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Aktivnost: A5.1. Razvoj metodologije procjene e-spremnosti

Datum: 01.05.2016.

D5.1. Metodologija za procjenu e-spremnosti u sustavu visokog obrazovanja

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Content:

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1. E-readiness concept

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 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 technology (IT) in business and industry (Choucri et al., 2003). E-readiness can be related to the competence of a society or an institution to successful implementation of Information and Communications Technology (ICT).

Since the end of last century, developed countries have realized the importance of establishing a coherent and integrated strategy for developing and integrating new technologies in all areas of civil and economic life. "The digital revolution" had to be harnessed and exploited to consolidate the economic power and human development of countries (Zoukkari et al., 2012).

Center for International Development (CID) at Harvard University defined an e-ready society as one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices); integrated current ICTs throughout business (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).

E-readiness is the 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 information and communications technology (ICT) and use it for economic and social benefit (The Economist Intelligence Unit), 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, 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

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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 information and communication technologies (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.

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2. Review of e-readiness assessment tools

Dozens e-readiness assessment tools have been developed by international organizations and other institutions. These tools measure specific aspects of the community and several features of services and technologies that should be available to facilitate the transfer into the digital era of e-government. These 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).

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 favorable to promoting connectedness and use of the Network (Bridges.org, 2001).

E-readiness assessment is a useful tool 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 & Liangrokapart, 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). E-readiness assessment tools are meant to guide development efforts by providing benchmarks for comparison and gauging progress (Purcell & Toland, 2004).

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.

E-Economy assessment tools:

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- WITSA E-Commerce Survey
- APEC's E-Commerce Assessment
- McConnell International's E-Readiness Report
- Mosaic's Global Diffusion of the Internet Framework
- Crenshaw & Robinson's Cross-National Analysis of Internet Development

E-Society assessment tools:

- CID's E-Readiness Assessment Guide
- CSPP's E-Readiness Assessment Guide
- The various models for evaluating e-readiness from 'digital divide' reports
- CIDCM's Negotiating the Net Model

Authors Ghavamifar et al. compared seven e-readiness assessment tools and proposed a suitable tool for comparing the e-readiness in developing countries (Ghavamifaret 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).

Alaaraj, H., Ibrahim, F.W. (2014) provide classifications of the assessment models of e-readiness as:

- e-economy and e-society assessment tools,
- the methods of quantitative and qualitative pictures and
- area of focus whether it is macro or micro.

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, among others, the Economist Intelligence Unit (E-Readiness Indices),

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the Center 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)[22], [13], [50].

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. In this paper, twelve of macro assessment tools are described (Figure 1.).

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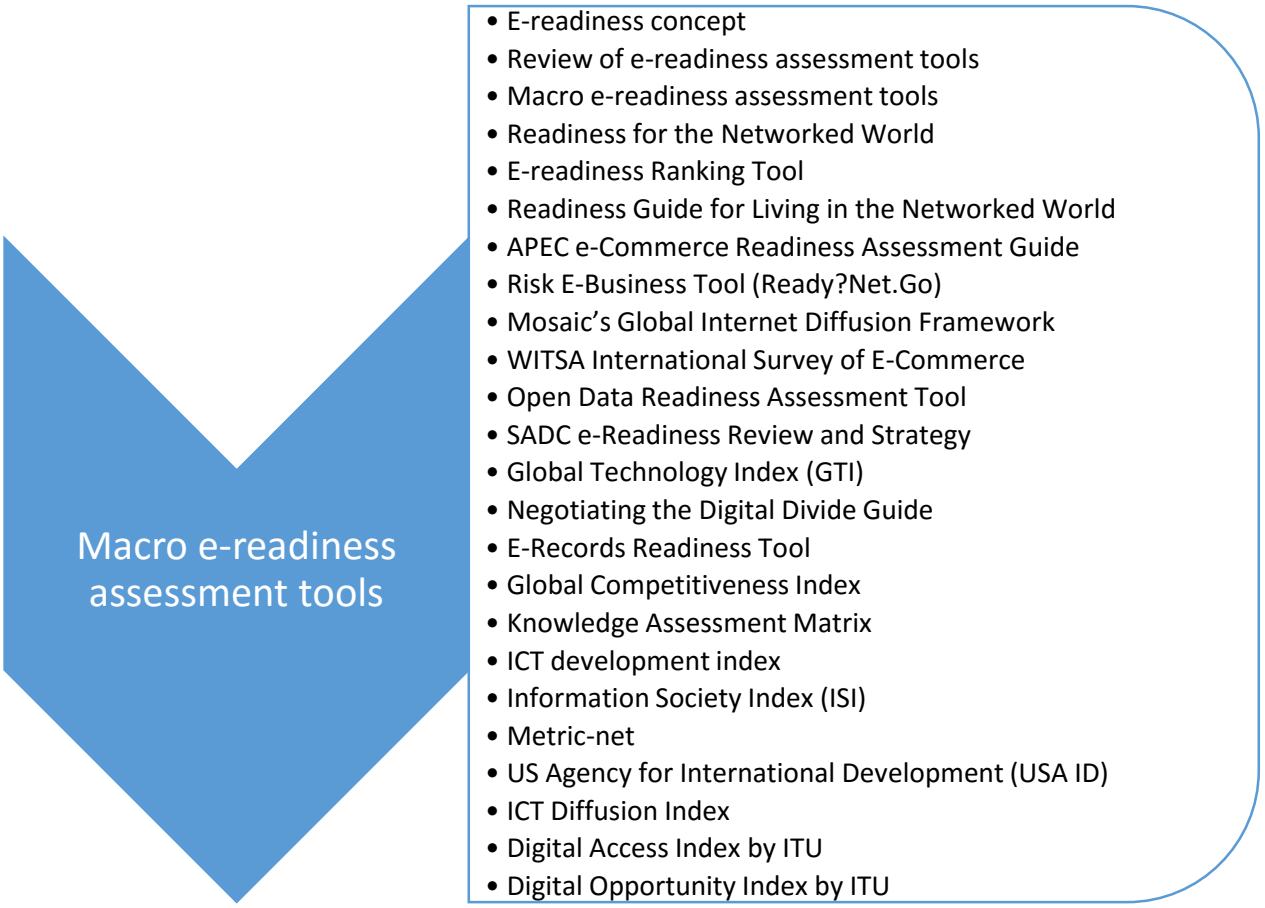

Figure 1: Macro assessment tools

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2.1. Macro e-readiness assessment tools

2.1.1. Readiness for the Networked World

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 (Table 1.):

- **Networked Access** category measures readiness of the ICT infrastructure with six indicators: Information Infrastructure, Internet Availability, Internet Affordability, Network Speed and Quality, Hardware and Software and Service and Support. These six indicators measure the availability, cost and quality of ICT networks, services and equipment.

- **Networked Learning** category indicators measures how the educational system integrate ICTs into its processes to improve learning and is there technical training programs in the community that can train and prepare an ICT workforce. This category has three indicators: School's Access to Information and Communication Technologies, Enhancing Education with ICTs and Developing the ICT Workforce.

- **Networked Society** category measures readiness with four indicators: People and Organization Online, Locally Relevant Content, ICT in Everyday Life and ICT in the Workplace. This indicators measures to what extent are individuals using information and communication technologies at work and in their personal lives and is there significant opportunities available for those with ICT skills.

- **Networked Economy** category measures how businesses and governments using information and communication technologies to interact with the public and with each other. This category is measured with for indicators: ICT Employment Opportunities, Business to Consumer (B2C) Electronic Commerce, Business to Business (B2B) Electronic Commerce and E-Government.

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- **Network Policy** category measures to what extent does the policy environment promote or hinder the growth of ICT adoption and use. It is measured with two indicators: Telecommunications Regulation and ICT Trade Policy.

Main Category	Indicators
Networked Access	• Information Infrastructure • Internet Availability • Internet Affordability • Network Speed and Quality • Hardware and Software • Service and Support
Networked Learning	• School's Access to Information and Communication Technologies • Enhancing Education with ICTs • Developing the ICT Workforce
Networked Society	• People and Organization Online • Locally Relevant Content • ICT in Everyday Life • ICT in the Workplace
Networked Economy	• ICT Employment Opportunities • Business to Consumer (B2C) Electronic Commerce • Business to Business (B2B) Electronic Commerce • E-Government
Network Policy	• Telecommunications Regulation • ICT Trade Policy

Table 1: Main categories and indicators of CID E-readiness tool

2.1.2. E-readiness Ranking Tool

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 information and communications technology and use it for economic and social benefit. All this data are published in annual e-readiness ranking. The e-readiness rankings allow governments to gauge the success of their ICT strategies against those of other countries, and provide companies wishing to invest overseas with an overview of the world's most promising investment locations from the perspective of e-readiness (EIU, 2010).

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E-readiness is a measure of the quality of a country's information and communications technology (ICT) infrastructure and the ability of its consumers, businesses and governments to use ICT to their benefit. Nearly 100 quantitative and qualitative criteria are organized into six categories that reflect the broader themes of e-readiness. Each category is weighted differently (Table 2).

Main Category	Category criteria and weights
Connectivity and technology infrastructure	• Broadband penetration (15%) • Broadband quality (10%) • Broadband affordability (10%) • Mobile-phone penetration (15%) • Mobile quality (10%) • Internet user penetration (15%) • International Internet bandwidth (10%) • Internet security (15%)
Business environment	All nine criteria are weighted equally. • Overall political environment • Macroeconomic environment • Market opportunities • Policy towards private enterprise • Foreign investment policy • Foreign trade and exchange regimes • Tax regime • Financing • The labor market
Social and cultural environment	All five criteria are weighted equally • Educational level (measured by school life expectancy, gross enrolment in education and enrolment in tertiary education) • Internet literacy • Degree of entrepreneurship • Technical skills of workforce • Degree of innovation (measured by the generation of patents and trademarks, as well as R&D spending)
Legal environment	• Effectiveness of traditional legal framework (30%) • Laws covering the Internet (25%) • Level of censorship (10%) • Ease of registering a new business (25%) • Electronic ID (10%)
Government policy and vision	• Government spend on ICT as a proportion of GDP (5%) • Digital development strategy (25%) • E-government strategy (20%)

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	• Online procurement (5%) • Availability of online public services for citizens (15%) and businesses (15%) • E-participation (15%, based on the UN e-participation index)
Consumer and business adoption	• Consumer spending on ICT per head (15%) • Level of e-business development (10%) • Use of Internet by consumers (25%, assessing both the range of Internet features used by individuals and their online purchasing activity) • Use of online public services by citizens (25%) and businesses (25%)

Table 2: Main categories and criteria of E-readiness Ranking Tool

Connectivity and technology infrastructure measures the extent to which individuals and businesses can access the Internet and mobile networks, and do so affordably with an assurance of quality, reliability and security. Penetration of each market's mobile-phone subscriptions, overall Internet users and broadband Internet accounts are ranked as a percentage of the total population. The affordability of the lowest-priced broadband subscription, measured as a percentage of an average household's median income, is used as the overall measure of digital service affordability. Broadband quality is measured as the extent to which fibre-optic access figures in a country's total broadband connections. Likewise, mobile quality is based on the extent of 3G and 4G mobile subscriptions as a share of total mobile subscriptions. The penetration of secure Internet servers in the population is used as a reference indicator of the extent to which reliable digital transactions can be made in each market. International Internet bandwidth is an indicator of the ability of a country's networks to carry the burgeoning volume of data traffic originating from within and outside of its borders. *Weight in overall score: 20%.*

Business environment evaluates the general business climate, the Economist Intelligence Unit screens 74 sub-indicators to provide a comprehensive and forward view of each country's attractiveness as a trading economy and as a destination for business investment from 2009 to 2013. The criteria cover such factors as the strength of the economy, political stability, taxation, competition policy, the labor market, and openness to trade and investment. *Weight in overall score: 15%.*

Social and cultural environment - education is a precondition to being able to utilize Internet services, but this category also considers a population's web-literacy—its experience using the Internet and its receptivity to it—and the technical skills of the workforce. These technical skills are evaluated by both evidence of the familiarity of a country's population with information technology (IT) applications and

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the extent to which its schools and governments provide the education infrastructure to engender them. Also included is an assessment of entrepreneurship, while our scoring of innovation levels in each market (measured by the number of patents and trademarks registered, as well as the level of spending on R&D) evaluates how well the society fosters creative business activity that can lead to the creation of intellectual property, new products and industries. *Weight in overall score: 15%.*

Legal environment - E-business development depends on both a country's overall legal framework and specific laws governing Internet use. This category reflects those legal frameworks that have a direct impact on the use of digital technology to inform, communicate and transact business. Governments need to be forward-thinking in their creation of legal frameworks to cater to Internet commerce. These include legislative approaches to such issues as cybercrime, data privacy and spam, but just as importantly countries need to create a legal atmosphere that works to minimize abuses and non-competitive behavior, including provisions covering consumer protection and legal jurisdiction. E-ready countries are those that allow businesses and individuals to move nimbly and freely, where there is little bureaucracy to interfere with the registration of a new business or restrict access to information. The commitment of the country to implementing digital identity cards is also considered as a means of determining how a country's population can access digital commerce and digital government services. *Weight in overall score: 10%.*

Government policy and vision - E-ready governments supply their constituents—citizens and organizations— with a clear roadmap for the adoption of technology, and they lead by example in their use of technology to create efficiencies. The Economist Intelligence Unit assesses the activities of governments in this area, and their ability to lead their countries towards a digital future. Are governments employing technology to operate and provide public services with less resource investment? Are they spending on ICT to stimulate similar spending in the greater economy? Are "savings" translated into service gains for citizens? Can more people interact with, and receive information from, the government regardless of their own access to technology? This category also analyses, in each country, the availability of digital channels to individuals and businesses for accessing public services, and to citizens for obtaining government information about civic issues and engaging in consultation with government officials on matters involving the political process. *Weight in overall score: 15%.*

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Consumer and business adoption - if connectivity, societal adoption, and legal and policy environments are necessary enabling platforms for a digital economy, then the actual utilization of digital channels by people and companies is a measure of successful implementation. The Economist Intelligence Unit looks at the amount that businesses and consumers spend on accessing ICT services, the extent and range of Internet features used by individuals, their online purchasing activity, and the extent to which individuals and businesses use the online public services that have been made available. *Weight in overall score: 25%.*

2.1.3. Readiness Guide for Living in the Networked World

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 determinate 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 main categories (Table 3.):

Main Category	Category criteria
Infrastructure	• Residential Speed & Availability • Commercial Speed & Availability • Fixed Wireless Competition • Mobile Wireless Competition
Access	• Business • Government • K-12 (elementary and secondary (K–12) schools) • Higher education institutions (community colleges, colleges, and universities) • Health (health care provider operations) • Home
Applications and services	• Business • Government • K-12

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	• Higher Education • Health • Home
Economy	• Innovation • Workforce • Consumer
Enablers – policy, privacy, security and ubiquity	• Ubiquity • Security • Privacy • Policy

Table 3: Main categories and its criteria's of Readiness Guide for Living in the Networked World

Infrastructure — there is an ever-expanding communications network infrastructure that spans the globe, connecting people and devices to all sorts of voice, video, and data services. However, there is tremendous variability in the speed, quality, affordability, and range of services that are available where people actually connect to the Network: in homes, schools, businesses, cars, trains, etc.

Access — infrastructure alone does not ensure connectedness. The Network must extend to the places where people spend their time. Mobile technologies will soon make the Network available everywhere, but wired access will remain important for higher speed connections and fixed access devices.

Applications and Services — the Networked World is all about how we are able to use the Network to make our lives better, jobs more meaningful, time more well spent, people smarter, and communities stronger, healthier, and safer.

Economy — the role of the Network in driving the economy. The Internet has started to change the economy-the Networked World will revolutionize it. There are three key factors that indicate an economy, whether at the macro or micro level, is well-grounded to benefit from the change: 1) are the ingredients in place to promote innovation; 2) is the workforce trained and skilled enough to adapt to an ever-changing environment; and 3) are consumers plugged into the networked economy.

Enablers — key levers to expediting the Networked World. The Networked World is happening all around us in fits and starts. Most of us still operate in a duplicative online and physical mode because we are not yet at a level of reliability and ubiquity to do many of the things possible on the Network alone. Many people are concerned that online interactions are not adequately secure and private. Policies are still maturing that will ensure that a viable legal framework is in place and that promote connectedness everywhere and for everyone. If these key issues are addressed expeditiously, communities will be better enabled to benefit from the Networked World.

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2.1.4. APEC e-Commerce Readiness Assessment Guide

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. Every economy, presents a readiness profile on the global stage, composed of its national policies, level of technology integration, and regulatory practices. The Guide points to prescriptions for the changes that are necessary to improve the business environment (APEC, 2000). The tool builds on six indicators of e-readiness (Table 4): 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. The results of the assessment are not intended to be scored, rather to provide a starting point in a strategic planning process for adoption of e-business (APEC, 2000). The APEC tool is more inclined to focus on assessing government policies for e-business.

Main Category	Indicators
Basic Infrastructure and Technology	• speed • pricing • access • market competition • industry standards • foreign investment
Access to Necessary Services	• bandwidth • industry diversity • export controls • credit • card regulation
Current level and type of use of the Internet	• use in business • use in government • use in homes

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Promotion and Facilitation Activities	• industry led standards
Skills and Human Resources	• ICT education • workforce
Positioning for the Digital Economy	• taxes and tariffs • industry self- regulation • government regulations • consumer trust

Table 4: Main categories and its indicators of APEC's e-commerce readiness index

During the assessment through this tool, the 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 within their borders to the deployment of e-commerce".

2.1.5. Risk E-Business Tool (Ready?Net.Go)

Risk E-Business Tool (Ready?Net.Go) was developed by McConnel 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 (Table 5.):

Main Category	Key elements
Connectivity	• infrastructure • access • pricing
E-leadership	• government policies • regulations

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Information security	• intellectual property • privacy • electronic signatures
Human capital	• ICT education • available skilled workforces
E-business climate	• competition, political and financial stability • foreign investment • financial infrastructure

Table 5: Risk E-Business Tool main categories and key elements

Connectivity - availability of wireline and wireless communication services, community access centers (free and paid), and networked computers in business, schools and homes. Affordability and reliability of network access, including the cost of service, downtime and the prevalence of sharing access among individuals. Underlying infrastructure, including the reliability of electrical supply for business-critical computer operations and the ease of importing goods and of transporting them within a country.

E-leadership - priority given by government to promoting the development of an e-society on a national level. Extent of demonstrated progress on e-government including efforts to automate governmental processes, offer services to business and citizens electronically and create national portals. Quality of partnership between industry leaders and government to improve e-readiness. Level of effort to promote access for all citizens.

Information security – strength of legal protections and progress in protecting intellectual property rights, especially for software. Extent of efforts to protect electronic privacy. Strength and effectiveness of the legal framework to address and prosecute computer crimes, authorize digital signatures and enable public key infrastructures.

Human capital – quality of and participation levels in the education system with an emphasis on efforts to create and support a knowledge-based society. Penetration of ICT in schools and ability of educators to use and teach in accordance with the technologies. Culture of local creativity and information sharing within the society. Skills and efficiency of the workforce and strength of efforts to retain skilled managers and technologists.

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E-business – existence of effective competition among communication and information services providers. Transparency and predictability of regulatory implementation, openness of government, rule of law and general business risk. Openness to financial and personal participation by foreign investors in ICT businesses. Ability of the financial system to support electronic transactions. Sponsorship of science and technology parks as hubs of innovation and support for new enterprises.

2.1.6. Mosaic's Global Internet Diffusion Framework

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) and 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.org, 2001).

The analyses focus on major social, economic, and political events, and the legal and regulatory environments as they affect the countries' Internet. 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.org, 2001). It measures e-readiness in six categories (Table 6.):

Main Category	Indicators
The Pervasiveness of the Internet	• Non-existent • Embryonic • Nascent • Established • Common
The Geographic Dispersion of the Internet	• Non-existent • Single location • Highly dispersed • Nationwide
Sectoral Absorption	• Non-existent • Rare • Moderate

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	• Common • Widely used In four mayor sector and its subsectors: *Academic* (Primary and Secondary Education, University Education), *Commercial* (Distribution, Finance, Manufacturing, Retail, Service), *Health* (Hospitals, Clinics, Research Centers, Physicians/Practitioners), *Public* (Central Government, Regional and Local Governments, Public Companies).
Connectivity Infrastructure	• Non-existent • Thin • Expanded • Broad • Extensive on four components: Domestic Backbone, International Links, Internet Exchanges and Access Methods
Organizational Infrastructure	• None • Single • Controlled • Competitive • Robust
Sophistication of Use	• None • Minimal • Conventional • Transforming • Innovating

Table 6: Mosaic's main categories and its indicators

The Pervasiveness of the Internet- is based on the number of hosts and users per capita.

The Geographic Dispersion of the Internet- over 200 nations now have IP connectivity, but in many of these, access is restricted to one or two large cities. This dimension measures the concentration of the Internet within a nation, from none or a single city to nationwide availability with points-of-presence or toll free access in all first-tier political subdivisions and pervasive rural access.

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Sectoral Absorption - while widespread access is desirable, the payoff is in who uses the Internet in a nation. This dimension assesses the degree of Internet utilization in the education, commercial, health care, and public sectors. These sectors are seen as key to development, and were suggested by the measures used by the United Nations Development Programme Human Development Index (United Nations Development Programme, 1997).

Connectivity Infrastructure - this measure is based on international and domestic backbone bandwidth, exchange points, and last-mile access methods. A highly rated nation will have high speed domestic and international backbone connectivity, public and bilateral exchange points, and a high proportion of homes with last-mile access using CATV, DSL, or some other technology that is faster than analog modems.

Organizational Infrastructure - this dimension is based on state of the ISP industry and market conditions. A highly rated nation would have many ISPs and a high degree of openness and competition in both the ISP and telecommunication industries. It would also have collaborative organizations and arrangements like public exchanges, ISP industry associations, and emergency response teams.

Sophistication of Use - this variable ranks usage from conventional to highly sophisticated and driving innovation. A relatively conventional nation would be using the Internet as a straight forward substitute for other communication media like telephone and FAX, whereas in a more advanced nation, applications may result in significant changes in existing processes and practices and may even drive the invention of new technology.

2.1.7. WITSA International Survey of E-Commerce

The World Information Technology and Services Alliance (WITSA) conducted this survey in 2000. WITSA is a consortium of 38 information technology (IT) industry associations from economies around the world. As the global voice of the IT industry, WITSA is dedicated to advocating policies that advance the industry's growth and development; facilitating international trade and investment in IT products and services. WITSA is also dedicated to strengthening its national industry associations through the sharing of knowledge, experience, and critical information (WITSA, 2000).

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

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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 (Bridges.org, 2001).

The results of this study show that the information technology industry and regulatory bodies have much work still to do before electronic commerce achieves its full potential. The survey identified eight issues that need special attention (WITSA, 2000) (Table 7.):

Main Category	Indicators
Trust	• What are the Most Significant Barriers Facing the Electronic Commerce Industry? • How Strongly will Trust Effect the Growth of Electronic Commerce?
Technology	• What are the Most Significant Technology Issues? • How strongly will Technology Affect the Growth of Electronic Commerce?
Workforce Issues	• What are the Most Significant Workforce Barriers to the Future Growth of Electronic Commerce? • How strongly will Workforce Affect Growth of electronic Commerce?
Public Policy	• What are the Most Significant Public Policy Barriers to the Growth of Electronic Commerce? • How Strongly Will Public Policy Affect Growth of Electronic Commerce?
Taxation	• What Taxes are Most Harmful to the Viability of Electronic Commerce? • How strongly will Tax Barriers Impede the Growth of Electronic Commerce?
Business Process	• What Internal Business Process Issues will Affect Growth of Electronic Commerce? • How Strongly will Business Process Issues Affect the Growth of Electronic Commerce?
Costs	• What Costs are the Most Significant Impediment to Electronic Commerce? • How strongly will Costs Impede the Growth of Electronic Commerce?
Consumer Attitude	• What Resistance do WITSA members Face from Customers?

Table 7: WITSA Information Technology International Survey main categories

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Trust - security of payments is of paramount importance in the corporate acceptance, adoption and widespread deployment of electronic commerce. Developing countries cited low levels of credit card use and restrictions on using credit cards over the telephone as a problem in implementing consumer electronic commerce.

Technology - efforts to integrate electronic commerce systems with existing enterprise systems and the lack of internationally recognized standards covering such activities as transaction processing, security and authentication were also identified. Networking bandwidth was a prominent concern among developing countries, many of who are still developing basic telecommunications infrastructures

Workforce Issues - there was a strong consensus among WITSA members that people issues will play an important part in the development of electronic commerce. The shortage of skilled workers, a perennial problem for the IT industry, is the most important issue for the majority of respondents.

Public Policy - as industry associations, WITSA members are closely involved in influencing public policy in their countries. Leading public policy issues highlighted by respondents included the development of standards for authentication that would ensure trading partners are legitimate; the impact on electronic commerce of the taxation of online sales and the confusion caused by conflicting international contractual and legal frameworks.

Taxation - although taxation scores highly in the public policy arena, overall it is perceived as less of a barrier than any other issue related to electronic commerce. Local sales taxes are perceived as most harmful to electronic commerce. Despite a lack of clarity on taxation in many countries, the majority view was that taxes were not an important barrier to electronic commerce.

Business Processes - while new internet only businesses such as auction sites and share dealing services have been launched, the majority of organizations trading on the internet are established businesses that must integrate their electronic activity with existing business processes.

Costs - in line with the emphasis on people issues, the most significant costs for those implementing electronic commerce are connected with organizational change. The costs of changing business processes and adapting corporate cultures to accommodate electronic commerce are seen to represent the biggest cost elements.

Consumer Attitudes - the experiences of WITSA member companies in convincing customers to adopt electronic commerce again underlines the need to reassure users that they can trust the Internet.

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2.1.8. Open Data Readiness Assessment Tool

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. It will serve as a useful tool for others to use, or to inspire the development of more targeted assessments or processes that closely link to local needs. The assessment is designed to address both the supply and demand side of Open Data. However, it may be advisable for a government to use this tool alongside other tools that focus more deeply on specific areas of interest (e.g., civil society demand for Open Data or technical capacity of the public sector). The purpose of the tool is to provide a basis for a robust and 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, and within them a small number of "primary questions" (Table 8.).

Main Category	Primary questions
Leadership	• Is there visible political leadership of Open Data/Open Government/Access to information? • Is there an established political structure for policy and implementation of cross-government initiatives? • Are there any existing political activities or plans relevant to Open Data? • Does the wider political context of the country help or hinder Open Data?
Policy/legal framework	• Is there any policy on Open Data or (re-)use of public sector information? • What are policies/laws on government secrecy and access to information?

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	• What policies/laws help or hinder the use of information by public and civil society?
Institutional structures, responsibilities and skills within government	• Is there an agency or entity that has the mandate, project management experience and technical skills to manage an Open Data portal? • Do any agencies have a CIO, CTO or permanent official positions dedicated to data management? • Are there any inter-agency mechanisms to coordinate on ICT issues (such as for technical matters)? • Is there any process currently used to measure agency performance or quality of service delivery? • Is there an agency or ministry primarily responsible for data or statistics?
Data within government	• What are the policies/laws on the management of government information? • Does the government have a coherent view of its data holdings? • How and where is government data held? • What data is already published - either free or for a fee - and on what conditions? • Are there some agencies with established capabilities in data management (e.g. the NSO) which could give leadership to a wider initiative?
Demand for open data / citizen engagement	• What is the level and nature of demand for data from Civil Society and the media? • What is the level and nature of demand for data from business/the private sector? • What is the extent of engagement with government through social media and other digital channels? • What is the extent of intra- and inter-government demand for data? • How do public agencies listen to demands for data and respond?
Open data ecosystem	• Are there infomediaries (such as data journalists) who are able to help translate Open Data into meaningful information for the public? • Has government engaged in activities to promote reuse of government-held data (e.g., in developing apps or organizing co-creation events)? • Is there an Apps Economy that already exists in your country/locality? • Is there an academic or research community that both trains people with technical skills and has people skilled at data analysis?
Financing	• Have sufficient resources been identified to fund an initial phase of an Open Data initiative?

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	• Do any resources exist or have any been identified to fund development of initial apps and eServices that will use Open Data? • Is sufficient funding available to support the necessary ICT infrastructure and ensure enough staff have the skills needed to manage an Open Data initiative? • Does your government have any funding mechanisms for innovation?
National technology and skills infrastructure	• Is Internet access at sufficient levels and at low enough cost to support a robust Open Data ecosystem in your country/locality? • Does government use shared infrastructure or shared services? • How strong is the government's overall ICT skill base among senior government leaders and civil servants? • How strong are the IT industry, developer community and overall digital literacy in your country/locality? • How active is the government's presence on the Web?

Table 8: Open Data Readiness Assessment Tool main categories and primary questions

It is those themes and primary questions which form the basis of the assessment and recommendations. For each primary question a number of subsidiary questions are suggested to test the detail of your interviewees' responses. It is not necessary to rigorously ask all the subsidiary questions of all interviewees. (The World Bank, 2013).

Leadership - importance: Very High. Open Government Data programs often face resistance both from bureaucratic forces within government with a culture of secrecy, and by actors inside and outside government who have benefitted from privileged access to data. Strong, sustained, political leadership is therefore important in overcoming resistance and giving cover to political and other risks from opening up government information.

Policy/legal framework - importance: High. Open Government Data programs should wherever possible work within and leverage existing legal codes and policies, especially in the start-up phase. This greatly reduces the legal/policy impediments and lead times, means that the initiative can work with relevant policy experts and that any policy/legal changes needed for steady-state sustainability can be based on practical experience. Conversely it is important to identify at an early stage actual or perceived "blockers" in order that policy or legal change can be initiated early if essential.

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Institutional structures, responsibilities and skills within government - importance: High. Middle management level skills and leadership are important to success: Open Government Data requires agencies to manage their data assets with a transparent, organized process for data gathering, security, quality control and release.

Data within government - importance: High. Open Government Data programs can build on established digital data sources and information management procedures within government where they already exist. Where data is only available in paper form it will be hard to release as open, reusable data quickly and cheaply.

Demand for open data / citizen engagement - importance: Very High. The value of data is in its use. A strong demand-side "pull" of data is important not only in creating and maintaining pressure on government to release data but also in ensuring that the wider Open Data ecosystem develops and that the open government data is turned into economically or socially valuable services for citizens. The "pull" can come either from civil society or from businesses, or both.

Open data ecosystem - importance: High. Experience among leading governments has demonstrated that Open Data initiatives are more sustainable and high-impact when Open Data efforts use an "ecosystem" approach – meaning governments invest not only in supplying data but also address the policy/legal framework, institutional readiness, capacity building (for government and infomediaries), citizen engagement, innovation financing and technology infrastructure. Governments need to play a multi-dimensional role in an Open Data ecosystem and create new types of partnerships with a wide range of stakeholders.

Financing - importance: Medium High. Financing with respect to both the "supply side" and "demand side" of Open Data is important to drive innovations with Open Data. While Open Data need not be a high-cost effort by government, it does require resources that are best invested across the Open Data ecosystem.

National technology and skills infrastructure - importance: High. In very practical ways, successful Open Data initiatives require adequate infrastructure, in terms of technology platforms and ICT skills among officials, infomediaries and the general public.

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2.1.9. SADC e-Readiness Review and Strategy

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 (Table 9.):

Main levels	Indicators
Fundamental level	• Basic telecommunications services • Basic infrastructure (electricity, education, access to television and radio) • Human factors
Middle level	• Advanced telecommunications (data) services • E-government • E-education • E-health
Advanced level	• Higher level of ICT infrastructure and application • Well-developed banking infrastructure • Legal support mechanisms

Table 9: SADC e-Readiness assessment tool main levels and indicators

Fundamental level - this level involves the fundamental enablers of e-readiness such as basic telecommunications services, basic infrastructure (electricity, education, access to television and radio) and human factors.

Middle level - this level involves access to more advanced telecommunications (data) services, including e-mail and Internet usage in general, and the foundation of an ICT infrastructure, with specific focus on priority applications like e-government, e-education, and e-health (with a focus on PC penetration in schools, clinics, community centers, government offices, and businesses).

Advanced level - the advanced level involved the latter stages of a higher level of ICT infrastructure and application, and implies the use of the Internet for global trade and other commercial activities. This implies the foundational requirements of a well-developed banking infrastructure and legal support mechanisms (SADC, 2002).

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2.1.10. Global Technology Index (GTI)

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 (Table 10.):

Main categories
Knowledge jobs
Globalization
Economic dynamism and competition
Transformation to a digital economy
Technological innovation capacity

Table 10: Global technology index main categories

2.1.11. Negotiating the Digital Divide Guide

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

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institutions and draws upon a range of background statistics and information grouped in four categories (Table 11.) (Bridges.org, 2001):

Main categories	Indicators
Background and history	• Economy • Education • Infrastructure • Government • Policy making • Culture
Key players in Internet development	• Government • Local business • Foreign business • Universities • NGO • International financial institutions • Research groups
Internet development and ICT policy over time	• Access • Regulation • Competition
Negotiations between players in developing the country's Internet	• Precommercial • Commercial • Competitive • Consolidated

Table 11: Negotiating the digital divide main categories and its indicators

Background and history – structural context (economy, education levels, existing infrastructure), political structure and culture (type of government, policy making style), cultural norms (religion, etc).

Key players in Internet development – responsibilities and objectives of relevant players in government, local and foreign businesses, universities, NGOs, international financial institutions, research groups.

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

Negotiations between players in developing the country's Internet - each aspect of Internet development and ICT policy is categorized into one of four stages (precommercial, commercial, competitive, and consolidated).

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2.1.12. E-Records Readiness Tool

E-records Reediness Tool was designed in 2004 by the International Records Management Trust to be used in conjunction with existing e-government readiness tools. The aim is to enable governments to conduct high-level assessments of key areas of e-records readiness in relation to other aspects of e-government and to determine whether the records and information management infrastructure is capable of supporting e-government initiatives (IRMT, 2004). This tool uses a brief questionnaire that will provide a risk assessment of e-records readiness both at the government-wide, national level and at the agency-specific level. The questionnaire consists of twelve components of e-records readiness (Table 12.). The first six components address national, government-wide e-records readiness; the last six components address agency-specific e-records readiness. Each e-records readiness component is described at three possible stages of capacity. After reading the description of each of the component, decide whether the government or the agency best fits the stage 1, 2 or 3 description.

Main components	Indicators on stage 1, 2 and 3
Legal Mandate for the Government-Wide Management of Public Records and Information	• National archives law or equivalent legislation • Authority to make decisions on the retention, destruction and accessibility of records and information, paper and electronic. • Arrangements for managing
Legal Framework for E-Commerce Activities	• Legislation for e-commerce transactions and admissibility of e-records in legal proceedings • Online transactions • Corruption and fraud associated with online transactions
Freedom of Information and Protection of Privacy Legislation	• Freedom of information
Government-Wide ICT Infrastructure and Capacity	• Electrical power • Government computer systems • Government-wide ICT strategy

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Government-Wide E-Records Management Standards and Guidelines	• Standard for electronic records management • Guidelines on the capture and management of email and electronic document • Government-wide core standard for records and e-content metadata. • Government ICT systems
Government-Wide Digital Preservation Strategy	• Digital preservation issues
Policies and Responsibilities for Records and Information Management	• Records and information management policy
Tools and Procedures for Records and Information Management	• Records classification schemes or • Records retention and disposition schedules for the records and information it creates
E-Records Management Products and Technologies	• Integration of e-records requirements and product solutions into existing systems
Resources and Training for Records and Information Management Personnel	• Designated records and information management unit within the government agency • Budget to support records and information management programmers, tools, equipment and staff
Internal and Public Awareness of Records and Information Management	• Recognize the significance of well-managed and trustworthy records for effective government service delivery and for reform initiatives
Monitoring for Compliance with Records and Information Management Policies and Procedures	• Monitoring for Compliance with Records and Information Management Policies and Procedures - As in any area of management, an agency's records and information management infrastructure (people, procedures, tools and technologies) must be regularly monitored and evaluated to determine whether it is meeting requirements and expectations. Where problems or new challenges are identified, action is required.

Table 12: Twelve components of E-records readiness tool

Legal Mandate for the Government-Wide Management of Public Records and Information - e-government services produce digital information, or 'e-records', that document government transactions and online activities. It is important that a central agency, such as the national archives, is

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designated to ensure that government-wide standards and practices are developed and implemented, that appropriate facilities are created and that adequate resources are invested in managing official records in digital and other formats.

Freedom of information and protection of privacy legislation supports accountability, transparency and anti-corruption measures and is an important aspect of modern democracies. It gives citizens a mechanism for holding their governments accountable by requesting information about official activities, and it provides assurance that personal information is only used for legitimate purposes.

Legal Framework for E-Commerce Activities - as more and more private sector and government activities are carried out online in electronic format, it critical that evidence of these activities is available to protect the rights and responsibilities of all involved.

Government-Wide ICT Infrastructure and Capacity - ICT infrastructure and capacity is addressed in detail in traditional e-readiness assessments. These tools will provide a comprehensive evaluation of a government's ICT infrastructure. However, the issues involved are covered here also as they need to be factored into an overall score of e-records readiness.

Government-Wide E-Records Management Standards and Guidelines - governments that create e-records need to adopt or develop a government-wide standard setting out functional requirements for electronic records management.

Government-Wide Digital Preservation Strategy - e-records created as a result of e-government activities must remain accessible and usable for as long as they are required for business or legal purposes or, in some cases, for historical purposes. Many e-records will need to be preserved long-term or even permanently.

Policies and Responsibilities for Records and Information Management - within the wider context of public sector legislation and standards, each government agency that implements e-government services should establish internal policies and responsibilities for records and information management in a form appropriate to its internal organizational structure, culture and resources.

Tools and Procedures for Records and Information Management - these tools need to be accompanied by procedure manuals describing when and how staff should fulfill their responsibilities for creating, capturing, classifying, capturing, storing, retrieving, tracking, disposing and preserving records.

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E-Records Management Products and Technologies - over the past decade a number of technologies and products for managing e-records and digital information have matured into a coherent industry and market.

Resources and Training for Records and Information Management Personnel - although the agency may have established records and information management policies, tools and procedures, they will be ineffective unless they are supported by qualified records management staff with adequate and regular financial support to implement and maintain them.

Internal and Public Awareness of Records and Information Management - a government agency may have adequate records and information management policies, procedures, tools and resources but these will be ineffective unless there is a commitment to implementing them. Managers and staff need to be aware of the importance of trustworthy and well-managed records for delivering effective government services and for protecting institutional accountability and integrity.

2.1.13. Global Competitiveness Index

Global Competitiveness Index (GCI) define competitiveness as the set of institutions, policies, and factors that determine the level of productivity of a country. The level of productivity, in turn, sets the level of prosperity that can be reached by an economy. The productivity level also determines the rates of return obtained by investments in an economy, which in turn are the fundamental drivers of its growth rates. In other words, a more competitive economy is one that is likely to grow faster over time.

The concept of competitiveness thus involves static and dynamic components. Although the productivity of a country determines its ability to sustain a high level of income, it is also one of the central determinants of its return on investment, which is one of the key factors explaining an economy's growth potential (Schwab, 2016).

There are twelve pillars of competitiveness.

Pillars	Indicators
Institutions	• Property rights • Diversion of public funds • Public trust in politicians • Irregular payments and bribes • Judicial independence

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	• Favoritism in decisions of government officials • Wastefulness of government spending • Burden of government regulation • Efficiency of legal framework in settling disputes • Efficiency of legal framework in challenging regs • Transparency of government policymaking • Business costs of terrorism • Business costs of crime and violence • Organized crime • Reliability of police services • Ethical behavior of firms • Strength of auditing and reporting standards • Efficacy of corporate boards • Protection of minority shareholders' interests • Strength of investor protection, 0–10 (best)
Appropriate Infrastructure	• Quality of overall infrastructure • Quality of roads • Quality of railroad infrastructure • Quality of port infrastructure • Quality of air transport infrastructure • Available airline seat km/week, millions • Quality of electricity supply • Mobile telephone subscriptions/100 pop. • Fixed telephone lines/100 pop.
A Stable Macroeconomic Framework	• Government budget balance, % GDP • Gross national savings, % GDP • Inflation, annual % change • General government debt, % GDP • Country credit rating, 0–100 (best)
Good Health And Primary Education	• Malaria cases/100,000 pop. • Business impact of malaria • Tuberculosis cases/100,000 pop. • Business impact of tuberculosis • HIV prevalence, % adult pop. • Business impact of HIV/AIDS • Infant mortality, deaths/1,000 live births • Life expectancy, years • Quality of primary education • Primary education enrollment, net %
Higher Education And Training	• Secondary education enrollment, gross % • Tertiary education enrollment, gross % • Quality of the education system • Quality of math and science education • Quality of management schools • Internet access in schools

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	• Availability of research and training services • Extent of staff training
Efficient Goods Markets	• Intensity of local competition • Extent of market dominance • Effectiveness of anti-monopoly policy • Effect of taxation on incentives to invest • Total tax rate, % profits
Efficient Labor Markets	• Cooperation in labor-employer relations • Flexibility of wage determination • Hiring and firing practices • Redundancy costs, weeks of salary • Effect of taxation on incentives to work • Pay and productivity • Reliance on professional management • Country capacity to retain talent • Country capacity to attract talent • Women in labor force, ratio to men
Developed Financial Markets	• Availability of financial services • Affordability of financial services • Financing through local equity market • Ease of access to loans • Venture capital availability • Soundness of banks • Regulation of securities exchanges • Legal rights index, 0–10 (best)
The Ability To Harness The Benefits Of Existing Technologies	• Availability of latest technologies • Firm-level technology absorption • FDI and technology transfer • Individuals using Internet, % • Fixed broadband Internet subscriptions/100 pop. • Int'l Internet bandwidth, kb/s per user • Mobile broadband subscriptions/100 pop.
And Its Market Size, Both Domestic And International	• Domestic market size index, 1–7 (best) • Foreign market size index, 1–7 (best) • GDP (PPP$ billions) • Exports as a percentage of GDP
By Producing New And Different Goods Using The Most Sophisticated Production Processes	• Local supplier quantity • Local supplier quality • State of cluster development • Nature of competitive advantage • Value chain breadth • Control of international distribution • Production process sophistication • Extent of marketing • Willingness to delegate authority

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Innovation	• Capacity for innovation • Quality of scientific research institutions • Company spending on R&D • University-industry collaboration in R&D • Gov't procurement of advanced tech products • Availability of scientists and engineers • PCT patents, applications/million pop.

Table 13: Global Competitiveness Index (GCI) pillars and indicators

The **institutional** environment is determined by the legal and administrative framework within which individuals, firms, and governments interact to generate wealth. The importance of a sound and fair institutional environment has become all the more apparent during the recent economic and financial crisis and is especially crucial for further solidifying the fragile recovery, given the increasing role played by the state at the international level and for the economies of many countries.

Extensive and efficient **infrastructure** is critical for ensuring the effective functioning of the economy, as it is an important factor in determining the location of economic activity and the kinds of activities or sectors that can develop within a country. Well-developed infrastructure reduces the effect of distance between regions, integrating the national market and connecting it at low cost to markets in other countries and regions. In addition, the quality and extensiveness of infrastructure networks significantly influence economic growth and reduce income inequalities and poverty in a variety of way.

The stability of the **macroeconomic** environment is important for business and, therefore, is significant for the overall competitiveness of a country.10 although it is certainly true that macroeconomic stability alone cannot increase the productivity of a nation, it is also recognized that macroeconomic disarray harms the economy, as we have seen in recent years, conspicuously in the European context.

A **healthy workforce** is vital to a country's competitiveness and productivity. Workers who are ill cannot function to their potential and will be less productive. Poor health leads to significant costs to business, as sick workers are often absent or operate at lower levels of efficiency. Investment in the provision of health services is thus critical for clear economic, as well as moral, considerations. In addition to health, this pillar takes into account the quantity and quality of the basic education received by the population, which is increasingly important in today's economy.

Quality **higher education** and training is crucial for economies that want to move up the value chain beyond simple production processes and products. In particular, today's globalizing economy requires

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countries to nurture pools of well-educated workers who are able to perform complex tasks and adapt rapidly to their changing environment and the evolving needs of the production system.

Countries with efficient **goods markets** are well positioned to produce the right mix of products and services given their particular supply-and-demand conditions, as well as to ensure that these goods can be most effectively traded in the economy. Healthy market competition, both domestic and foreign, is important in driving market efficiency, and thus business productivity, by ensuring that the most efficient firms, producing goods demanded by the market, are those that thrive. The best possible environment for the exchange of goods requires a minimum of government intervention that impedes business activity.

The efficiency and flexibility of the **labor market** are critical for ensuring that workers are allocated to their most effective use in the economy and provided with incentives to give their best effort in their jobs. Labor markets must therefore have the flexibility to shift workers from one economic activity to another rapidly and at low cost, and to allow for wage fluctuations without much social disruption.

The **financial and economic** crisis has highlighted the central role of a sound and well-functioning financial sector for economic activities. An efficient financial sector allocates the resources saved by a nation's citizens, as well as those entering the economy from abroad, to their most productive uses. It channels resources to those entrepreneurial or investment projects with the highest expected rates of return rather than to the politically connected. A thorough and proper assessment of risk is therefore a key ingredient of a sound financial market.

In today's globalized world, **technology** is increasingly essential for firms to compete and prosper. The technological readiness pillar measures the agility with which an economy adopts existing technologies to enhance the productivity of its industries, with specific emphasis on its capacity to fully leverage information and communication technologies (ICTs) in daily activities and production processes for increased efficiency and enabling innovation for competitiveness.

The size of the **market** affects productivity since large markets allow firms to exploit economies of scale. Traditionally, the markets available to firms have been constrained by national borders. In the era of globalization, international markets have become a substitute for domestic markets, especially for small countries. Vast empirical evidence shows that trade openness is positively associated with growth. Even

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if some recent research casts doubts on the robustness of this relationship, there is a general sense that trade has a positive effect on growth, especially for countries with small domestic markets.

There is no doubt that **sophisticated business** practices are conducive to higher efficiency in the production of goods and services. Business sophistication concerns two elements that are intricately linked: the quality of a country's overall business networks and the quality of individual firms' operations and strategies. These factors are especially important for countries at an advanced stage of development when, to a large extent, the more basic sources of productivity improvements have been exhausted.

Innovation can emerge from new technological and no technological knowledge. Non-technological innovations are closely related to the know-how, skills, and working conditions that are embedded in organizations and are therefore largely covered by the eleventh pillar of the GCI. The final pillar of competitiveness focuses on technological innovation. Although substantial gains can be obtained by improving institutions, building infrastructure, reducing macroeconomic instability, or improving human capital, all these factors eventually run into diminishing returns. The same is true for the efficiency of the labor, financial, and goods markets. In the long run, standards of living can be largely enhanced by technological innovation (Schwab, 2016).

2.1.14. Knowledge Assessment Matrix

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, and Information and Communications Technologies. Variables are normalized on a scale of 0 to 10 relative to other countries in the comparison group. The KAM also derives a country's overall Knowledge Economy Index (KEI) and Knowledge Index (KI) (World bank institute, 2009).

Categories	Indicators
Economic and institutional regime	• Tariff and non-tariff barriers • Regulatory quality

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	• Rule of law
Education and skill of population	• Adult literacy rate • Gross secondary enrollment rate • Gross tertiary enrollment rate
Information infrastructure	• Telephones per 1,000 people • Computers per 1,000 people • Internet users per 1.000 people
Innovation system	• Royalty payments and receipts, US$ per person • Technical journal articles per million people • Patents granted to nationals by the U.S. Patent and Trademark Office per million people

Table 14: The Knowledge Assessment Matrix indicators

Economic Incentive and Institutional Regime - the country's economic and institutional regime must provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship.

Education and Skills - the country's people need education and skills that enable them to create and share, and to use it well).

Innovation system - the country's innovation system—firms, research centers, universities, think tanks, consultants, and other organizations—must be capable of tapping the growing stock of global knowledge, assimilating and adapting it to local needs, and creating new technology.

Information and Communications Technologies - a dynamic information infrastructure is needed to facilitate the effective communication, dissemination, and processing of information.

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2.1.15. ICT development index

The ICT Development Index (IDI) is a composite index that combines 11 indicators into one benchmark measure that can be used to monitor and compare developments in information and communication technology (ICT) between countries and over time. The IDI was developed by ITU in 2008 in response to requests from ITU Member States to develop an overall ICT index, was first presented in the 2009 edition of the Measuring the Information Society Report (ITU,2009), and has been published annually since then. The main objectives of the IDI are to measure:

• the level and evolution over time of ICT developments within countries and the experience of those countries relative to others;

• progress in ICT development in both developed and developing countries;

• the digital divide, i.e. differences between countries in terms of their levels of ICT development; and

• the development potential of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.

The Index is designed to be global and reflect changes taking place in countries at different levels of ICT development. It therefore relies on a limited set of data which can be established with reasonable confidence in countries at all levels of development (Measuring the Information Society Report 2015, 2016).

Categories	Indicator
ICT access	• Fixed-telephone subscriptions per 100 inhabitants • Mobile-cellular telephone subscriptions per 100 inhabitants • International Internet bandwidth (bit/s) per internet user • Percentage of households with a computer • Percentage of households with Internet access
ICT use	• Percentage of Individuals using the Internet • Fixed-broadband subscriptions per 100 inhabitants • Active mobile-broadband subscriptions per 100 inhabitants

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ICT skills	• Adult literacy rate • Secondary gross enrolment ratio • Tertiary gross enrolment ratio

Table 15: ICT Development Index indicators

2.1.16. Information Society Index (ISI)

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 [25]. Main indicators are:

- Computer infrastructure
- Information infrastructure
- Internet Infrastructure
- Social Infrastructure

2.1.17. Metric-net

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 [33]. Main indicators are:

- Knowledge jobs
- Globalization
- Economics Dynamism and Competition
- Transformation to Digital Economy
- Technological Innovation Capacity

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2.1.18. US Agency for International Development (USA ID)

In order to improve USAID's effectiveness as a key foreign policy instrument, this Administration intends to coordinate and focus Agency resources and capabilities to address globalization and conflict. 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, and to describe its programs more clearly [48]. Main indicators are:

- The Global Development Alliance (GDA)
- Economic Growth and Agriculture
- Global Health
- Conflict Prevention and Developmental Relief

2.1.19. ICT Diffusion Index

The Index of ICT Diffusion is designed to evaluate ICT development using indicators of ICT diffusion across countries. The index consists of two categories, each of which is measured by several variables (Press, Dumas, 2005.).

Categories	Indicator
Connectivity	• Internet hosts per capita • PCs per capita • Telephone mainlines per capita • Mobile subscribers per capita
Access	• Number of Internet subscribers • Literacy

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	• Cost of a local call (telephone, Internet) • GDP per capita, measuring income

Table 16: The Index of ICT Diffusion indicators

2.1.20. Digital Access Index by ITU

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, each measured by one or two variables [26].

Categories	Indicators
Infrastructure	• Fixed telephone subscriber • Mobile cellular subscribers
Affordability	• Internet access price
Knowledge	• Literacy • School enrolment
Quality	• Broadband subscribers • International Internet bandwidth
Usage	• Number of Internet users

Table 17: Digital Access Index variables

2.1.21. Digital Opportunity Index by ITU

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, where each is measured by several variables. Each variable has a "goalpost" (desirable value).

Categories	Indicators

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Opportunity	•Percentage of population covered by mobile cellular telephony • Mobile cellular tariffs as a percentage of per capita income • Internet access tariffs as a percentage of per capita income
Infrastructure	• Proportion of households with a fixed line telephone • Mobile cellular subscribers per 100 inhabitants • Proportion of households with Internet access at home • Mobile Internet subscribers per 100 inhabitants • Proportion of households with a computers
Utilization	• Internet users per 100 inhabitants • Ratio of (Fixed) Broadband Internet subscribers to total Internet subscribers • Ratio of (Mobile) Broadband Internet subscribers to mobile Internet subscribers

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2.2. E-learning readiness assessment tools

E-learning readiness assessment is essential for institutions that want to implement eLearning and those that have the system in place. In sum, eLearning 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 eLearning. For that, several organizations, academia and researchers have suggested different assessment models.

2.2.1. Chapnick (2000) E-Learning Readiness Model

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, which are summarized in the Table 18. This model has been used by a variety of institutions in a number of countries to assess their own e-learning readiness.

Analysis of the eight categories as facilitated by the framework leads to the assessment of e-learning readiness and identifies the factors that are necessary for the successful implementation of e-learning. Furthermore, it is necessary that the identified factors are evaluated collectively in order to determine the overall readiness to adopt e-learning.

The eight categories in Chapnick (2000) framework are used to analyze the overall e-learning readiness and the factors associated with it. It is observed that this model also considers the factors related to financial and sociological readiness. The model identifies that, for the successful assessment of readiness to adopt and implement e-learning, it is extremely important that the financial capability should be considered in addition to the sociological factors that determine the overall readiness to adopt e-learning. These sociological factors include the overall culture and the perceptions of individuals regarding the implementation of the new and innovative technology of e-learning and the overall process of acquiring education. The technological aspects related to readiness in this model are equipment and technological skills.

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E-learning readiness factors	Explanation of factors
Psychological readiness	The effect of an individual's state of mind on the outcome of the e-learning initiative. Considered a particular important factor, because it can sabotage the implementation process.
Sociological readiness	The interpersonal aspects of the environment within which the e-learning program will be implemented.
Environmental readiness	The major forces operating stakeholders, both inside and outside the organization.
Human resource readiness	The availability and design of the human support system.
Financial	The budget size and allocation process for the e-learning program.
Technological skill readiness	The observable and measurable technical competencies of the organization and individuals involved.
Equipment readiness	Possession of the proper equipment.
Content readiness	The subject matter and goals of construction.

Table 18: E-learning readiness framework (adopted source: Chapnick, 2000)

2.2.2. E-learning readiness model Engholm and McLean (2001)

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 (Figure 4). The organization's culture, the individual learners, and technology form the core of an organization's e-learning assessment, but various content and organizational and industry factors strengthen the justification for using e-learning as a training solution. What organizations might need to specifically assess or consider within each of these factors are summarized in Table 19 .

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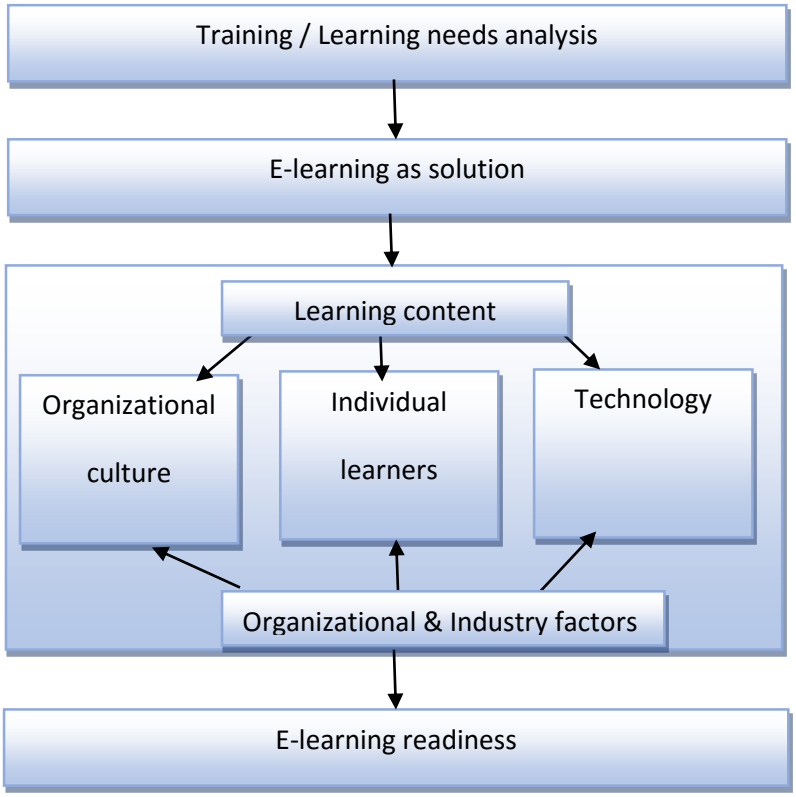

Figure 2: Model of e-learning readiness (Engholm and McLean)

THE INDIVIDUAL LEARNERS:
• Learners can take responsibility and manage time for own learning (L,R) • Learners are motivated and willing to use computers for learning (L,R) • Learners see e-learning as a viable alternative to traditional methods (L,R) • Learners have basic computer skills (L,R) • Learners see the needs and personal benefits with learning (L,R) • Learners are comfortable with computers (L,R) • Learners have basic literacy and learning skills (R) • Learners are willing to collaborate and share information and knowledge (L)

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• Learner characteristics (age, education, type of employment) (R)
THE ORGANISATION'S CULTURE:
• Learning is supported and encouraged (L,R) • Time and opportunities are given to learn (L,R) • Learning is accepted and communicated at all levels (L,R) • Training/learning is seen as an investment, not as a cost (L,R) • The right people are involved (R) • Some people have previous knowledge about e-learning (R) • Learners are required to do some e-learning (R) • E-learning logistics, processes and strategy is clearly planned and followed (L,R) • E-learning is aligned to broader organisational goals and strategy (L,R) • Learning management systems exist to support learners (L,R)
TECHNOLOGY:
• Learners have easy access to a computer and the network where the e-learning content is hosted (L,R) • Bandwidth issues do not hamper the e-learning effort or limit its capacity (L,R) • An internal network exists and is reliable (L,R) • IT department (support and development) are well resourced and used (L,R) • Network systems and components are compatible (R) • Communication with the IT department is strong (L,R)
CONTENT:
• Content is suitable for e-learning (L,R) • Content is made user-friendly (L,R) • Content is easy to create and put over the network (L,R) • Content is easy to update and modify (L,R) • Content is made interacting and/or rewarding (L,R) • Content is designed to accommodate for different learning styles (L,R) • Content is appropriately targeted to learners (L,R) • Relationship with vendor is good (L,R)
ORGANISATIONAL AND INDUSTRY FACTORS:
• The organization has a large, geographically spread workforce (L,R) • The organization needs quick delivery and access to knowledge and information (L,R) • The competition level in the industry is high (L,R) • The organization is in a high risk, high compliance market (R) • The organization is financially stable (L,R) • Training legislation requirements exist (R)
L = E-learning readiness factor identified from the literature

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R = E-learning readiness factor identified from the research

Table 19: E-learning readiness factors (Engholm and McLean, 2001)

2.2.3. Borotis and Poulymenakou (2004) E-Learning Readiness Model

Borotis and Poulymenakou (2004) present 11 issues appearing as critical success factors for e-learning adoption and sustainability (Figure 2). Corporate e-learning has attracted lately the interest of many organizations, both in the supplier and customer side. Its promising role in the upcoming "knowledge revolution" seems to have boosted its position in the training market and called for comprehensive careful decisions in the process of adopting and sustain it in the long term. The topic of e-learning readiness, which is defined as "the mental or physical preparedness of an organization for some e-learning experience or action" (Borotis, Poulymenakou, 2004) surfaced recently and the present chapter contributes to this effort by presenting a set of critical success factors for the adoption and sustainability of e-learning with incorporate settings.

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Figure 3: E-Learning Readiness Model (adopted source: Borotis and Poulymenakou)

2.2.4. Aydain and Tasci (2005) E-Learning Readiness Model

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. The model

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therefore, asks managers about the average educational level of their employees, whether their company has skilled human resources or personnel or training department specialists, a champion (leader) and whether there are enough e-learning vendors and external eLearning experts.

The categories of resources, skills and attitude are also well considered in this model to determine the overall readiness to adopt e-learning. Aydin and Tasci (2005) identified that these factors facilitate the successful implementation of an e-learning system in an organization as they determine the necessary requirements for the new technology of e-learning and the factors associated with it (Table 20.).

	Restores	Skills	Attitudes
Technology	Access to computers and the Internet	Ability to use computers and the internet	Positive attitude toward use of technology
Innovation	Barriers	Ability to adopt innovation	Openness to innovation
People	• Education level of employers • Experienced HR specialist • An e-learning champion • Vendors and external parties		
Self-Development	Budget	Ability to manage time	Belief in self-development

Table 20: E-learning readiness model (Aydin and Tasci, 2005)

2.2.5. Psycharis (2005) E-Learning Readiness Model

From the available research, there are a number of variables that keep on recurring and Psycharis (2005) suggests three large 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 main factors. Education means the readiness of content and the

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educational readiness. Environment includes entrepreneurial readiness, leadership readiness and readiness of culture (Figure 3).

The three categories of assessing e-learning readiness in Psycharis (2005) model take the factors associated with e-learning in a holistic view in order to analyze the ability and willingness of the users for whom the e-learning is being implemented. The environment and resources categories are extremely important in this case as they analyze the exact capacity related to the technology, human resource and economic readiness. At the same time, the environment category analyzes the support from the leadership and the overall environment regarding the adoption of e-learning. The technological aspects related to readiness in this model include hardware, software and access to the internet.

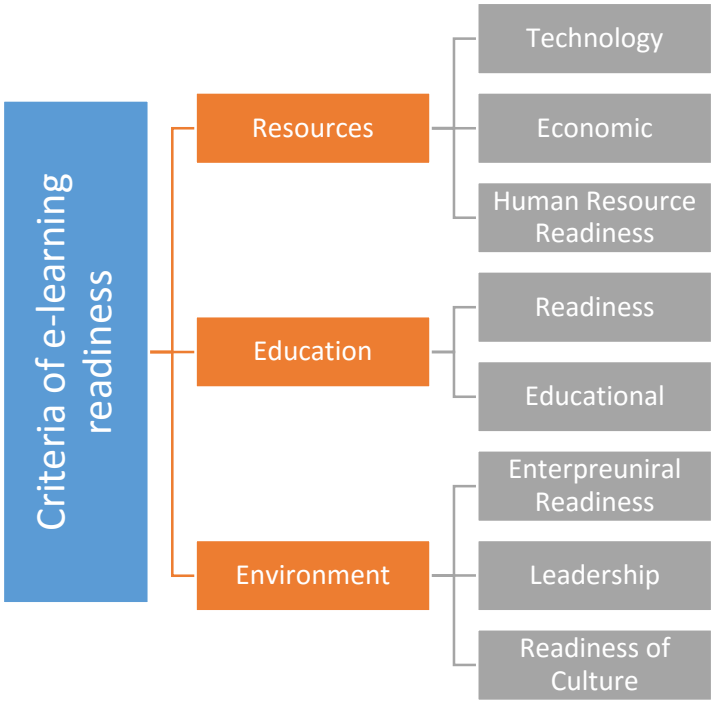

Figure 4: Criteria of e-learning readiness model (adopted source: Psychari,2005)s

2.2.6. The comparison of the e-learning readiness factors

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

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readiness model (from sections 2.2.1. – 2.2.5.) identified that there are various factors that can be used to measure readiness for e-learning implementation in higher education institutions. The comparison of the e-learning readiness factors is shown in Table 21.

The factors that are identified in the literature as the important factors to be considered in e-learning 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 content (at the third highest frequency). Acceptance of e-learning and training procedure (both at the fourth highest frequency). The factors of standards, institution and social and cultural awareness are recognized in the literature as important factors that influence e-learning readiness, but with low frequency.

Authors / Factors	Chapnick (2000)	Engholm and McLean (2001)	Borotis and Poulymenakou (2004)	Aydain and Tasci (2005)	Psycharis (2005)	Total	Frequency
Technology	+	+	+	+	+	5	1
Learners		+	+	+	+	4	2
Resources	+		+	+	+	4	2
Equipment	+			+	+	3	3
Management	+		+		+	3	3
Human resources	+		+		+	3	3
Content	+		+		+	3	3

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Acceptance of e-learning			+	+		2	4
Training procedure			+		+	2	4
Standards				+		1	5
Institution					+	1	5
Social and cultural awareness		+				1	5

Table 21: The comparison of the e-learning readiness factors

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2.3. E-readiness tools in Higher Education Institutions (HEI)

2.3.1. E-Readiness Assessment of 7 Higher Education Institutions in Ghana

The purpose of this research project has been 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). This report used a framework developed by Colle (2004) and consists of five categories to be measured by variables.

Categories	Variable
Human Resources	• Existence of IT Support personnel
ICT Facilities	• Computers • Networks • Media production facilities
Academic Programmes	• Programmes that invite students to study and apply ICT •Research & internship opportunities that thrust students and faculty members into the ICT-for-development environment
Outreach Policies	• Support for "university without walls"
Faculty Posture	• Faculty's proficiency in ICT •Faculty's innovativeness and aggressiveness in application of ICT to learning and outreach

Table 22: E-Readiness Assessment of 7 Higher Education Institutions in Ghana – categories

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2.3.2. Developing an e-Readiness Model for Higher Education

The purpose is to reveal a "primary model of e-readiness for the specific context of higher education," where 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" (Machado, 2007). Carlos Machado tested his conceptual framework of e-readiness of an HEI on a focus group, which derived key stakeholders interested in development of e-readiness and their functions as mapped to the conceptual framework.

Categories	Variable
Ability of HEI Stakeholders	• HEI current policy • HEI future strategy
Capacity of Learning Stakeholders	• Knowledge • Teaching & learning styles • Instructional methodology • Techno-cultural acceptance
Facility by Learning Stakeholders	• Infrastructure • Network services

Key Stakeholders (as defined by the focus group)	• Administration level
	  ◦ Ability
	  ◦ Facility (motivation, training, performance appraisal, provision of facility, access)
	• Instructor level
	  ◦ Capacity (way of thinking, resistance acceptance, understanding new methods, skills)

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	• Student level • Capacity (behavior, resistance-acceptance, understanding new methods, computer skills, language skills)

Table 23: e-Readiness Model for Higher Education - categories

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3. Literature review

The study of the literature shows that there has been much research done in the field of e-readiness. Table 13.shows the results of the identification of research related to the measurement of the level of readiness for e-learning in higher education institutions.

Year	Topic	Author	Indicators	Results and Conclusion
2004	**An Assessment Of E-Learning Readiness At Open University Malaysia**	Kuldip Kaur, ZorainiWati Abas	Equipment, Accessibility and Availability of Technology, Policy Makers and Regulatory Body	Learners and enablers surveyed are moderately ready for e-learning. Policy makers and regulatory bodies have to play a more concerted role in enhancing the image of e-learning programmers so that there is greater engagement in a technology-driven teaching-learning environment.
2007	**Developing an e-readiness model for higher education institutions: results of a focus group study**	Carlos Machado	Ability of HEI Stakeholders, Capacity of Learning Stakeholders, Facility by Learning Technologies	The attitude of teaching staff, the response from students, the rectors' visions or the local and national policies on new technological practices are all issues as important to e-readiness as are the provision of computers, the access to the Internet and other technical resources.
2008	**Policies for Computer and Internet Use: A Roadmap for Leveraging**	Michael Awoleye O., Owolabi Siyanbola W.,	ICT and Internet access	Nigerian university teachers have better access to the computer and the Internet than their counterparts do in the polytechnics and colleges of

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	Teaching in Nigeria Higher institutions	Ibikunle Ogundari O.		education do although there is an appreciable level of e-readiness among the teachers in colleges of education. Personal office Internet connectivity is poor in the polytechnics and colleges of education.
2010	**Assessment of instructors' readiness for Implementing e-learning in continuing medical Education in Iran**	Tahereh Eslaminejad, Mona Masood, Nor Azilah Ngah	Knowledge, Attitudes, Skills and Habits Toward E-learning in both Technology and Pedagogy Domain	The findings of this study suggest that training should be offered to instructors on a continuous, rather than a one-off basis so that their IT knowledge and skills are upgraded over time. In addition, results indicate that pedagogical innovations are required to develop and implement an effectiveness e-learning program.
2010	**E-learning in engineering education: a theoretical and empirical study of the Algerian higher education institution**	Soraya Benchicoua, Mohamed Aichounib, Driss Neharic	E-learning strategy, Teachers' ICT competencies, Motivations for e-learning, E-learning quality elements, Barriers for e-learning, E-learning infrastructure	Higher education institutions are responsible for strategic leadership and commitment and large-scale investments in infrastructural resources. Quality management principles and business excellence criteria, known basically by focus on the customer, continuous process improvement, people involvement and empowerment, should be taken by the institutions as fundamental pillars to the e-learning strategy to find real success on the ground

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				and not to duplicate the ready 'keys on hand' solution generally adopted by public services.
2011	**Are Turkish universities ready for e-learning: A case of Hacettepe University Faculty of Letters**	Irem Soydal, Gülten Alır, Yurdagül Üna	People, Content, Technology, Institution	The results showed that younger academic staff was more confident while using Internet and office software. The mean scores also suggest that the critical mass could be associated professors during the implementation trials of e-learning environments who appear to be more ready than the other academic staff in HUFL.
2013	**An Investigation of First-Year Students' Pedagogical Readiness to E-Learning and Assessment in Open and Distance Learning: An University of South Africa Context**	Patrick N. Mafenya	Skill, Attitude, Experience, Organizational Barrier, Motivation	Online learning depends heavily on digital infrastructure, computers and internet penetration, and connection costs. A student's success in an e-learning module or course often depends on the foundation of his readiness. It is therefore imperative that prior to implementing any e-learning initiative, the institution must take into consideration the readiness of their students.
2013	**Readiness for Implementation of ELearning in Colleges of Education**	Hamid Mohammad Azimi	ICT infrastructure, Human Resources, Budget and Finance,	Successful implementation of the e-learning environment was dependent on the four key factors of ICT infrastructure, ICT

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			Psychological and Content	leadership, support and training initiatives and the teachers‟ ICT capacity. Findings in this study which assessed readiness of implementation of e-leaning revealed that ICT infrastructure readiness, human resources readiness, budget and financial readiness, psychological and content readiness to implementation of e-learning, was found to be same for all types of institutions.
2014	**E-Learning Readiness Assessment Model In Kenyas' Higher Education Institutions: A Case Study Of University Of Nairobi**	Hada Achieng Oketch	Technological readiness, Culture readiness, Content readiness and Demographic Factors	The results show that technological readiness of is the most important factor in e-learning readiness followed by culture readiness. Content readiness and demographic factors had no significance in determining e-learning readiness.
2014	**Introducing a Learning Management System at a Russian University: Students' and Teachers' Perceptions**	Natalya Emelyanova, Elena Voronina	Convenience, Usefulness, Effectiveness	The analysis showed that both groups, students and teachers, are at ease with computers and using LMS is not perceived as presenting any significant difficulty for them. It is a vital prerequisite as user perceptions are important for the success of the system, however not all learners perceive it as user-

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				friendly. Moreover, for a number of students perceived ease of use of LMS does not imply its usefulness as a learning tool.
2014	**Students' Perceptions and Readiness in Practicing Blended Learning in an Institution of Higher Education in Malaysia**	Norhayati Baba, HaziahSa'ari, Suriana Che Daud, Hafizah Adenan, Siti Nor Hazimah Kamarulzaman	ICT, Usage of online tools, Effectiveness of blended learning in teaching and learning	Most students had some knowledge about blended learning. Blended learning emerged as one of the most popular pedagogical concepts at the beginning of 2000. With an increasing tendency, many researches have reported on blended learning since it flourished. Blended learning has been used in almost all developing countries in order to shape the teaching and learning, the curriculum and entitlement framework, assessment, students profile, leadership and collaborative working involving teachers and students.
2015	**Investigation of the Relationship between Learning Process and Learning Outcomes in E-Learning Environments**	Halil Yurdugül, Nihal Menzi Çetin	Perception of Learning, Performance of Learning	Academic performance is not determined only by approaches to learning. Following a deep strategy has a significant effect on performance of learning; however, deep motivation and perception of learning do not predict high performance every time. Because perception of learning is based on a

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				learner's self reported learning level, it is different from performance of learning which is assessed by achievement tests.

Table 24: Studies on measurement of e-readiness in HE

3.1. An Assessment Of E-Learning Readiness At Open University Malaysia

E-learning readiness is an important part of distance education as it is conceivably related to the success of e-learning initiatives. Policy makers and regulatory bodies have to be cognizant of the degree of e-readiness of a populace in order to design and implement efficient e-learning programmers. This paper reports on a study that was carried out to determine the e-readiness of a group of Open University Malaysia receivers (learners) and enablers (tutors) to provide significant information to the respective teaching-learning community.

This study has raised a number of issues that are significant to the success of e-learning initiatives at Open University Malaysia. It may be concluded that learners and enablers surveyed are moderately ready for e-learning, and that there are individuals who may need to be acculturated into the e-learning system before they can be said to be at an advanced state of readiness for e-learning. Finally, the study has shown that policy makers and regulatory bodies have to play a more concerted role in enhancing the image of e-learning programmers so that there is greater engagement in a technology-driven teaching-learning environment(Kaur, 2004).

3.2. Developing an e-readiness model for higher education institutions: results of a focus group study

The attitude of teaching staff, the response from students, the rectors' visions or the local and national policies on new technological practices are all issues as important to e-readiness as are the provision of computers, the access to the Internet and other technical resources. It was confirmed that the ability of administrators to facilitate not only hardware and software to teachers and students, but also to improve the capacity of the main actors in the learning process, has a role to play.

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Regarding the capacity of the instructors, it was felt that e-learning could develop into an accepted practice if the new generation of teachers participates in e-learning initiatives and educational institutions facilitate specific training for the teaching staff. Although innovation in e-learning practices may bring abrupt changes in teaching and learning organizations, bridging the gap between the older school of professors and younger academics will depend on their attitude, willingness and motivation towards-learning practices. All these concepts were strongly referred to as requisites needed to be able to adequately implement online activities (Machado, 2007).

3.3. Policies for Computer and Internet Use: A Roadmap for Leveraging Teaching in Nigeria Higher institutions

This work therefore measured both technical and attitudinal capacity (Pillay, et al., 2006) of the teachers across the institution types (the Universities, Polytechnics and Colleges of education). In the overall, intensity of computer access is better than Internet access in all the institution types and the intensity of Internet access is better than personal office connectivity. Although there are varied levels of access relative to institution types.

This paper has taken an empirical approach to the discussion of the readiness of Nigerian tertiary institution teachers to fit into the ICT-driven paradigm in teaching and learning, the findings are quite illuminating. Intensity of computer access is better than Internet access in all the institution types and the intensity of Internet access is better than personal office connectivity. E-readiness varies among Nigerian tertiary institutions depending on type of institution and the ICT involved. Nigerian university teachers have better access to the computer and the Internet than their counterparts do in the polytechnics and colleges of education do although there is an appreciable level of e-readiness among the teachers in colleges of education. Personal office Internet connectivity is poor in the polytechnics and colleges of education (Michael, et al. 2008).

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3.4. Assessment of instructors' readiness for Implementing e-learning in continuing medical Education in Iran

This study focuses on knowledge, attitudes, skills and habits toward e-learning in both technology and pedagogy domain of e-learning process, namely the readiness factors, on implementing e-learning in Continuing Medical Education programs in Iran.

Academics' readiness is a critical factor influencing the success of e-learning. It is not only related to e-learning content and providing a volume of texts, but is also an essential element of e-learning in the teaching process, that emphasizes communication and interaction with students. Also, during the designing of the educational content, the teaching principles and theories should be considered. Thus, it is essential for instructors to update their teaching methods; in this paradigm shift from traditional to non-traditional education system, they will need a set of online content and resources to facilitate the learning process. Also, technical readiness is one of the significant requirements for improving e-learning system, because other critical factors on successful e-learning, such as learning resources design and improve students' capacity to prepare for online learning are related to this factor.

The findings of this study suggest that training should be offered to instructors on a continuous, rather than a one-off basis so that their IT knowledge and skills are upgraded over time. In addition, results indicate that pedagogical innovations are required to develop and implement an effectiveness e-learning program (Eslaminejad, et al. 2010).

3.5. E-learning in engineering education: a theoretical and empirical study of the Algerian higher education institution

The purpose of this paper was to identify directions for addressing the needs of academics in higher education institutions in Algeria in order to adopt the e-learning approaches a strategy to improve quality of education. The paper will report results of an empirical study that measures the readiness of the Algerian higher education institutions towards the implementation of ICT in the educational process and the attitudes of faculty members towards the application of the e-learning approach in engineering education. Three main objectives were targeted, namely: to provide an initial evaluation of faculty members' attitudes and perceptions towards web-based education; reporting on their perceived

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requirements for implementing e-learning in university courses; providing an initial input for a collaborative process of developing an institutional strategy for e-learning.

The most important conclusion that emerges out of this study for higher education institutions is the crucial role of developing an institutional policy for e-learning through a benchmarking and democratic process that would guarantee widespread participation of faculty members and e-learning experts from inside and outside the country. Higher education institutions are responsible for strategic leadership and commitment and large-scale investments in infrastructural resources. Quality management principles and business excellence criteria, known basically by focus on the customer, continuous process improvement, people involvement and empowerment, should be taken by the institutions as fundamental pillars to the e-learning strategy to find real success on the ground and not to duplicate the ready 'keys on hand' solution generally adopted by public services (Benchicoua, et al. 2010).

3.6. Are Turkish universities ready for e-learning: A case of Hacettepe University Faculty of Letters

Universities play an important role in lifelong learning. e-learning is one of the key elements in today's networked and knowledge oriented world. It is crucial to know whether the universities are ready to transform their courses to e-learning systems. In this paper, the e-learning readiness of the academic staff of Hacettepe University Faculty of Letters (HUFL) is investigated. A 37-item questionnaire along with some demographic questions is used for obtaining the data. Results show that title might be a significant factor for e-learning readiness and in general, HUFL academic staff are not ready for the e-learning environment.

The results showed that younger academic staff was more confident while using Internet and office software. The mean scores also suggest that the critical mass could be associated professors during the implementation trials of e-learning environments who appear to be more ready than the other academic staff in HUFL (Soydal, et.al. 2011).

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3.7. An Investigation of First-Year Students' Pedagogical Readiness to E-Learning and Assessment in Open and Distance Learning: An University of South Africa Context

This research study sought to obtain empirical evidence of first-year students' pedagogical readiness to e-learning and assessment at the University of South Africa (Unisa), an open and distance learning (ODL) institution.

This descriptive qualitative research study was undertaken to assess first-year students' pedagogical readiness to e-learning and assessment at the University of South Africa by using focus-group and individual interviews to address the following research question: What are first-year students' pedagogical experiences and challenges with regard to their readiness to e-learning and assessment in open and distance learning.

Online learning depends heavily on digital infrastructure, computers and internet penetration, and connection costs. A student's success in an e-learning module or course often depends on the foundation of his readiness. It is therefore imperative that prior to implementing any e-learning initiative, the institution must take into consideration the readiness of their students (Mafenya, 2013).

3.8. E-Learning Readiness Assessment Model InKenyas' Higher Education Institutions: A Case Study Of University Of Nairobi

This paper includes a model that has been developed to assess e-learning readiness of lecturers from institutions of higher learning in Kenya. It investigates the e-learning readiness of lecturers from the University of Nairobi, and the objective was to carry out a diagnostic e-learning readiness assessment of lecturers and determine the factors that influence e-learning readiness. The study had three objectives; develop an e-learning readiness assessment model, carry out a diagnostic e-learning readiness assessment, and determine the factors that influence e-learning readiness in Kenya's Higher Education Institutions. The study used a stratified sample technique in coming up with the sample for the study. The study used questionnaires as the instrument for data collection.

The results show that technological readiness of is the most important factor in e-learning readiness followed by culture readiness. Content readiness and demographic factors had no significance in determining e-learning readiness (Azimi, 2013).

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3.9. Readiness for Implementation of ELearning in Colleges of Education

This study is a descriptive and survey work, which explores readiness for implementation of e-learning in colleges of education from point view of its Heads/principals. A researcher made questionnaire to measure e-learning readiness. Readiness categories included ICT infrastructure, Human Resources, Budget and finance, Psychological and Content with reference to the different types of colleges of education.

Successful implementation of the e-learning environment was dependent on the four key factors of ICT infrastructure, ICT leadership, support and training initiatives and the teachers‟ ICT capacity. Findings in this study which assessed readiness of implementation of e-leaning revealed that ICT infrastructure readiness, human resources readiness, budget and financial readiness, psychological and content readiness to implementation of e-learning, was found to be same for all types of institutions (Oketch, 2014).

3.10. Introducing a Learning Management System at a Russian University: Students' and Teachers' Perceptions

The study aims at investigating the students' and teachers' perceptions of LMS and their commitment to it and help to build a productive learning environment and a committed user community. The paper looks at this process at a Russian university (National Research University Higher School of Economics – HSE) where the system is being implemented and examines the following issues: qualification and readiness of the stakeholders to use LMS and their perceptions of the system's convenience, effectiveness, and usefulness. The research reveals remarkable divergence of students’ and teachers’ perceptions of various aspects of LMS which must be considered when raising the effectiveness of the system and building commitment to e-learning.

The analysis showed that both groups, students and teachers, are at ease with computers and using LMS is not perceived as presenting any significant difficulty for them. It is a vital prerequisite as user perceptions are important for the success of the system, however not all learners perceive it as user-friendly. Moreover, for a number of students perceived ease of use of LMS does not imply its usefulness as a learning tool (Emelyanova, Voronina, 2014).

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3.11. Students' Perceptions and Readiness in Practicing Blended Learning in an Institution of Higher Education in Malaysia

The aim of this paper is to examine the relationship between students' perceptions and readiness in practicing blended learning in three different faculties in Universiti Technology MARA, UiTM Malaysia. This research was conducted at three faculties namely Faculty of Information Management, Faculty of Business Management and Faculty of Hotel Management and Tourism that embarked on a major initiative to scale-up blended learning across its campuses.

Most students had some knowledge about blended learning. Blended learning emerged as one of the most popular pedagogical concepts at the beginning of 2000. With an increasing tendency, many researches have reported on blended learning since it flourished. Blended learning has been used in almost all developing countries in order to shape the teaching and learning, the curriculum and entitlement framework, assessment, students profile, leadership and collaborative working involving teachers and students. UiTM management has introduced blended learning inits learning and teaching activities. With its assessment methods and exploring the potential of blended learning as to extend and enhance access to i-learn, an online learning system use in Universiti Teknologi MARA (UiTM), for the students. The education system in UiTM has entered a period of significant change. Ithas been a revolutionary as the university sets itself up to compete in the global market. UiTM has chosen blended learning to be adopted in students learning environment in order to encourage students to be more active and aware of the technological capabilities. UiTM students are entering varying phases of using the i-learn system via online interactions (Baba, et.al. 2014).

3.12. Investigation of the Relationship between Learning Process and Learning Outcomes in E-Learning Environments

In this study, we especially considered the learning process and the learning outcomes and investigated the effects of learning process on learning outcomes. In addition, we took into consideration the two dimensions of learning outcomes as a) perceptions of learning, and b)performances of learning,

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respectively. Also, we investigated the relationship between learners' perceptions of learning and performance of learning.

In this paper it is found that autonomous learners have higher perception of learning; learning performance was independent of learner motivation. Learning strategies are a crucial element for achieving online learning goals for autonomous learners. Another finding is that performance of learning and perception of learning are independent from each other. Academic performance is not determined only by approaches to learning. Following a deep strategy has a significant effect on performance of learning; however, deep motivation and perception of learning do not predict high-performance every time. Because perception of learning is based on a learner's self reported learning level, it is different from performance of learning which is assessed by achievement tests (Yurdugül, et al. 2015).

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4. Methodology for e-readiness assessment of higher education system for e-learning implementation

The Higher Education (HE) is recognized as one of the pillars of community development and it is required to give maximum contribution to people's life.

E-readiness is a measure of the degree to witch a country, nation or economy may be ready, willing or prepared to obtain benefits witch arise from information and communication technologies (ICT) (Dada, 2006). An e-readiness assessment is a useful tool for determining a country's starting point when it comes to a national strategy for a sector, such as education, that needs ICT as a precondition for its implementation. In this respect many aspects can be considered, such as physical and network infrastructure, reliable providers/technologies, learningandtrainingcentersfore-learning,userfriendly/accessibletechnologies,relevant learning resources, human resources development, value added services (support), guidance, information for raising awareness, good practices availability, reward for learning, motivation and individual commitment, etc (Divjak, Begičević et al., 2011).

The strategic planning process and the decision on the introduction of e-learning consist of four stages (Dyer, 1991): (1) intelligence, (2) design, (3) choice (4) implementation. Four stages of strategic planning and decision making, and methods that are used in these phases are shown in Table 25.

Phase	Method	Outcome
1. Intelligence State of the art Previous researches	Qualitative analysis • Data acquisition • Storage and retrieval of data • Data analysis	Overview of macro e-readiness tools, e-learning readiness assessment tools and e-readiness tools in HEI
2. Design Selection of three indicative e-readiness model	Focus group	Input for developing e-readiness methodology in HE in Croatia
3. Choice		
4. Implementation		

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Table 25: Four stages of strategic planning and decision making (adopted by Dyer, 1991)

4.1. Intelligence phase

During the Intelligence phase qualitative analysis was performed which included a review and presentation of 21 Macro e-readiness assessment tools, 5 e-learning readiness assessment tools with comparison of the e-learning readiness factors and review readiness tools in Higher Education Institution. The tools that we have used were: Data Acquisition, Storage and Retrieval and Data analysis.

4.2. Design phase

Many e-readiness assessment tools have been developed in the past two decades (E-readiness Ranking Tool, Readiness Guide for Living in the Networked World, Readiness for the Networked World, APEC's E-commerce Readiness Guide, Risk E-business Tool (Ready? Net.Go), Mosaic's Global Internet Diffusion Framework, World Information Technology, International Survey of E-commerce, Open Data Readiness Assessment tool, SADC E-Readiness Assessment Tool, Global Technology Index, The World Bank E-Readiness Assessment Framework, Negotiating the Digital Divide Guide, E-Records Readiness Tool, E-Europe Model for Building Skills in Information Society, World Economic Forum Framework). Each tool estimates how ready a society or economy is to benefit from information technology.

Several assessment models and tools designed and used by various groups and organizations were reviewed for their utility and relevance for conducting the assessment in higher education in Croatia. Among others, we considered Asia Pacific Economic Cooperation Electronic Steering Group (APEC), Mosaic's Global Diffusion of the Internet Project and the Harvard University Guide (CID methodology).

Over 20 different e-readiness assessment tools are currently available; and the assessments use range of questionnaires, statistical methods and reports. Some tools look specifically at the e-economy and how ICT's can be used to improve the economy, whereas others are concerned with the broader picture, and try to measure the emergence of an e-society, and assess how ICT's are improving social equality. For example, CID assessment tool and the E-readiness Ranking Tool methodology measure the readiness of countries or states as the smallest community. WITSA and APEC objective is to assess the readiness

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of e-commerce and digital economy. They have not been used for institutional assessment of e-readiness and therefore do not render themselves readily useable for higher education community and institutions. For example, institutional ICT strategy indicators are often missing from all the frameworks yet they are critical for institutional adoption of ICT.

As the basis for the e-readiness assessment in higher education in Croatia , Harvard University Guide prepared by the Center for International Development has been used. It is usually called CID (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 (network access, network learning, networked society, networked economy and networked policy. Additionally, it articulates a set of indicators, which describe the community's actual state of readiness. Specifically, these indicators are the community's information infrastructure; Internet availability; Internet affordability; network speed and quality; hardware and software services and support; and the state of ICT in schools, workforce access, e-commerce, and e-government. The CID methodology was published in 2000 and is available at *http://cyber.law.harvard.edu/readinessguide*. The goal of the guide is to*...systematically organize(s) the assessment of numerous factors that determine the Networked Readiness of a community in the developing world* (CID, 2006).

The CID methodology was selected as a result of focus group meeting. The focus group meeting was held in Varaždin, from June 9th to11th, 2015. There were 15 participants from Croatia, Belgium and Scotland present. The focus group was led by senior expert Blaženka Divjak, Ph.D.. All members of the focus group share an interest in e-learning implementation, but in many other aspects, the group was heterogeneous. It means that we had are presentation of teachers (university level, secondary school), PH.D. students, a representative of University of Zagreb University Computing Centre (SRCE) and a representative Institute IGH.

Focus group was introduced to e-readiness assessment tools, their main indicators, advantages and disadvantages. As it was mentioned earlier, we narrow our research on three e-readiness assessment tools: APEC, Mosaic's and CID methodology. Discussion, analysis and conclusions were used as an input for a development of methodology for e-readiness assessment and its use for strategic planning for

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introducing e-learning in higher education is planned and will be implemented in higher education in Croatia

After qualitative research, the CID methodology was selected because it is suitable for use in different environments, sufficiently flexible to be adapted for a particular purpose and generic enough to allow comparability between countries in the form of rankings. One of the influential rankings is ''Readiness for the Networked Word'' prepared by Harvard University as a framework for developing countries to compare their readiness for the use of ICT. E-readiness in this context is defined as "the degree to which a community's relative advancement is the areas that are most critical for ICT adoption and the most important applications of ICT s" (CID, 2006).Here a "networked world" can be defined as a web of communications networks in which it is possible to send and receive information in a variety of digital formats anywhere in the world using a variety of transmission media. E-readiness can be considered as the preparedness for this Networked World.

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