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## **Technological equity: an international perspective of e-government and societal divides**

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**Abstract:** The following paper looks at technological equity from an international perspective. Utilising survey data of international municipal Web portals as well as existing United Nations data, this research evaluates existing divides throughout the world. We also note that there exists a relationship between the digital divide and other societal divides. Therefore, we conclude that the 'digital divide' should continue to fall within the discussion of social equity, given the continued dependence of government to provide service via the internet.

**Keywords:** e-government; web portal; municipalities; digital divide; human development; GDP; education; technological equity; internet penetration; citizen participation.

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## 1 Introduction

The context for this research underscores the growing use of the internet by government entities. Moreover, with a continued use and dependence on technology, there comes the risk of technological divides. The importance of this research is to highlight current trends in technological equity and the digital divides, which exist throughout the world and to explore its potential relationship with existing societal divides.

The continued growth of the internet and the use of Information and Communication Technologies (ICTs) by municipalities has fostered an age of online government services throughout the world. The use of ICTs by government entities has introduced the concept of e-government to both scholars and practitioners. As noted by a study of the United Nations,

“e-government, the application of ICTs within public administration to optimise its internal and external functions, provides government and business with a set of tools that can potentially transform the way in which interactions take place, services are delivered ... and citizens participate in governance ...” (UNDESA, 2003, p.1)

According to Liikanen (2003, p.5) e-government is defined as

“the use of information and communication technology in public administrations combined with organisational change and new skills in order to improve public services and democratic processes and strengthen support for public policies.”

Norris et al. define e-government as “... the delivery of services and information, electronically, to businesses and residents, 24 h a day, seven days a week” (Norris et al., 2001, p.5). E-government as a system overcomes geographical and time constraints, with the potential to transform the relationship between government, citizens and businesses (Lee et al., 2008). Carter and Belanger (2005) identified three main benefits of e-government: increased government accountability to citizens; greater public access to information; and a more efficient, cost-effective government. With this increasing use of online technologies for government services, e-government has also resulted in a divide between those who are able to utilise these online services and those who cannot. The ‘digital divide’ can take many forms and this research seeks to highlight the emergence of a divide across international municipalities.

Given the existence of technological and societal divides, our first research question focuses on the existing divides in e-government. Based on existing international e-government data we seek to review the current trends of the digital divide worldwide. Is the divide increasing, decreasing or stabilising? A second research question, but critical for future research of e-government, is the digital divide reflective of other societal divides throughout the world? The underlining objective of this research is to highlight the trends of the digital divide and its potential relationship with societal divides. By exploring these relationships, it can potentially help bring the digital divide to the

forefront of research. If the digital divide research remains at the margins of e-government, then the risk of such existing technological divides could widen. To this end we will begin this research paper with an overview of the existing data and a literature review so as to provide a framework for the research. Second, the methodology utilised for this research is discussed, highlighting the approach taken to obtain research data. Next, the results of the survey data are presented followed by a discussion of our findings. Finally, we conclude with our limitations and opportunities for future research based on our findings.

## **2 Literature review**

### *2.1 E-government data*

The data for this paper is based on a study of global municipal web portals conducted through a collaboration between the E-Governance Institute at Rutgers-Newark, USA, and the Global e-Policy e-Government Institute at Sungkyunkwan University in Seoul, South Korea. The joint study ranked municipalities worldwide based on their scores in five e-governance categories of security and privacy, usability, content, services and citizen participation. Initial surveys conducted in 2003 and 2005 indicated a growing digital divide between cities across the globe. However, the 2007 survey points toward a closing or slowing down of the digital divide. In this research, digital divide is defined as the difference in the average e-governance scores between the cities belonging to the Organisation for Economic and Co-operation Development (OECD) and non-OECD nations among those evaluated in the Digital Governance in Municipalities Worldwide Surveys.

In a 2007 study, Holzer and Manoharan (2009) highlighted how most of the research on e-government performance has focused primarily on the public agency, with less consideration of the societal impact of providing services online. This is a theoretical tenant not uncommon in public management research. When evaluating key questions of public management – there exists an underlying omission of the social consequences of public administration in a democratic society (Kirlin, 1996). In these regards, the emergence of e-government brings with it the risk of a digital divide throughout the world with both developed and developing nations. The concept of the digital divide is often associated with the lack of access and resources by citizens to utilise technology. The digital divide is not only relegated to people's access, but it can also be applicable to service provision by national governments.

There exists a divide among nations in the degree and performance of online service delivery or e-government functionality. As noted in a United Nations report,

“the network society is creating parallel communications systems: one for those with income, education and literal connections, giving plentiful information at low cost and high speed; the other for those without connections, blocked by high barriers of time, cost and uncertainty and dependent upon outdated information.” (UNDP, 1999, p.63)

We review the divide among large municipalities throughout the world via their online services and functionality, while also attempting to further understand the relationship of this digital divide to other divides – social, political, economic and literacy divides among nations, particularly those between OECD and non-OECD nations.

## 2.2 *The digital divide*

The general definition of the digital divide highlights the gap between those who have access to ICTs and those who do not. The US Department of Commerce's (1999) study of the digital divide identified a persistence in the divide between

“the information rich (such as Whites, Asians/Pacific Islanders, those with higher incomes, those more educated, and dual-parent households), and the information poor (such as those who are younger, those with lower incomes and education levels, certain minorities, and those in rural areas or central cities).” (p.16)

The biggest concern with the emergence of the digital divide is the potential for a growing division of the society and creation of the fourth world as Castells had predicted in the *End of Millennium*. The fourth world represents a population which lacks access to technology and would be burdened with inequality, poverty and disempowerment (Castells, 2000).

Compaine (2001) argues that the digital divide is not an “over-hyped nonissue”, providing data supporting the existence of a divide apparent along racial, economic, ethnic, and education lines. Compaine goes on to point that by the turn of the century the gaps had become increasingly smaller (2001). The divide has become stabilised in terms of computer ownership, but internet access continues to be an issue, especially with the advent of high-speed access (US Department of Commerce, 2000). The digital divide also includes the design barriers of government websites (Becker, 2004). Online accessibility still falls short of expectations, even with federal websites where being accessible is mandated (Stowers, 2004). Mossberger et al. (2003) propose moving the traditional definitions of digital divide, which focuses on ‘access’, to a broader definition that includes the lack of skills and economic opportunity necessary for effective technology use.

Kuttan and Peters (2003) capture the various types of divides and outline them as IT usability, computer access, and broadband speed and internet access. In terms of IT usability, a government's website should be easy to navigate and user-friendly. Not everyone has the IT training or experience to navigate through a website efficiently and effectively. Moreover, there is an increasingly growing expectation that governments provide certain online privacy protections, services, and modes for online participation. Similarly, Keniston and Kumar (2004) outline the divide into four categories. The first category is a

“massive digital divide based on income, related to education and urban residence, and correlated with economic, political and cultural power.” (Keniston and Kumar, 2004, p.13)

The second divide among English-speaking nations of USA, UK Canada, New Zealand, Australia, as well as those nations with large English-speaking populations like India, South Africa, Singapore and Hong Kong and those nations where the English language is less prominent. Keniston and Kumar refer to this as the “Anglo-Saxon linguistic and cultural hegemony” (p.16). The third divide is among the Northern nations that are information-rich and the Southern nations that are information-poor. The fourth divide refers to the creation of new professional elite, made up of computer engineers who have reaped huge benefits from the IT revolution (p.17). Jones (2003) proposes the following dimensions: social divide between the information rich and information poor; global

divide between developed and developing nations; and democratic divide between those who use internet for civic participation and those who do not. Jones concludes that such divides are dependent on three unique aspects: “access to ICTs, access to appropriate content and geopolitical aspects” (p.138).

The concept of access to information and its relationships to one’s socio-economic status is not new to the internet age. Tichenor et al. (1970) pointed out that

“segments of the population with higher socio-economic status tend to acquire information at a faster rate than the lower segments so that the gap in knowledge in these tends to increase rather than decrease.”

Along these lines, van Dijk (2005) views the digital divide as a “social and political problem, not a technological one”. Gorla (2008) considers digital divide as a consequence of inequitable distribution of technology, compounded by poverty, illiteracy and other social problems. As Holzer and Manoharan (2009) have previously asked, is the divide between the ‘haves’ and ‘have-nots’ merely an extension of the existing inequalities between the two in terms of standard of living, education, employment levels, access to infrastructure and expertise both with regard to population and nations? To address this question, their research reviewed the association of the digital divide to other divides – social, political, economic and literacy divides among nations, particularly those between OECD and non-OECD nations.

Beginning in 2003, the Digital Governance in Municipalities Survey was conducted by the E-Governance Institute at Rutgers-Newark, USA and the Global e-Policy e-Government Institute at Sungkyunkwan University in Seoul (Appendix – Table A). The initial study, as well as two subsequent studies ranked municipalities worldwide based on their scores in five e-governance categories of security and privacy, usability, content, services and citizen participation. The survey was repeated in 2005 and 2007 to assess the longitudinal trends in municipal e-governance across the most wired nations of the world and the results indicate a growing digital divide among the cities evaluated. Overall, the average score for OECD nations in 2007 was 45.00 while that of the non-OECD nations was 27.46, resulting in a gap of 17.54 points. This gap represented a decrease from a 17.85-point gap in the 2005 survey (Table 1).

**Table 1** Worldwide e-government average scores of OECD and non-OECD nations

	<i>OECD</i>	<i>Average</i>	<i>Non-OECD</i>	<i>Difference</i>
2007 overall averages	45.00	33.37	27.46	17.54
2005 overall averages	44.35	33.11	26.50	17.85
2003 overall averages	36.34	28.49	24.36	11.98

### 3 Methodology

We define the digital divide as the differences among the average e-governance scores between the cities belonging to the OECD and non-OECD nations among those evaluated in the Digital Governance in Municipalities Worldwide Survey 2003, 2005 and 2007. The OECD consists of 30 nations and the largest municipality in each nation was

evaluated including those of 51 non-OECD nations. This digital divide is then compared to the divides in five different factors – education level, GDP, life expectancy, number of online users and number of computers between OECD and non-OECD nations. These divides are assessed for the years 2003, 2005 and 2007 to determine if they reflect the direction of digital divide between OECD and non-OECD nations. The measures for education level, life expectancy and GDP are obtained from the UN Human Development Report (UNHDR, 2007), which ranks nations based on a combination of three important factors – healthy life, access to knowledge, and standard of living. These factors are measured by life expectancy, literacy rates, and enrolment at primary, secondary and tertiary level of education and GDP per capita. The life expectancy measures are obtained from the World Population Prospects: 1950–2050, prepared biannually by the United Nations Department of Economic and Social Affairs Population Division. The adult literacy rate is based on the statistics from the United Nations Educational, Social and Cultural Organisation (UNESCO).

The measures for the number of online users and number of computers in each nation are obtained for each from the International Telecommunication Union (ITU), an organisation affiliated with the United Nations (UN). The Rutgers-SKKU E-Governance Survey focused on cities worldwide and considered their population size and the total number of online users in the nation overall. The top 100 municipalities were selected using the ITU data from a total of 196 countries for which telecommunications data was reported. Those nations with an online population over 160,000 were identified as the top 100 wired nations, and the most populated cities in these nations were surveyed. Of the 100 cities, 81 were included in the overall rankings, excluding the 19 municipalities where no official Web portals were available.

#### **4 Data analysis and results**

The scores of the municipal Web portals have been used as a basis for comparison of the education level, life expectancy and GDP values obtained from the UN Human Development Report; as well as the number of online users per 100 inhabitants and number of computers per 100 inhabitants obtained from the ITU Report for 2005 and 2007.

Overall, the average score for OECD nations in 2007 was 45.00 while that of the non-OECD nations was 27.46, thus resulting in a gap of 17.54. This is a slight decrease from the previous two-year gap observed from 2003 and 2005. The initial gap of 11.98, in the 2003 survey, significantly increased in 2005, but has now slowed, or rather decreased, to 17.54. The significance of this slowing of the digital divide can be attributed to greater gains in e-governance performance by non-OECD nations. Table 2 highlights how these gaps are represented in each of the five e-governance categories outlined by the Rutgers-SKKU E-Governance Survey for the most recent study conducted in 2007.

When we evaluate the digital divide with other societal divides, we find that there is a similar regression of existing divides. The human development index developed by the United Nations highlights an overall decrease among OECD and non-OECD nations. The human development index is a combination of various factors and variables which, when looked at independently, also reflect a decreasing divide. For example, the life expectancy divide has decreased in the gap among nations from 0.175 to the recent

score of 0.155. Similarly, the educational index and GDP among non-OECD nations has closed in comparison to the previous years.

**Table 2** Average score and gap of e-governance categories in OECD member and non-member countries (2007)

	<i>Usability</i>	<i>Content</i>	<i>Service</i>	<i>Privacy and security</i>	<i>Citizen participation</i>
OECD member countries	13.64	10.15	8.33	7.74	5.14
Average score gap	2.56	3.88	3.82	4.90	2.40
Non-OECD member countries	11.08	6.27	4.51	2.84	2.74

In addition to societal factors, technological divides are also decreasing in terms of mobile cellular subscribers and overall internet users within non-OECD nations. The divide among mobile cellular users decreased from a divide score of 39.5 in 2005 to a 28.89 in 2007. Although not a drastic close in the gap, the divide among internet users in non-OECD nations also decreased slightly from 2005 to 2007.

The overall closing of societal and technological divides is critical to recognise as this reflects that overall efforts to become more socially equitable across nations have been effective. The exact reasons for the closing of digital divides cannot be specifically pinpointed, but it is evident that significant strides have been taken in efforts to close societal divides. Although the data below, in Table 3, only highlights the overall average scores of OECD and non-OECD nations, the results from three distinct sources point to one common finding; there is a slowing of existing societal and digital divides.

Data analysis for this research comes short of performing a statistical analysis such as correlation, given the relatively small sample of years (2005 and 2007). This research will continue to be conducted and the resulting data released by the United Nations and Rutgers' E-Governance Institute, providing future research to further analyse technological divides. With that said, it is clearly evident from the data presented here that based on the relative changes in the divides across the areas presented there is a high correlation across each content area.<sup>1</sup>

**Table 3** Digital and societal divide of OECD and non-OECD nations

<i>Year</i>	<i>Digital divide</i> <sup>2</sup>	<i>Human development</i> <sup>3</sup>	<i>Life expectancy</i> <sup>2</sup>	<i>Education index</i> <sup>2</sup>	<i>GDP index</i> <sup>2</sup>	<i>Mobile cellular subscribers (per 100 inhabitants)</i> <sup>4</sup>	<i>Internet users (per 100 inhabitants)</i> <sup>4</sup>
2007	17.54	0.155	0.128	0.116	0.219	28.89	36.35
2005	17.85	0.175	0.146	0.145	0.233	39.50	37.05

## 5 Discussion

There has been a push for bridging the digital divide in developing nations. The G-8 formed a special task force, the Digital Operating Task Force, in order to provide strategic solutions to bridge the digital divide existing in the developing nations. The Task Force was quick to implement its plans and proposed a network among nations

to provide the developing nations with expertise on the policies and regulatory frameworks for bridging the divide (DOT, 2002). It could be argued that many of these initial efforts are now starting to reflect positive impact in closing the divide among developing nations. Based on the findings, efforts that have been taken in both the digital world and the world at large to close existing divides should continue. In respect to the digital divide, specific aims can and should continue to be taken to help narrow existing technological divides. As Holzer and Manoharan (2009) first proposed in their analysis of the growing divide from 2003 to 2005, based on the same data explored here, we want to reinforce key factors that can help continue to close the divide, most notably, computer education, infrastructure and a governmental focus on e-readiness.

Digital divide needs to be viewed in terms of social divides rather than just technical access. The divide is also a function of the digital skill level of the population to use technology that is relevant to improving their lives. Among the various social factors affecting the digital divide it is perhaps the educational factor that needs to be addressed more than others. Closing the gap will involve not just placing computers in schools and colleges, but also a considerable amount of instructor training in governmental institutions. Much of the development of East Asian nations can be attributed to simultaneous investments in technology and education

Technological infrastructure allows for both sustainability and progress in e-governance. Investing in technology infrastructure will help reach not only the upper levels of society in developing nations but also set the foundation for reaching out to all parts of the nation's society. The basic telecommunication network of a nation highlights the potential internet infrastructure, and other advanced communication infrastructure, for that nation. By focusing on tele-connectivity overall, a nation is setting the necessary ground work for a well wired nation.

Utilising open source software can, collectively reduce the high cost of technology along with the cost of access. By adopting open source software, the cost of implementation and sustainability can be heavily reduced and in the long run allow for the expansion of e-governance. As noted by Halse and Terzoli, in 2002 a major computer firm offered to provide free access to select their software that would save high costs for the Government of South Africa in their effort to bridge the digital divide but many computers that were provided to schools were used computers that could not support the newer versions of the software (Halse and Terzoli, 2002, p.1). Therefore, when one invests in the latest software, it also becomes necessary to invest in newer hardware. So they suggest utilising open-sourced software over commercial investments.

Bridging the digital divide requires the use of innovative technologies, especially by many of the non-OECD nations wanting to catch up in terms of information and communication technology. Many nations are now recognising the potential of m-government, or mobile-government, fuelled by the rapid growth in the use of mobile technology. This growth has extended the boundaries of the internet from computers to mobile carriers (Sheng and Trimi, 2008). Owing to its unique advantages of 'mobility' and 'wirelessness', m-government holds tremendous potential in bridging the digital divide by helping developing nations overcome obstacles in terms of infrastructure and costs. According to Sheng and Trimi (2008), "the advancements in MT enable a natural transition from the era of e-government to the era of m-government". Mobile technology also holds potential to accelerate the much-needed business developments in developing nations by transforming business transactions, owing to the rapid increase in mobile commerce (Seeman et al., 2007).

E-government has also often been viewed from a supply-side perspective; however, the demand perspective should also be considered in providing online services and in this regard the e-readiness of nations should be an important consideration. Kirkman et al. (2002) define e-readiness as “the degree to which a community is prepared, and has the potential, to participate in the Networked World”. According to the Global Internet Policy Initiative,

“e-readiness refers to a country’s ability to take advantage of the internet as an engine of economic growth and human development. E-readiness has several components, including telecommunications infrastructure, human resources, and legal and policy framework.” (Global Internet Policy Initiative, 2005)

The implementation of e-government, especially in non-OECD nations requires a series of steps that starts with identifying if the people are ready to accept ICT for their development. Many scholars have developed indicators of e-readiness to measure the degree of receptiveness of information tools in nations. Ifinedo and Davidrajuh (2005) used an e-readiness factor comprising of three blocks – demand forces, supply forces and societal infrastructure to study the digital divide in the Nordic region of Europe. According to Ghapanchi et al. (2008), e-government implementation in developing nations involves unique challenges as well as opportunities, especially when taken in consideration of providing socio-economic development. They suggest a holistic approach along with a comprehensive framework in implementing e-government strategies.

## **6 Conclusion**

E-government continues to grow among governments throughout the world with an increase in online services at federal, state and local levels. Measures of online public service delivery should focus more on its impact on society rather than operational features of public organisations. This approach is challenging, since societal consequences can be attributed to various inter-related factors. The digital divide is, in part, dependent on the complex network of physical, social, economical and political factors. Digital inequality also has a major effect on citizen participation and trust in government. When governments make decisions, it is necessary for such information to reach all sections of the population. Access to internet, television and radio has greatly enabled the poorer sections of the population to have access to government information. The internet, however, has an edge over other means of information dissemination as it provides an interactive platform where citizens from any part of the region can interact with the government machinery. Use of the internet and other ICT tools develop the foundation for a more accountable and transparent government. E-voting, e-polls, e-taxes and other aspects of e-government are some of the steps in bridging the digital divide and thus build a strong foundation for a truly democratic nation.

By refocusing on being able to provide online public services, governments will be able to recognise existing digital divides through a comparison of e-government practices. In this research, we have highlighted the digital divide between the developed and developing nations. The digital divide among the OECD and non-OECD nations is closely associated with the number of online users and the overall technological infrastructure of nations as well as social factors such as human development and

education. Therefore, efforts in bridging the digital divide should focus on sustaining and developing the infrastructure, as well as developing appropriate computer hardware and software.

We have reviewed the current state of technological equity from an international perspective. By analysing municipal Web portals, we have highlighted the digital divide from an e-governance standpoint between developed and developing nations. Although the concept of the digital divide, within the context of e-government, is often associated with the lack of access and resources by citizens to utilise technology in working with government, we have noted various other divides. The digital divide among the OECD and non-OECD nations is closely associated with the number of online users and the overall technological infrastructure of nations as well as social factors such as human development and education. The relationship between the digital divide reflects other societal divides and given the continued dependence of government to provide service via the internet, the digital divide should continue to fall within the framework of social equity.

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## Notes

- <sup>1</sup>Using Microsoft's Excel Correlation function, the digital and societal divides are highly correlated >0.9.

<sup>2</sup>Data for the digital divide reflects the difference between the average scores of OECD and non-OECD nations surveyed in Rutgers-SKKU E-Governance 2007 and 2005 Surveys.

<sup>3</sup>Data for the social divides of OECD and non-OECD nations for the Human Development Index, Life expectancy Index, Education Index, and GDP index represents the two most recent accessible data years from the UN Human Development Reports 2003 and 2006.

<sup>4</sup>The Mobile Cellular and Internet Users data taken from the ITU Reports for 2005 and 2007 highlights the divide between OECD and non-OECD nations.

## Appendix

**Table A** *Digital Governance in Municipalities Survey* conducted by the e-governance institute at Rutgers-Newark, USA and the global e-policy e-government institute at Sungkyunkwan University in Seoul

<i>E-governance category</i>	<i>Key concepts</i>	<i>Raw score</i>	<i>Weighted score</i>	<i>Keywords</i>
Security/privacy	18	25	20	Privacy policies, authentication, encryption, data management, and use of cookies
Usability	20	32	20	User-friendly design, branding, length of homepage, targeted audience links or channels, and site search capabilities
Content	20	48	20	Access to current accurate information, public documents, reports, publications, and multimedia materials
Service	20	59	20	Transactional services involving purchase or register, interaction between citizens, businesses and government
Citizen participation	20	55	20	Online civic engagement, internet based policy deliberation, and citizen based performance measurement
Total	98	219	100	