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A NEW METRIC SYSTEM FOR ASSESSMENT OF E-TRANSFORMATION

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─Abstract ─

Objective evaluation of e-transformation is crucial to shift governments' e-performance to an advanced level. In this regard, the purpose of this paper is to introduce a new metric system, which takes into account core e-transformation measurement factors to be used for assessing nations' performance in their adoption of e-transformation. The approach adopts a derived point of view, hence aims to establish a new e-transformation metric system comprising measures of prestigious e-transformation assessment studies. Existing methodologies conducting e-performance assessment have been analyzed and numerous indicators have been reviewed to extract widely recognized measurement factors. Built from literature, the system includes commonly utilized set of metrics under six measurement categories that have impact on e-transformation; "Technology Infrastructure", "e-Society", "Human Capital", "Political and Regulatory Environment", "Economy Environment", "Online Services and Applications". The system is empirically implemented for evaluation and justification.

The paper presents implementation of the proposed model by revealing e-performance of thirty countries. Then, the paper demonstrates that proposed system is verified to be used to evaluate countries' maturity in e-transformation based on implementation results. In other words, the paper confirms that new system has ability to produce e-performance scores highly correlating with those generated by prestigious research institutions.

Key Words: *e-Government Evaluation, e-Performance, e-Transformation Metric System*
JEL Classification: O39

1. INTRODUCTION

Today's digital era has pushed governments to adopt innovations and developments of information and communication technologies (ICT). e-Transformation is defined as "the use of ICT to change the culture, business model, business processes, product and services in an integrated way for the benefits of employees, citizens, business partners, and all other social shareholders" (Arifoğlu, 2004). e-Transformation is becoming of increasing importance principally for gaining

competitiveness in global world. Mani emphasized that in Information Age, countries can accelerate development "if they are able to develop knowledge, which, combined with adequate ICT-related infrastructure, can allow successful integration into knowledge-based economies" (Mani, 2002).

Effective implementation of e-transformation requires; participation of government and citizens, utilization of advanced ICT, implementation of e-government projects, and development of e-government related strategies and policies. (Deng, 2008; Aldrich *et al*., 2002; Jaeger and Thompson, 2003; Akman *et al*., 2005; Andersen and Henriksen, 2006). Governments are developing strategies to implement essential actions towards digital transformation. However, strategy and implementation related to e-transformation shall be followed with measurement phase so that governments can be informed about their progress, success and shortcomings in digital transformation.

Governments shall learn outcomes of their attempts and carry on further actions for achievement of effective e-transformation. Gupta and Jana support the idea stating that "in order to ensure success, it is important to assess the performance of e-government and take necessary actions based on these assessments" (Gupta and Jana, 2003). Furthermore, outcomes of the assessments are significant direction for governments in a way that they can realize and learn the best practices, discover the worldwide e-government trends and decide to learn e-government policies of other countries (Jansen, 2005).

Governments need to regularly check where they are in their continuous e-transformation journey. Such evaluation is a valuable opportunity for governments to shift their e-transformation to advanced level (Jansen, 2005; Ojo and Estevez, 2007). In order to assist governments in assessment of e-transformation, various studies have been offered by governments, international research institutions and consultancy firms. Although there are a number of studies; each adopts unique purpose, hence consists of different set of measurement factors in their methodologies. That is, of the methods; some measures maturity level of e-government services, some attempts to assess transformation of information society, some considers e-performance of governments with the environmental factors, and so on. Even if assessment studies adopt same purpose, they generate diverse results and ranking place for a nation. Inconsistency between results prevents countries to detect their actual e-performance in an objective way. Furthermore, e-transformation evaluation studies in literature consist of various numbers of metrics, ranging between 8 and 100. Because gathering data in national or international level is laborious practice, studies with considerable number of metrics require huge effort during evaluation process.

Major goal of the study is to offer an objective e-transformation evaluation method with reasonable amount of metrics. In this regard, our study aims to identify assessment factors commonly recognized as crucial aspects for evaluation of e-transformation. In order to identify core measures, the study aims to investigate eighteen reputable e-transformation evaluation studies and extract their mutual assessment factors. At the same time, our study shows that identical or close e-performance results can be obtained by new evaluation method derived from studies investigated.

Following the introduction, the paper provides comprehensive review of existing e-transformation assessment methodologies. Then, in the 2nd section we introduce the metric system proposed for assessment of governments' progress in e-transformation. In 4th section, the paper presents

findings acquired from implementation of the proposed system on thirty countries. In the final section, a conclusion summarizing major points of the approach is provided.

2. LITERATURE REVIEW

This section provides review of literature focusing on studies developed to assess capabilities of governments in e-transformation process. The list of the studies examined is given in Table-1. Afterwards, each study is summarized with their purpose and assessment domains.

Table-1 e-Transformation Evaluation Studies

Study
1. UN - e-Government Survey
2. EIU - e-Readiness Rankings
3. CapGemini - Online Public Service Availability
4. WEF - Network Readiness Index
5. Brown University - Global e-Government
6. Waseda University - World e-Government Ranking
7. CID - Readiness for the Networked World
8. CSPP - Readiness Guide for Living in the Networked World
9. ITU, OECD, UN - Measuring ICT
10. APEC - e-Commerce Readiness Assessment
11. McConnell International and WITSA- Seizing the Opportunity of Global E-Readiness
12. European Commission - Statistical Indicators Benchmarking the Information Society
13. Turkish Statistical Institute - Research of ICT Usage in Turkey
14. STOPE Framework for e-Readiness Assessment
15. WB - Knowledge Assessment Methodology
16. UNDP - Technology Achievement Index
17. ITU - Digital Access Index
18. ITU - Digital Opportunity Index

E-Government Survey attempts to assess preparedness level of member states for knowledge economy (UNDESA/DPADM, 2008). Specifically, the survey evaluates governments' abilities of integrating ICT into implementation, and delivery of e-services and products for society. UN's assessment framework is based on three main domains that affect e-transformation: human capacity, infrastructure development, and access to information and knowledge. Additionally, e-participation is considered to assess presence of public services enabling citizens to participate in government's policy decision making.

Since 2000, Economic Intelligence Unit (EIU) and IBM Institute for Business Value collaboratively have been evaluating chief economies' capabilities to adopt and apply ICT for economic and social benefit of the country. e-Readiness Rankings (EIU and IBM, 2008) assessment framework is built around six main measurement categories: connectivity and technology infrastructure, business environment, social and cultural environment, legal environment, government policy and vision, consumer and business adoption.

Through the efforts of European Union (EU), CapGemini Company performs the study - EU Online Public Service Availability (CapGemini, 2007) to measure European countries' performance in delivery of online public services. Regarding e-services, assessment concentrates on two main aspects: full online availability and sophistication level.

World Economic Forum (WEF) delivers a yearly network readiness index (NRI) – now in its seventh year – of Network Readiness Rankings (World Economic Forum, 2008). Focusing on three domains (environment, readiness and usage) NRI reveals nations' readiness level to benefit from developments in ICT.

The Center for Public Policy of the Brown University (CPP-BU) has been issuing an annual report of Global e-Government Survey (Darrell, 2007). This survey examines performance of national government web sites with regard to six measurement categories: information availability, service delivery, privacy and security, disability access, foreign language access, fees and public outreach.

Japan Waseda University Institute of e-Government carries on World e-Government Ranking (Obi, 2008) study aiming to monitor and assess e-transformation performance of the countries. Nations are examined according to a range of indicators distributed over 6 areas, which are constructed as "fields for ideal e-government": network preparedness, required interface-functioning applications, management optimization, homepage/portal situation, introduction of CIO, promotion of e-government.

Center for International Development (CID) of Harvard University published the Readiness for the Networked World Guide (Center for International Development, 2000) to investigate communities' readiness to adopt Networked World. Assessment methodology of the guide includes indicators under five linked areas: network access, networked learning, networked society, networked economy and network policy. For each indicator, four stages of progress (Stage 1-4) are established to specify level of community performance.

Readiness Guide for Living in the Networked World (CSPP, 2000) has been developed by CSPP, "a public policy advocacy group comprising the Chairman and Chief Executive Officers of US information technology companies." Through this guide individuals and communities are enabled to identify their participation level into networked world. During model production, a variety of criteria are tracked and five main measurement categories are decided as appropriate assessment areas: The Network (Infrastructure), Networked Places (Access), Networked Applications and Services, Networked Economy and Networked World Enablers.

At the World Summit on Information Society (WSIS) organized in 2003, it is emphasized that measurement and benchmarking of information society is important process. In the light of this significance, Measuring ICT (United Nations ICT Task Force, 2005) project was initiated for provision of ICT statistics and construction of assessment techniques to investigate information society. This project categorized indicators into five main categories: ICT infrastructure and access, access to and use of ICT by households and individuals, use of ICT by businesses, ICT sector and trade in ICT goods, and ICT in education.

Asian Pacific Economic Cooperation (APEC) e-Commerce Steering Group released the e-Commerce Readiness Assessment guide (APEC Readiness Initiative, 2000) to enable APEC member economies to measure their readiness level for e-commerce. APEC's guide offers a broad assessment framework composed of six main measurement indicators: basic infrastructure and

technology, access to necessary services, current level and type of use of the Internet, promotion and facilitation activities, skills and human resources, and positioning for the digital economy.
Seizing the Opportunity of Global E-Readiness (McConnell International and WITSA, 2001) report is published by collaborative study of McConnell International and World Information Technology and Services Alliance (WITSA). The goal is to examine countries' level of capacity to participate in digital economy. The assessment methodology concentrates on five interrelated attributes: connectivity, e-leadership, information security, human capital, and e-business climate.

SIBIS (Gesellschaft für Kommunikations- und Technologieforschung mbH, 2002-2003), one of the projects of the European Commission, aims to establish methods and data to support European attempts to examine Information Society. In the light of this goal SIBIS model proposes a number of information society indicators based on nine measurement categories: basic access and usage, information security, e-commerce, e-work, e-government, e-health, digital literacy, learning and training, and digital divides.

Research of ICT Usage in Turkey (T.R. Turkish Statistical Institute, 2008) is offered to measure ICT penetration of enterprises and households of Turkey. Major focus is on detection and construction of information society indicators to support the e-Europe and e-Europe+ actions of European Union.

STOPE Framework (Al-Osaimi *et.al*, 2006) has been proposed for e-readiness assessment of organizations and governments. To build STOPE Framework, e-readiness assessment studies and potential measured factors have been considered. Five major e-readiness fields are included in assessment framework of STOPE: Strategy, Technology, Organization, People and Environment.

Knowledge Assessment Methodology (KAM) aims to explore problems and opportunities countries face with in their digital transformation process (World Bank, 2009). In other words, KAM attempts to investigate countries' readiness towards knowledge based economy. The KAM consists of indicators distributed over 4 Knowledge Economy pillars: Economic Incentive and Institutional Regime, Innovation, Education, and Information and Communications Technologies.

Technology Achievement Index (TAI) has been created by United Nations Development Programme (UNDP) to evaluate technological accomplishment of countries (Meghnaddesai and Sagasti, 2002). This study has proposed measurement factors that are applicable to all countries at any level of development. For countries to take benefit of knowledge economy, four measurement fields are offered: creation of technology, diffusion of recent technologies, diffusion of old innovations, and human skills.

The Digital Access Index (DAI) was built by Market Information and Statistics Unit of International Telecommunications Unit (Gupta and Jana, 2003). DAI evaluates availability of opportunities provided for citizens to access and utilize latest ICT. DAI includes four critical indicators – infrastructure, affordability, knowledge and quality – necessary for country achievement to access ICT.

The Digital Opportunity Index (ITU, 2003) was developed by ITU. Major purpose of DOI is to gauge opportunities proposed for citizens towards access to information. DOI includes eleven indicators distributed over three measurement fields: opportunity, infrastructure, and utilization.

3. E-TRANSFORMATION METRIC SYSTEM

Countries' e-performance is often measured through different criteria under a range of perspectives such as technology, society, economy, policy and so on. We propose a hybrid e-transformation evaluation method to allow governments to:

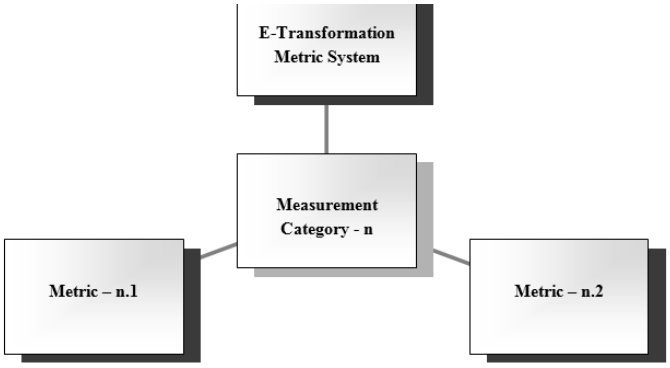
- assess their progress, strengths and weaknesses concerning digital transformation,
- learn their e-performance ranking in global competitive world,
- take appropriate further actions for e-transformation.

e-Transformation metric system we offered is built from literature and consists of mutual measures across previously constructed assessment methodologies. Investigation of assessment tools, guides, and surveys enables us to discover indicators recognized as essential factors to gauge governments' maturity level in digital transformation. The system adopts a structure including measurement categories and their sub measures - metrics. We provide scales for measurement factors and a mathematical formula to combine the individual results into a combined e-transformation index. In justification of the system, we use Pearson product-moment correlation.

3.1. General Structure

E-transformation metric is structured by involving two types of measurement factors in a hierarchical order. The higher level factors are measurement categories that are agreed as crucial factors for assessment of e-transformation. Specific set of metrics are respected as building blocks integrated into each measurement category. To summarize, the structure of the system is demonstrated in Figure-1.

Figure-1: Structure of the Metric System



3.2. Measurement Factors

Technological infrastructure, e-society, human capital, political and regulatory environment, economy environment, and online services and applications are six categories of measure determined to be major components of our system. Set of metrics included within each category are presented in Table-2.

Table-2: Metrics of e-Transformation Metric System

Technology Infrastructure	**e-Society**
• Proportion of households with computer • Proportion of households with Internet • Mobile cellular subscriptions per 100 inhabitants • Fixed telephone lines per 100 inhabitants • Broadband per 100 inhabitants • Secure Internet servers per 1 million inhabitants • International Internet bandwidth per Internet user (bit/s) • Mobile cellular prices (% of GNI per capita) • Broadband Internet prices (% of GNI per capita)	• PC users per 100 inhabitants • Internet users per 100 inhabitants • Mobile phone users per 100 inhabitants • Fixed phone users per 100 inhabitants • Broadband users per 100 inhabitants • Firm level Technology Absorption • Extent of Business Internet Use • Government Success in ICT Promotion • ICT Use and Government Efficiency • Presence of ICT in Government Offices
Human Capital	**Political and Regulatory Environment**
• Professional and Technical Workers as % of the Labor Force • Adult Literacy Rate • Digital Literacy Rate • Tertiary enrollment ratio • Secondary enrollment ratio • Schools having Internet access • Quality of Educational System • Patents granted by USPTO per million people • Total royalty payments and receipts (US$/pop.) • University-Company Research Collaboration	• Government prioritization of ICT • Importance of ICT to government vision of the future • Laws relating to ICT • Quality of competition in the ISP sector • Effectiveness of law-making bodies • Judicial independence • Intellectual property protection • Efficiency of legal framework for disputes • Property rights
Economy Environment	**Online Services and Applications**
• Annual GDP Growth (%) • GDP (current US$ bill) • The level of taxes • Financial market sophistication • Intensity of local competition • Time required to start a business	• Information Dissemination/Outreach • Service Delivery Capability • Access/Usability • Citizen participation / Interconnectedness

3.3. e-Transformation Index

Countries' overall maturity in e-transformation is reflected through an index produced by metric system. To produce the index, a mathematical formula is applied to reveal country's performance over system's six measurement categories and set of metrics. The calculation procedure consists of five ordered steps:

1. Initially, country data essential for system's metrics are gathered from reputable research institutions. ITU, UN, WEF, and WB are major institutions from which we acquired data for the assessment.

2. Considering values obtained in Step-1, countries are sorted from maximum scorer to minimum scorer. In this way, for each individual metric, distinct country rankings are resulted.

3. Because each metric possesses unique range of scores, performance scores for measurement categories can be calculated after normalization procedure. That is, to place all data in same scale of measurement, normalization procedure is applied. The normalization is conducted based on Knowledge Assessment Methodology of World Bank. The formula applied can be detailed as follows (World Bank, 2008):

Normalized score=10*(1-Highers/All)
Highers: Number of countries scoring higher than country being assessed
All: Total number of countries assessed

Normalized scores range from 0 (lowest score) to 10 (highest score). Rising from 0 to higher scores shows the progress of country.

4. After normalization procedure, scores of the measurement categories can be calculated. Category score is calculated by taking average of the normalized scores of the set of metrics covered in that category. In this step, six groups of score are generated.

5. Calculation of overall e-transformation index is the last step. Averaging measurement category scores obtained in Step-4 will produce e-transformation index for each country. Final e-transformation index ranges between 0 and 10.

4. RESULTS

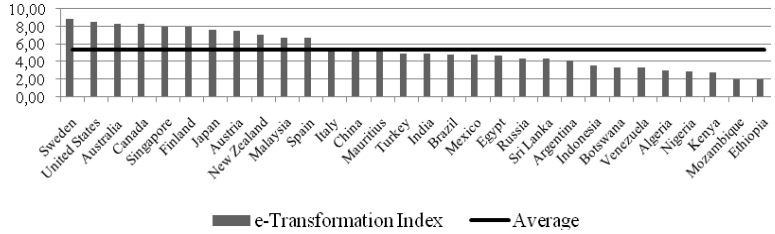
E-transformation metric system was applied to 30 countries located in five regions of the world. Table-3 lists assessed countries located in five regions – Africa, America, Asia, Europe and Oceania.

Table-3: Countries Assessed

Region	Countries Assessed
Africa	Algeria, Botswana, Egypt, Ethiopia, Kenya, Mauritius, Mozambique, Nigeria
America	Argentina, Brazil, Canada, Mexico, United States, Venezuela
Asia	China, India, Indonesia, Japan, Malaysia, Singapore, Sri Lanka, Turkey
Europe	Austria, Finland, Italy, Spain, Sweden, Russia
Oceania	Australia, New Zealand

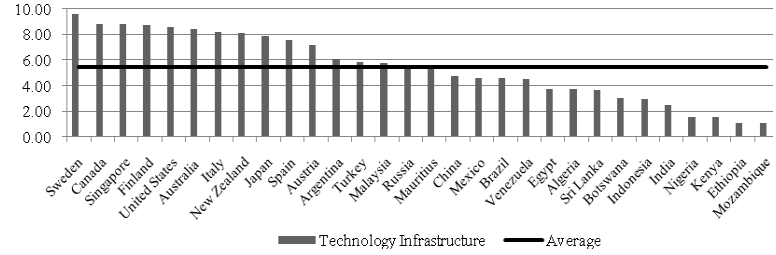
The countries assessed are ranked with regard to their overall value of e-transformation index. Figure-2 demonstrates overall e-transformation performance of the countries.

Figure-2: e-Transformation Performance of the Countries



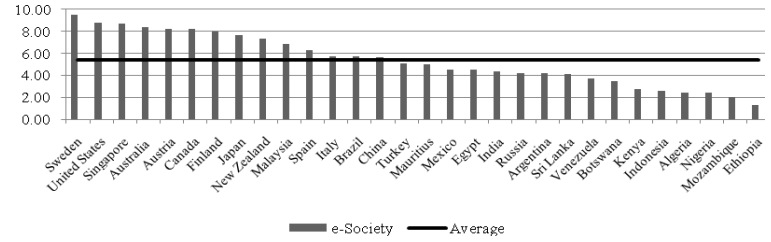
Countries' average on e-transformation index is 5.40. Results of the ranking clearly shows that with its score 8.91, Sweden keeps the leadership of the country ranking. The second place goes to United Stated with a score 8.55. The least scorer country is Ethiopia with its 1.98 e-transformation index value. Besides overall e-performance, country rankings in six measurement categories are also revealed.

Figure-3: Countries' Performance on Technology Infrastructure



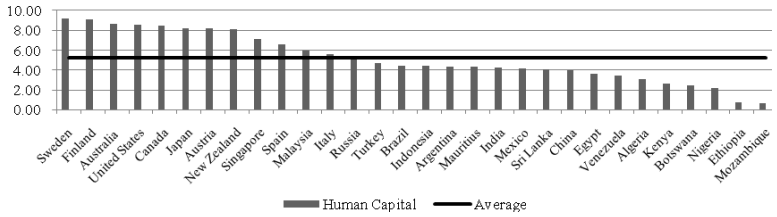
The overall 5.45 score on technology infrastructure is the average of all the countries assessed. With its score 9.59, Sweden keeps the leadership of the country ranking. The second place goes to Canada and Singapore with an equal score of 8.78. The lowest scorer country is Mozambique with score 1.07.

Figure-4: Countries' Performance on e-Society



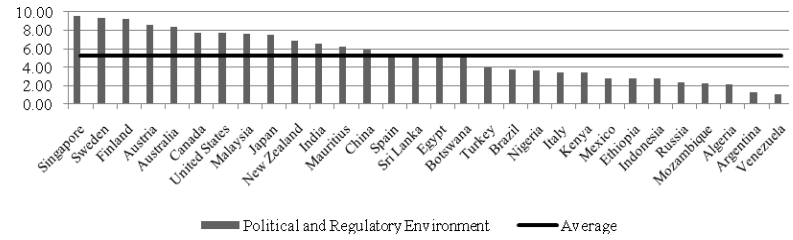
The average score of all the assessed countries on e-society category is 5.40. Sweden attains the leadership of the country ranking with its 9.48 score. In the second place United States sits with its score of 8.82. Concerning e-society, the worst scorer country is Ethiopia with its score 1.33.

Figure-5: Countries' Performance on Human Capital



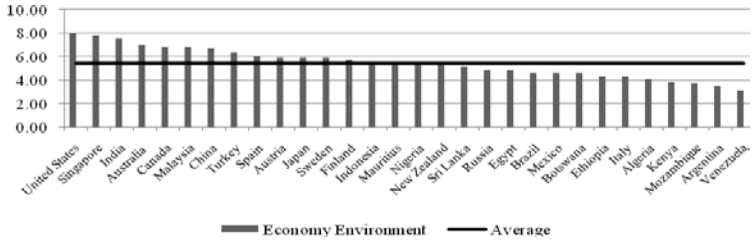
The average score of human capital is calculated as 5.23. As in technology infrastructure and e-society categories, Sweden obtained the highest score on human capital. Sweden scores 9.21 far above the average. Finland keeps the second place with its score 9.13. The lowest scorer country is Mozambique, with its score 0.71.

Figure-6: Countries' Performance on Political and Regulatory Environment



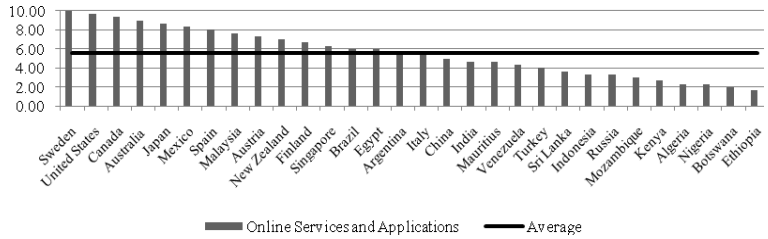
The overall 5.29 score achieved on political and regulatory environment is the average of all the assessed countries. Singapore is the leading country with its score 9.59. Sweden is in the second position with its 9.33 score. The worst scorer country is Venezuela with its score 1.04.

Figure-7: Countries' Performance on Economy Environment



The average performance of the countries with regards to economy environment is 5.46. With its 8.00 score, United States accomplished the leadership of the country ranking. The second place goes to Singapore with score 7.83. Venezuela is the lowest scorer country with its score 3.11.

Figure-8: Countries' Performance on Online Services and Applications



Average performance on online services and applications is calculated as 5.6. Results of the ranking apparently explores that Sweden takes the number one spot with its score 10.00. The second place is achieved by United States with its score 9.67. The least scorer country is Ethiopia with its 1.67 score.

5. JUSTIFICATION

Findings of e-transformation evaluation studies of the major research institutions are considered to justify the proposed system. For the justification of the system, countries' e-transformation indices in our system are compared with the indices of the previously developed studies (UN's e-Government Survey, EIU's e-Readiness Rankings, WEF's Network Readiness Index, WB's Knowledge Assessment Methodology, and ITU's Digital Access Index). The relationship between countries' e-transformation scores in our system and in five studies is investigated by applying Pearson product-moment correlation coefficient. Preliminary analyses are conducted to ensure no violation of the assumptions of normality, linearity and homoscedasticity. The results of Pearson product-moment correlation are presented in Table-6.

Table-6: Correlations Regarding e-Transformation

Survey Pairs		**Correlation**
e-Transformation Index (e-Transformation Metric System)	e-Government Readiness Index (UN's e-Government Survey)	0.95

e-Transformation Index (e-Transformation Metric System)	e-Readiness (EIU's e-Readiness Rankings)	0.94
e-Transformation Index (e-Transformation Metric System)	Network Readiness Index (WEF's Network Readiness Index)	0.99
e-Transformation Index (e-Transformation Metric System)	Knowledge Economy Index (WB's Knowledge Assessment Methodology)	0.95
e-Transformation Index (e-Transformation Metric System)	Digital Access Index (ITU)	0.92

The results proved that there is a significant large positive correlation between the two variables with countries' e-transformation scores in e-Transformation Metric System with countries' e-transformation scores in each of five e-government evaluation studies. This finding implies that our system produces very close results with the approaches developed by major research institutions.

6. CONCLUSIONS

Evaluation of e-transformation has a vital role to identify success and shortcomings of government's digital transformation process. In this paper, we introduced our e-transformation metric system to be used in country level assessment of digital transformation. Review of the literature shows that there are some methods developed for evaluation of e-transformation. But, there is not such a model covering both crucial and reasonable number of measures. Major contribution of our study is to offer an assessment method including key measurement factors of e-transformation.

Our system is derived from eighteen e-transformation evaluation methods by including extensively used measures of those studies. In order to experiment the system, we evaluated 30 countries located in five regions of the world. Essential data of the countries are collected from databases of major research institutions (i.e. UN, WEF, WB, and ITU). Countries' e-performance is revealed to illustrate the implementation of the system. For the justification of the system, we considered relationship between our findings and findings of the some e-transformation assessment studies investigated. Application of Pearson-product moment correlation demonstrates strong correlation across the findings. Therefore, this finding proves the reliability of our assessment method.

BIBLIOGRAPHY

Akman, I., Yazici, A., Mishra, A., Arifoglu, A. (2005), "E-government: a global view and an empirical evaluation of some attributes of citizens", *Government Information Quarterly*, Vol. 22 pp.239-57.

Aldrich, D., Bertot, J.C., McClure, C.R. (2002), "E-government: initiatives, developments, and issues", *Government Information Quarterly*, Vol. 19 pp.349-55.

Al-Osaimi, K., Alheraish, A., & Bakry, S. H. (2006). *An integrated STOPE framework for e-readiness assessments. 18th National Computer Conference 2006.*

Andersen, K.V., Henriksen, H.Z. (2006), "E-government maturity models: extension of the Layne and Lee model", *Government Information Quarterly*, Vol. 23 pp.236-48.

APEC Readiness Initiative. (2000). *APEC E-Commerce Readiness Assessment Guide*

Arifoğlu, A. (2004). *eDönüşüm Yol Haritası, Dünya, Türkiye.* Ankara: Sas Bilişim Yayınları.

CapGemini. (2007). *The User Challenge Benchmarking The Supply Of Online Public Services.* Diegem: CapGemini.

Center for International Development. (2000). *Readiness for the Networked World A Guide for Developing Countries.* Cambridge: Harvard University

Chen, D. H., & Dahlman, C. J. (2005). *The Knowledge Economy, the KAM Methodology and World Bank Operations.* Washington : The World Bank.

CSPP. (2000). *Readiness Guide for Living in the Networked World. A Self-Assessment Tool for Communities.*

Darrell, M. W. (2007). *Global E-Government.* Rhode Island: Brown University Center for Public Policy.

Deng, H. (2008), "Towards objective benchmarking of electronic government: an inter-country analysis", *Transforming Government People, Process and Policy*, Vol. 2 pp.162-176.

EIU, & IBM. (2008). *E-readiness rankings 2008 Maintaining momentum.* The Economist Intelligence Unit.

Gesellschaft für Kommunikations- und Technologieforschung mbH. (2002-2003). *Measuring the Information Society in the EU, the EU Accession Countries, Switzerland and the US.* Bonn: SIBIS

Gupta, M. P., & Jana, D. (2003). E-government evaluation: A framework and case study. *Government Information Quarterly*, 365-387.

International Telecommunications Union (2003). *Digital Access Index*, http://www.itu.int/ITU-D/ict/dai/, [Accessed 3.2.2009]

Jaeger, P.T., Thompson, K.M. (2003), "E-government around the world: lessons, challenges, and future directions", *Government Information Quarterly*, Vol. 20 pp.389-94.

Jansen, A. (2005). Assessing E-government progress– why and what. *NOKOBIT*. Bergen.

Mani, H. (2002). *e-Readiness*, http://www.mit.gov.in/download/CHAPTER1_1-14.PDF, [Accessed 9.2.2009]

McConnell International & WITSA. (2001). *Ready? Net. Go! Partnership Leading the Global Economy.* McConnell International LLC.

Meghnaddesai, Sakikofukuda-Parr, Johansson, C., & Sagasti, F. (2002). Measuring the Technology Achievement of Nations and theCapacity to Participate in the Network Age. *Journal of Human Development* .

Obi, T. (2008). *The 2008 Waseda University World e-Government Ranking.* Tokyo: Institute e-Government Waseda University.

Ojo, A., Janowski, T., & Estevez, E. (2007). *Determining Progress Towards e-Government - What are the Core Indicators?* Macao: United Nations University - IIST.

T.R. Turkish Statistical Institute. (2008). *2008 Yılı Hanehalkı Bilişim Teknolojileri Kullanım Araştırması Sonuçları.* Ankara: T.R. Turkish Statistical Institute.

UNDESA/DPADM. (2008). *Main Features Reviewed by the United Nations e-Government Survey*. New York : United Nations.

UNDESA/DPADM. (2008). *United Nations e-Government Survey 2008, From e-Government to Connected Governance.* New York : United Nations.

United Nations ICT Task Force. (2005). *Measuring ICT: the Global Status of ICT Indicators.* New York: United Nations ICT Task Force

World Economic Forum. (2008). *Global Information Technology Report 2007-2008.* World Economic Forum.

World Bank. (2009, June 5). *Knowledge for Development*, http://web.worldbank.org [Accessed 5.2.2009]