A Review of E-Government Readiness in India and the UAE

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Abstract

Benefits of e-government are many. Not only the citizens of a country receive a quality service and empowerment, but the government and other stakeholders are also benefited by adoption of an e-government system. The present paper investigates the e-government readiness scenario in India and UAE vis-à-vis other countries in Asia. The study is based on the e-government surveys conducted by the United Nations. Despite its various projects and policies concentrating on implementation of the information and communication technology, the Indian scenario of e-governance has not been up to the mark when compared with other countries in the region. The UAE, however, seems to be performing well above the world's average. The study further finds that the economic structure of a country also matters in its e-government readiness.

Keywords*:* Cluster analysis, E-government readiness, India, Socio-economic factors, United Arab Emirates (UAE).

Introduction

Electronic government (E-government) is an interactive system of communication and coordination between a government and its citizens, business entities, and other governmental units through the use of web-based and other electronic technologies. The United Nations (UN) explains e-government as an application of information and communication technology (ICT) by governments to aim at better access and delivery of services to citizens, improved interaction with citizens and business, and the empowerment of citizens through access to information (EGS, 2008). The most popular citizen services that an e-government system provides include the transactions of money, documents, information, and opinion polls pertaining to the ministries of health, education, labour, social welfare, and finance. Such systems are expected to lower the cost of the citizen services and improve their efficiency and quality. This paper aims at studying the state of readiness of India and the United Arab Emirates (UAE) to successfully implement the system of e-government. The authors also attempt to examine the e-government scenario in other Asian countries so that the benchmarks to India and UAE can be identified. The purpose of this benchmarking is to pinpoint the weaker links of the e-government infrastructure in the two countries.

There are four major players who constitute the e-governance chain of a country. At the extreme upstream side are the lawmakers of the country, whereas, the citizens are at the extreme downstream. In between are the public administrators and executors who define and implement the processes for realizing a law (Stojanovic *et. al*, 2004).This study may, therefore, be helpful to the policy makers and administrators of the countries under study in assessing their e-government readiness. This, in turn, is expected to enhance the quality of the respective citizen services while reducing its cost and increasing the efficiency.Information technologies (IT), in general, and information & communication technologies (ICT), in particular have been the major contributors in implementing e-government projects. The literature focuses on various issues pertaining to the structures and functions of IT and ICT (Jean, 2007; Schware, 2003; Mutula and Brakel, 2006) with reference to e-functioning and knowledge management in various organizations (Ng and Li, 2003; Mohamed, 2007).

Numerous studies have been conducted on different aspects of ICT-enabled e-governance at local, national, and international levels. E-government has been defined in different ways by the researchers (Tambouris *et al*., 2001; Whitson and Davis, 2001; Luling, 2001; Means and Schneider, 2000; Burn and Robins, 2003). Scholars have addressed a range of dimensions of e-government like requirements and facilitators, barriers, critical success factors, assessment of readiness and it's benchmarking. On the other side of such studies are the ones that even pose a basic question (Hazlett and Hill, 2003) about e-government like "Can e-government produce truly innovative, responsive public services, or merely exacerbate electronically, existing shortcomings?" The list of researches dealing with e-government adoption and its objectives include those reported by Sarikas and Weerakkody (2007), Ebrahim and Irani (2005), Williams (2008), and Themistocleous and Sarikas (2005). Kamal (2006), for example, has identified 42 factors as critical to technology adoption in government sector organizations. Information technology was the focus of this study.

Lam (2005), Ebrahim and Irani (2005) and Faisal and Rahman (2008) are among those researchers who have dealt with e-government barriers. Gonzalez *et al*. (2007) present a review of literature to assess the situation of e-government in various countries. A framework has been discussed by Beynon-Davies (2007) to evaluate and benchmark e-government efforts in the context of regional governments.

Objectives and Methodology

The present study reviews the e-government readiness in the Asian countries with special reference to India, the home country of the author, and the UAE where the author has served for a couple of years on an academic assignment. The purpose of this study is to assess the e-government scenario in the two countries and benchmark them against the better performers in the region. The study comprises (a) e-government readiness trends, (b) segmentation of the countries on the basis of their e-government readiness and its components, and (c) development of a regression model between the socio-economic parameters and e-government readiness. The study is based on the secondary data gathered primarily from the E-government surveys (2003, 2004, 2005, and 2008) conducted by the United Nations and the statistics of various countries published by the UN. These references are abbreviated as EGS (e-government survey) and CS (country statistics), respectively, in this manuscript. The Asian countries from the central, eastern, southern, south-eastern, and western zones are included in the study. The trend of e-government readiness during the last five years has been studied using the descriptive analysis approach. Cluster analysis method is used to segment the countries according to their e-government readiness and its components. Analysis of variance (ANOVA) and multiple regression programs are run on the data to investigate the relationship between socio-economic factors and the e-government readiness in the countries.

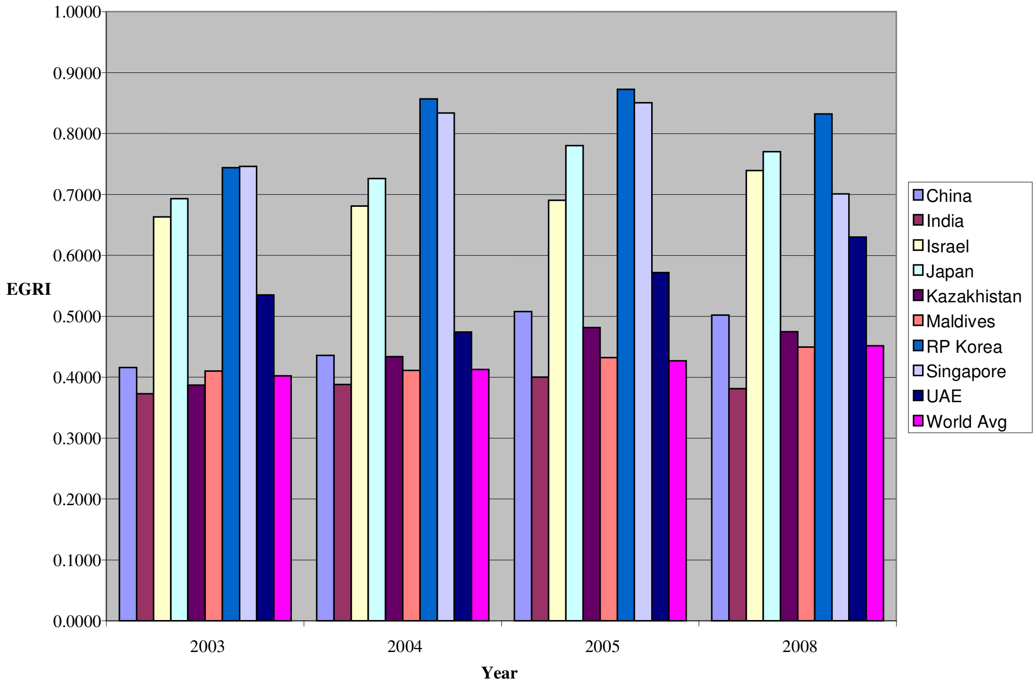
Data Analysis and Interpretation

The data are processed to find suitable answers to the objectives specified in the previous section. Three sub-sections are created below to deal with the various issues.

E-Government Readiness Trend

Starting with the year 2003, the United Nations has conducted four surveys till 2008 on the e-government readiness of its member countries. In these surveys, the e-government readiness of each country is measured in terms of the e-government readiness index (EGRI), a composite measure of the human capital index (HCI), telecommunication infrastructure index (TCII), and the web measurement index (WMI) (Appendix). The surveys divide the Asian countries into five zones, namely, central, eastern, southern (India is listed here), south-eastern, and western (where UAE appears). For the purpose of e-government readiness trend analysis, the EGRIs of a few selected countries from each zone are considered for all the four survey reports available till date (years 2003, 2004, 2005, and 2008). The selected countries are the ones which appear at the top of the respective zones (EGS 2003, 2004, 2005, 2008). This can be observed from Figure-1 that India has scored lowest on the EGRI each year as compared to other countries. The four surveys indicate that the world's average EGRI has gone up by 12% during the period 2003-2008. India has, however, been able to increase its EGRI by only 2% for this period. From the western part, the UAE has reported an overall improvement in e-government readiness (around 18 %) from the year 2003 with a slight decrease in the year 2004. On the other hand, countries like Kazakhistan, Republic of Korea, Japan, China, and Maldives have obtained an increase in their EGR indices of the order of 23%, 12%, 11%, 21%, and 10%, respectively.

Despite being among the top 25 countries as per the 2008 survey, Singapore has surprisingly witnessed a decrease of 6% in the EGRI of this year vis-à-vis 2003. The TCII of India has continuously improved during this period. Other indices of e-government readiness too have shown an encouraging trend in the country except between 2005-2008, where the HCI has gone down by 5% and the WMI by 18% (EGS 2003, 2004, 2005, 2008). It is this latest status of HCI and WMI, which is a matter of concern for the policy makers and administrators of the country. As far as the UAE is concerned, the trend of TCII has been erratic over the period 2003-2008, the WMI has remarkably improved and the HCI has gone up slightly (EGS 2003, 2004, 2005, 2008). The survey methodology (EGS, 2008) suggests that, out of the three components of e-government readiness, TCII is a relative measure, whereas, WMI and HCI are absolute measures of a government's potential to e-govern the country effectively and efficiently. The assessment of TCII takes into account both the best as well as the worst telecommunication infrastructure among that of all countries under survey. This can also be inferred from the descriptions of these indices (EGS, 2008) that except for HCI, it is the government of a country, which is mainly responsible for how high or low are its WMI and TCII. Since human capital index is an indicator of adult literacy and gross enrolment in education, the citizens have an important role to play to improve this index. The government should focus on the quality and utility of its national and other official web sites to improve the WMI. The ICT infrastructure also needs to be strengthened for a higher TCII and hence a better implementation of e-government.



[Figure-1: EGRI Trends]

Correlation and Cluster Analysis

Since the survey document works out the EGRI using TCII, WMI, and HCI, some correlations among the four indices are expected. Pearson coefficients of correlation are estimated in this sub-section to find the strength and significance of such correlations. The results of this analysis may help the policy makers rationalize their priorities as far as nation building and its progress is concerned.

Table-1: Correlations between Indices

		TCII	HCI	WMI	EGRI
TCII	Pearson	1	$.534^{**}$	$.787^{**}$	$.937^{**}$
	Sig. (1-tailed)		.000	.000	.000
	N	46	46	46	46
HCI	Pearson		1	$.308^{*}$	$.706^{**}$
	Sig. (1-tailed)			.034	.000
	N		46	46	46
WMI	Pearson			1	$.856^{**}$
	Sig. (1-tailed)				.000
	N			46	46
EGRI	Pearson				1
	Sig. (1-tailed)				
	N				46

**Correlation is significant at the 0.01 level (1-tailed)

* Correlation is significant at the 0.05 level (1-tailed)

A null hypothesis of no relationships among the four indices is tested for one-tailed significance. It is assumed that the three predicting variables, TCII, WMI, and HCI influence the dependent variable, EGRI in only one direction. Based on the EGRI, TCII, HCI, and WMI for the year 2008 of all the 46 countries in question, the correlations are found and presented in Table-1. The findings show that all correlations are significant at 1% or 5% significance level. The EGRI has got the strongest relationship with the TCII, followed by WMI and HCI. Moreover, the link between HCI and WMI has been the weakest when compared with other linkages between any two variables.To further this investigation, cluster analysis is performed to group the countries with similar e-government readiness profiles together. This clustering intends to identify the countries with which India and UAE are presently grouped and to explore whether their e-government status can be benchmarked with a better cluster. Hierarchical clusters have been generated according to the four variables, namely, EGRI, TCII, HCI, and WMI (for the year 2008).

Ward's procedure of clustering with squared euclidean distance method has been adopted for this purpose. The clustering program of the SPSS software has produced results in the form of an agglomeration schedule (not shown here) and a dendogram plot (Figure-2). The pattern of the values under the *coefficient* column of the agglomeration schedule and the cluster membership solutions (for four, five, and six clusters) suggest that a six-cluster solution is preferable for further analysis (Malhotra, 1999). The clustering solution, thus obtained, has been crosschecked to assess its reliability and validity using two other procedures, between-groups linkage and centroid method of clustering. To interpret these clusters more objectively in terms of e-government readiness profiles, the cluster centroids, as presented in Table-2**,** are examined. These centroids represent the mean values of the cluster members on different indices (Malhotra, 1999).The six-cluster solution puts India along with Afghanistan, Bangladesh, Bhutan, Nepal, and Pakistan. This cluster (labeled as cluster 2) scores very low on all the four indices as compared to the other clusters (Table-2). It is surprising to note that the countries like Cambodia, Myanmar, Timor, and Tajikistan, which are less developed than India, are placed in a relatively better cluster (cluster 1). The cluster analysis lists the UAE with Bahrain, Cyprus, Malaysia, Kuwait, and Qatar to form cluster 5. The mean EGRI of this group of countries has been second-highest among the six clusters. Cluster 6 is the benchmark for both India as well as the UAE with a mean EGRI as 0.7606. The countries included in this cluster are Israel, Japan, Korea, and Singapore.

Table-2: Cluster Centroids

Index	Cluster's Mean					
	1	2	3	4	5	6
EGRI	0.2750	0.2960	0.4331	0.4932	0.5770	0.7606
TCII	0.0175	0.02903	0.1135	0.1631	0.3463	0.6264
HCI	0.7163	0.4871	0.8725	0.8349	0.8535	0.9461
WMI	0.0966	0.3696	0.3169	0.48198	0.53262	0.7107

Rescaled Distance Cluster Combine

Figure-2: Dendogram

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C A S E        0        5       10       15       20       25
Label     Num  +---------+---------+---------+---------+---------+

China          9  □□
Thailand      39  □□
Philippines   31  □□
Jordon        18  □□□□
Oman          29  □□ □
Viet Nam      45  □□ □
Saudi Arabia  34  □□ □□□□□□□□
Turkey        41  □□ □    □
Lebanon       23  □□ □    □
Malaysia      24  □□□□    □
UAE           43  □□ □    □
Kuwait        20  □□ □    □
Qatar         32  □□□□    □
Bahrain        4  □□      □
Cyprus        10  □□      □□□□□□□□□□□□□□□□□□□□□□□□□□□□
Azerbaijan     3  □□      □         □
Mongolia      26  □□      □         □
Georgia       11  □□      □         □
Kazakhstan    19  □□      □         □
Kyrgyzstan    21  □□      □         □
Uzbekistan    44  □□      □         □
Armenia        2  □□      □         □□□□□□□□□□□□□□□□□□□□□□□
Indonesia     13  □□□□□□□□□□□               □        □
Sri Lanka     36  □□                □        □
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Brunei Darus	7	□□ □ □
Maldives	25	□□ □ □
Iran (Islami	14	□□ □ □
Syria	37	□□ □ □
Israel	16	□□ □ □
Singapore	35	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ □
Japan	17	□□ □
Republic of	33	□□ □
Bhutan	6	□□ □
Pakistan	30	□□ □
Bangladesh	5	□□ □
Nepal	28	□□□□□□□□□□□□ □
India	12	□□ □ □
Afghanistan	1	□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
Tajikistan	38	□□□□ □
Turkmenistan	42	□□ □ □
Iraq	15	□□ □□□□□□□□□
Myanmar	27	□□ □
Cambodia	8	□□□□
Timor-Leste	40	□□
Yemen	46	□□
Lao PDR	22	□□

E-Government Readiness and Socio-Economic Factors

The EGRI computation in the UN surveys does not take into account the socio-economic factors of the participating countries. The authors find it research worthy to address this aspect of e-government readiness. The investigation is made in two stages. The first one is a preliminary stage to know whether socio-economic factors are likely to influence e-government readiness. For this, the subject countries have been divided into three groups of economies, as per the World Bank's definition, low, middle, and high-income countries. The e-government readiness index 2008 of the countries under each group enters the analysis as the dependent variable. The data so formed are tested using one-way analysis of variance (ANOVA) to test the null hypothesis of equal means. The results (Table-3) indicate that the effect of economy on e-government readiness index is significant at 5% level of significance. This implies that the difference between the means of the EGRI of the three groups can be attributed to the strength of their economy. With this finding, the analysis proceeds to its second stage with EGRI as the dependent variable and a few selected socio-economic factors as its predictors.

Table-3: Analysis of Variance

Descriptives

Group	N	EGRI mean	Standard deviation	Standard error
Low-income	11	.3295	8.383E-02	2.240E-02
Middle-income	23	.4528	7.249E-02	1.812E-02
High-income	12	.7086	.1262	5.152E-02
Total	46	.4475	.1562	2.604E-02

ANOVA

Effect	Sum of squares	df	Mean square	F	Sig.
Between groups	.604	2	.302	39.915	.000
Within groups	.250	43	7.570E-03		
Total	.854	45			

Three indicators of the socio-economic status of a country, namely, gross domestic product, urbanization and literacy are considered relevant to its e-government readiness. The data on these parameters are obtained from the statistics division of the UN's web sites. The latest statistics that were available for all the countries belong to the year 2006. The gross domestic product is measured in US$ million (base year 1999), whereas, the urbanization is expressed as percentage of total population. The human capital index (HCI) itself has been used as a measure of literacy. To express the four variables in the same unit, the gross domestic product and urbanization have been converted into the respective indices, GDPI and URBI, for further analysis. Following the UN survey's methodology (EGS, 2008), the two indices (for India) are obtained for all the countries using the method illustrated below.

$(GDPI)_{India} = [(GDPPT)_{India} - (GDPPT)_L]/ [(GDPPT)_H - (GDPPT)_L]$

Where, GDPPT= GDP in million US$ per thousand population; $GDPPT_L$ = the lowest GDPPT in the sample (46 countries); $GDPPT_H$ = the highest GDPPT in the sample. Similarly URBI is computed the for each country. With GDPI, URBI, and HCI as predictors of the EGRI, multiple regression has been run to obtain an appropriate model of e-government readiness. The SPSS returns the R square value (.783) as significant ($p < .05$) explaining that GDPI, URBI, and HCI together account for nearly 78 per cent variations in the EGRI. The model parameters are shown in Table-4. The following regression model is thus developed for the given data set.

EGRI = .09 + .296(GDPI) + .138(URBI) + .320 (HCI)

Table-4 indicates that the contributions of gross domestic product and literacy are significant ($p<0.05$) in this model. Urbanization too has got a positive relationship with e-government readiness but its share is insignificant.

Table-4: Regression Model

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	9.355E-02	.063		1.494	.146
GDPI	.296	.071	.468	4.167	.000
URBI	.138	.078	.234	1.764	.088
HCI	.320	.093	.376	3.440	.002

Conclusions

E-government at the national level makes a governmental system interactive, cost-effective, quicker, and provides quality service. It is basically a system that deals with information and knowledge sharing among the stakeholders through information and communication technologies. The United Nations has begun, in 2003, to survey the whole world for its e-government readiness. Till date four such surveys have been conducted. The readiness of a country for e-governance is a composite measurement of its literacy (human capital), telecommunication infrastructure, and the ability of the national web site. The present paper aims at tracing the e-government readiness profile of the Asian countries, divided into five zones by the surveys, with special reference to India and the United Arab Emirates. This study also attempts to develop an e-government readiness model explaining the contribution of socio-economic factors. The major findings of the study are summarized below.

- Referring to the e-government scenario, India is lagging behind not only the developed countries in the region but also many other countries, which are at an equal or even lower footing than India in the world. The UAE, however, seems to be performing well above the world's average.
- India improved its EGRI by 2% and the UAE by 18% against the world's average increase of 12% during the period 2003-2008.
- The EGRI has strongest correlation with TCII in comparison with the other two indices, WMI and HCI.
- The economic structure of a country matters for its e-government readiness.
- Regarding the socio-economic factors, this has been found that gross domestic product and literacy affect the e-government readiness significantly.

Reaping benefits from e-government implementation depends on the adequacy and quality of education, economy, and ICT infrastructure. The outcomes of this study are, therefore, likely to help the concerned governments rank order their policies related to such issues. This would facilitate the efforts of making e-government systems more successful. One major limitation of the study is the use of the data that are generated by the UN using a particular survey methodology. The EGRI of a country does not necessarily present the actual picture of its e-governance capabilities and outcomes but gives a relative position only. Moreover, the economic and social structure of countries is not reflected in their EGRIs. The sample size also is not sufficient enough to generalize the results, particularly the regression model. To extend this work beyond its present scope and constraints, absolute values of the variables may be considered instead of their relative values, the indices, as have been used in this study.

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Appendix

Note: Refer to pages 12-17 and 218-224 of the United Nations e-Government Survey 2008 for detailed methodology. The following paragraphs are extracted from these pages to provide the readers with a ready reference.

The United Nations e-Government Readiness Index 2008

The e-government readiness index is a composite index comprising the web measure index, the telecommunication infrastructure index and the human capital index. This Survey focuses mainly on the 'government to citizen' (G to C) and 'government to government' (G to G) aspects of e-government. Although, this current Survey captures some elements of 'government to business' (G to B), it is a relatively small part of the Survey.

The Web Measure Index

As in previous surveys, the web measure index 2008 is based upon a five-stage model, which builds upon the previous levels of sophistication of a Member State's online presence. As a country migrates upwards through the various stages, it is ranked higher in the web measure index.All of the 192 Member States were assessed in 2007. The web measure survey assessments were based on a questionnaire, which allocated a binary value to the indicator based on the presence/absence of specific electronic facilities/services available. The primary site was the national portal or the official government home page of the Member States. Where no official portals were available, other governmental sites were assessed. The Survey assessed the same number of functionalities of the same or similar sites in each country to ensure consistency. In keeping with its conceptual framework of human development, these are the Ministries/Departments of Health, Education, Social Welfare, Labour and Finance, which are representative of the government services citizens require most. Each ministerial site was assessed on the basis of the same set of questions. This assessment of online services was conducted in October and November of 2007. All the sites were checked several times during those months before the data was validated in order to capture the most recent information and services from these sites.

Telecommunication Infrastructure Index

The telecommunication infrastructure index 2008 is a composite index of five primary indices relating to a country's infrastructure capacity as they relate to the delivery of e-government services. These are:

1. Internet Users /100 persons
2. PCs /100 persons
3. Main Telephones Lines /100 persons
4. Cellular telephones /100 persons
5. Broad banding /100 persons

Each index represents 20 per cent of the overall telecommunication infrastructure index. The source of the telecommunication infrastructure data obtained for each Member State is the United Nations International Telecommunication Union (ITU). Constructing five separate indices for the indicators standardizes the data across countries.

Human Capital Index

The human capital index is a composite of the adult literacy rate and the combined primary, secondary and tertiary gross enrolment ratio, with two thirds weight given to the adult literacy rate and one third to the gross enrolment ratio. The data for the adult literacy rate and the gross enrolment ratio was drawn primarily from the United Nations Educational, Scientific and Cultural Organization (UNESCO). This was supplemented with data from the UNDP Human Development Report.