment for future development activities and to put focus on the most significant factors in e-readiness assessment process.

Our review of e-readiness assessment tools will provide researchers and practitioners with a guideline and insight into future effective research regarding e-readiness assessment tools. Another achievement of this review was finding the most significant factors used in assessment of e-readiness. A large number of factors were proposed by our data set papers and reports and they were summarized in Table 1 and 2. According to our research findings, it has been revealed that the most important criteria considered for assessment e-readiness were infrastructure and human resources. The list of significant factors used for e-readiness assessment can help decision makers in the process of development or adoption of e-readiness assessment tools and in the process of e-readiness assessment.

However, this research has the following limitations. Due to the limitations of time and manpower, we only surveyed selected research papers and done analysis of tools based on selected characteristics. Therefore, additional papers review can be conducted to cover other important databases and to do more comprehensive literature research and systematic literature analysis with comparative analysis and critical thinking included.

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