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Abstract

This paper reports the results of two studies that investigated factors that influence the digital divide at the macro level. We propose a telecommunications infrastructure index as a measure of the country-level digital divide that is composed of five primary indices that define a country's ICT infrastructure capacity. The first part of the analysis identifies economic, socio-demographic, political, and cultural factors that differentiate 86 developed and developing countries. The second part of the analysis examines factors that differentiate ICT penetration rates for 21 Arab nations. Overall, results show that for the 86 countries political variables are the most important factor that influences the digital divide. Cultural differences, specifically gender disparities in literacy, influence the digital divide in the 21 Arab countries. The availability of secondary data published by official government sources is a serious limitation. Nonetheless, this research has practical and managerial implications for public management and for policy makers, including information about how to segment citizens into more refined groups to facilitate better resource allocation; development of policies designed to raise the literacy level, particularly ones that are specifically targeted at educating women; and training programs to educate the underserved about technology and to provide subsidized access to disadvantaged people.

Keywords: Digital Divide, Macro-level country analysis, Political disparities, Cultural disparities.

1   Introduction

Extensive research provides irrefutable evidence that the digital divide is substantial. A comparative analysis of developed, transitional, and developing economies finds that a significant digital divide separates regions and countries and developed, transitional, developing, and least developed economies (UNPAN 2008). Information and communication technologies (ICTs) and Internet penetration rates are uneven even for countries in the same region and for nations with similar cultures and languages (Internet Usage Statistics 2010; UNDP 2009; UNPAN 2005, 2008; UNDESA 2008). For example, regional Internet penetration rates in 2010 varied significantly: 11% in Africa, 30% in the Middle East, 58% in Europe, and 77% in North America. Internet penetration rates in 2010 for 15 countries in the Middle East were estimated at 88% for Bahrain and under 2% for Yemen (Internet Usage Statistics 2010).

The aim of this communication is to extend and enrich the research literature on the digital divide, specifically to understand the principal reasons for country-level digital disparities. We discuss findings from a comparative analysis of economic, socio-demographic, political, and cultural factors that influence digital disparities in 86 developed and developing countries and investigate specific factors that impact an Arab inter-country digital divide. Indices that define a country's ICT infrastructure capacity are constructed. The comparison between the world and Arab digital divides isolates the factors that are relevant to the Arab context and contributes to the paucity of research on Arab countries. The analysis relies on secondary data obtained from various official published sources.

Section 2 provides a working definition of the 'digital divide', describes various theoretical lens that have been applied to understand the digital divide, and discusses how to measure the digital divide at the macro level and the economic, socio-demographic, political, and cultural factors related to inter-countries digital disparities. Section 3 discusses the development of the World and Arab inter-countries models, statistical methods, results of our analysis, and limitations of the data. Section 4 summarizes the key findings and very briefly suggests their implications for scholars, managers, and policy makers.

2   Conceptualizing the digital divide

2.1   Definitions and theories of the digital divide

The term "digital divide" has been widely used by scholars to connote the intricate interactions between information and communication technologies (ICTs) and individuals and groups that derive from social inequality and disadvantage. During the 1990s, the first efforts to examine these interactions focused largely on inequalities and disadvantage related to computer and ICT technology access, including ownership, availability, affordability, and its infrastructure (Bertot et al. 2008; NTIA 2000; OECD 2001). This became known as a 'first order effect', which represents the inequality in ICT access (e-access divide). By the early 21st century, digital divide analysis evolved to identify individual capabilities or digital skills (van Dijk and Hacker 2003; DiMaggio et al. 2004). Scholars labelled this a 'second order effect', which represents inequality in the skills or digital competence necessary for ICT use (e-skills divide) (Hargittai 2002). Harfouche (2010) proposed a 'third order effect' that represents the inequality related to ICT acceptance.

A very large body of research since the 1990s has been conducted on the digital divide on different units of analysis, including individuals, households, organizations, communities, regions, and nations.[1] The digital divide can also be measured at domestic and international levels (Çilan et al. 2009; Stump et al. 2008). A "domestic digital divide" refers to the gap in access and skills to use ICTs between citizens of the same country. An "international digital divide" refers to the gap between countries.

Çilan et al. (2009, p. 99) contend that identifying appropriate measures of a digital divide is problematic' because we lack a theoretical framework to describe the information society and digital divide. Vehovar et al. (2006) concur that a 'general conceptual framework is lacking' (p. 280) and note that there is 'not just one divide but a number of different divides' (p. 281) and that methodological issues must also be addressed. Although we may not have (a) specific theory(ies) about the information society or the digital divide, theoretical lenses undergird analyses and have been applied to understand social inequality and disadvantage and their relationship to ICT access and use.[2]

Dominant among these has been the sociological that has investigated the structural and social-psychological antecedents and correlates of ICT use by individuals, culminating in a large body of research literature that has identified social-demographic characteristics, culture, human capital, cognition, and motivational factors. Economic and econometric theories have focused on informational capital, firms, market segmentation, and geographic and country-level disparities Diffusion of innovation theory has been applied to study factors that influence the adoption of home technology and public services. A technology lens has focused on design interfaces to encourage technology use. Critical and discourse theories have yielded an understanding of the power of the metaphor and rationalizations and justifications for a 'divide'. Policy and political lenses have illuminated how political factors interact with and influence the adoption of technologies to achieve policy goals such as to advance the information society, IT literacy, governance, and the social welfare of citizens and to foster acceptance of e-government.

What research based on these theoretical frameworks suggests is that many factors may be responsible for a digital divide, no matter the unit or level of analysis. As van Dijk and Hacker (2003, p. 315) comment: the concept is a "complex and dynamic phenomenon" and Vehovar et al. (2006) note that the concept yields a number of measurement issues that must be dealt with. Analysis must be multi-dimensional and multi-perspective (Helbig et al. 2009) because the digital divide is embedded in a socio-economic, demographic, cultural, and political context. Our communication focuses on the international and inter-country digital divide and these contextual differences between countries.

2.2 How to measure the digital divide at the macro (country-) level

Some studies calculate the number of Internet hosts in a country to measure the digital divide, while other studies calculate the number of Internet users as a percentage of the population. However, these kinds of measures reveal very little about the nature of a country-level digital divide, particularly if only one set of data is relied on.

Instead, we propose a telecommunications infrastructure index as a measure of the country-level digital divide (UNDESA 2008; UNPAN 2005). This telecommunications infrastructure index is composed of five primary indices based on infrastructural indicators that define a country's ICT infrastructure capacity. These indices constitute the causal indicators: personal computer ownership, number of ADSL subscribers, size of online population, number of mobile phones, and number of fixed telephone lines. These indices are not measured in absolute terms, that is, as the total number of personal computer, Internet, broadband, mobile phone, and telephone line users in a country. Rather,

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[1] A google scholar search of the phrase 'digital divide' yields around 810,000 primary and secondary references (search conducted 21 June 2011).
[2] An enormous literature on the digital divide exists. Page limitations constrain the number of cited works.

the indices are measured in relative terms as an indicator weighted by population size. This implies that these indexes reflect the demand side of the digital divide. Thus, the digital divide is the inverse of the telecommunications infrastructure. The infrastructure index is a formative construct because changes in its measures cause changes in the construct (Jarvis et al. 2003). The five indices are formative because they are not interchangeable.

We cannot, however, examine the reasons for the Arab inter-countries digital divide in the same way because our sample size of 21 Arab countries is too small. Instead, the digital divide is measured only by an Internet diffusion rate. Gefen et al. (2000) have recommended a minimal sample size of at least ten times the number of items in most complex constructs. As such, we need to limit our constructs to only one measure. We calculated the Internet diffusion rate by weighting the number of users per country by the population of that country (James 2008, p. 2).

Research into the determinants of the country-level digital divide has shown that the most significant factors are: economic differences (per capita GDP), socio-demographic differences (human development index), political democracy, and cultural factors (gender disparities). Similar factors characterize the inter-countries Arab World digital divide: economic differences (per capita GDP), (e.g., Stump et al. 2008; Dewan et al. 2005, p. 411), socio-demographic differences (gross enrolment ratio (e.g., Carvin 2000), cultural differences (female literacy rate, e.g., Jackson et al. 2008), and political democracy (civil liberty, e.g., Beilock and Dimitrova 2003; Robison and Crenshaw 2001).

2.3   Economic disparities between countries

The first category of variables that impact the digital-divide at the country level is economic disparities. Per capita gross domestic product is the variable most often used by scholars to measure a country's wealth. In studying the country-level digital divide across successive generations of ICT (mainframes, personal computers, and the Internet), Dewan et al. (2005) found that the most significant factors that affect the digital divide are economic factors, particularly per capita GDP (p. 411). Raghbendra and Majumdar (1999) argued that greater per capita GDP signifies greater affordability for more members of a country's population. According to Howard et al. (2009), rich countries have the highest rates of access to technology. Norris (2001) contends that the country level of economic development is a key variable for explaining the differential outcomes in Internet diffusion. Thus, we expect a positive relationship between economic disparities factors and all the measures of the digital divide. Hence,

> H1a. The higher the GDP per capita, the higher the telecommunications
> infrastructure index.

In the Arab World, low-income countries like Comoros, Mauritania, Djibouti, Soudan, Iraq, Yemen, and Somalia have less than 3% Internet penetration, while high-income countries like the United Arab Emirates, Kuwait, Bahrain, and Qatar have more than 30%. In all Arab countries an Internet connection costs between 25 and 50 US$ per month. Equipment and software are also expensive. This fact prevents ICTs and Internet access in low-income countries. As such, we suspect that the disparity in per capita GDP (expressed in U.S. dollar equivalents) between Arab nations can also explain the inter-counties Arab digital divide. Hence,

> **H1b**. In the Arab World, the higher the GDP per capita, the higher the Internet
> penetration rate.

Data related to per capita GDP are obtained from the *CIA Factbook* (2008).

2.4   Socio-demographic disparities between countries

Our second category of variables is socio-demographic and includes factors that affect access, e-skills, and ICT acceptance. The UNPAN 2005 report shows that the Internet and e-services require

education. This indicates the importance of education and literacy in today's society (this corresponds to the 'second order' or e-skills divide).

Two measures are included in this category. They are two composites of the human capital index (HCI) that is composed of the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio (UNPAN 2005). The adult literacy rate is computed as the percentage of people aged 15 years and above who can both read and write a short simple statement about their daily life. The gross enrolment ratio is the sum of primary, secondary, and tertiary enrolment ratio that is the total number of students enrolled at the primary, secondary and tertiary level regardless of age as a percentage of the population of school age for that level (UNDESA 2008). These two items are formative because each one employs different themes. The inclusion of these two formative measures is motivated by prior studies; indeed, many studies in IS include the stock of human capital in studying ICT penetration (see Dewan et al. 2005).

Because higher education levels can decrease the cost of training and increase the value of ICTs (Dewan et al. 2005), we expect that the adult literacy rate and gross enrolment ratio are likely to be positively associated with ICTs adoption. Hence,

> **H2a**. The higher the human capital index, the higher the telecommunications infrastructure index.

In comparing Arab countries we will consider only the adult literacy rate. It is estimated that 29.7% of Arabs are illiterate (UNDP 2009, Table H, p. 174). In some Arab countries such as Morocco, Yemen, Iraq, Mauritania, and Somalia, illiteracy is estimated at between 48% to 62% percent of the population. People with lower levels of functional literacy are less likely to use computer, Internet, and e-services. Hence,

> **H2b**. In the Arab world the higher the combined primary, secondary and tertiary gross enrolment ratio, the higher the Internet penetration rate.

Data related to country-level socio-demographic disparities will be obtained from the education index of the 2008 UNDESA report (UNDESA 2008).

2.5 Political democracy disparities

Government's monitoring and control can deter ICT use by citizens. Indeed, research results indicate that political freedom can increase Internet penetration rate. A cross-sectional analysis of 74 countries from the period 1995-1999 demonstrated that political democracy disparities (political freedom) between countries is one of the most significant factors to explain the digital divide. Studying the Internet diffusion rates in 21 countries, Mann and Rosen (2001) found evidence that a lack of political freedom is negatively associated with the rate of Internet diffusion. Beilock and Dimitrova's (2003) study of 105 countries identified a relationship between the digital divide and civil liberty disparities among countries. Similarly, Milner's (2006) study of 184 countries established that, on average, democracies have higher rates of Internet adoption than autocracies. Research by Corrales and Westhoff (2006) concluded that the authoritarian regimes discourage Internet use. Consequently, we expect that political democracy disparities are likely to be positively associated with the digital divide.

We use a democracy index to measure political democracy. Several international organizations conduct annual studies to determine different aspects related to democracy, civil liberties, and a country's freedom of expression. One of the most highly cited is The Economist Intelligence Unit (EIU) index that reflects the democratic disparity between nations (The Economist, 2008). The EIU calculates an annual democracy index based on the evaluation of 60 indicators rated on a 0 to 10 scale and grouped in five categories that employ formative measures: (1) electoral process and pluralism (free and fair competitive elections and satisfying related aspects of political freedom); (2) functioning of government (citizens freely make political decisions by majority rule); (3) political participation (active, freely chosen participation of citizens in public life); (4) political culture (losing parties and

their supporters accept the judgment of the voters and allow for the peaceful transfer of power); and (5) civil liberties (guarantees of basic human rights: freedom of speech, expression and the press, of religion, of assembly and association, and right to judicial due process). This disparity can predict the level of digital divides between countries. Hence,

> **H3a**. The higher the democracy index, the higher the telecommunications infrastructure index.

The lack of democracy in the Arab countries is dominant (Ali 1995), even following the Jasmine Revolution in Tunisia and the fall of the Mubarak regime in early 2011. Their power structures are characterised by strong traditional leaders who personalise the state and its aspirations and are another factor that influences their political development (Antoun 2009). In some Arab countries like Saudi Arabia, Bahrain, Syria, Iraq, Tunisia (until January 2011), Egypt (until January 2011), and Jordan, all Internet traffic passes through government-controlled gateways and governments monitor e-mail communication and ban access to unwanted sites. In contrast, in other countries like the United Arab Emirates, Lebanon, Algeria, and Morocco, governments have made efforts to limit their control over Internet access. Hence,

> **H3b**. In the Arab World, the higher the civil liberties, the higher the Internet penetration rate.

Data related to democracy index are obtained from the Economist Intelligence Unit (EIU 2008).

2.6   Cultural differences: The gender disparity

Today, influenced by the work of Hofstede (1980, 1983), there is a significant IS literature that assumes that each country has a distinctive and influential culture. Some IS researchers contend that a nation's culture can influence ICT acceptance or rejection (Hofstede 2001; Jackson et al. 2008; Straub 1994; Strite and Karahanna 2006; Van Birgelen et al. 2002). Hofstede's national cultural values index depicts a culture or a society in terms of values, one of which is gender difference (masculinity/feminity).

One of the many meanings given to the masculinity/femininity value is one that measures the variation in disparities between men and women. Calculating a gender equality index involves two steps: (1) Based on the Gender Empowerment Measure (UNDP 2008), percentages for females and males are calculated for: (a) the number of parliamentary seats held by women; (b) number of women legislators, senior officials, and managers; (c) number of professional and technical positions held by women; (d) estimated earned income, and (e) the number of illiterate women. (2) Then, for each area, pairs of gender percentages are combined into an equally distributed equivalent percentage that rewards gender equality and penalizes inequality.

This disparity between men and women is one factor that can explain the digital divide. Indeed, in many countries, many women remain outside the information society network and risk being marginalized. According to the 2005 UNPAN report, women have less access to advanced technologies than men. We posit:

> H4a. The higher the gender equality, the higher the telecommunications infrastructure index.

In the Arab World, a real divide separates women from men and women are at risk of social exclusion due to lower levels of education, lower digital skills, or lower income in some Arab countries (UNPAN 2005). In some countries such as Libya, Saudi Arabia, Syria, Oman, and Tunisia, the discrepancy between male and female literacy rates is significant. Despite the evolution of their rights and living conditions, 38% of Arab women are still illiterate (Karake Shalhoub 2004). Of the 101 million Arab illiterates, 65 million are women. Some progress has been made, however. But despite this progress, inequalities persist. We posit:

H4b. In the Arab World, the higher the women literacy level, the higher the Internet penetration rate.

Data related to the gender disparities are collected by the United Nations (UNDP 2008).

3   Methodology

Only countries for which complete data were available from the official government publications cited in Section 2 above are included in the 86-nation analysis and in the 21-nation Arab analysis.[3] We compared the telecommunications infrastructure index of the 86 countries and the Internet penetration rate for the 21 Arab countries to determine the influence of country-level economic, socio-demographic, political, and cultural factors on a country's digital divide. Data from the sources identified in Section 2 were analyzed using PLS. Two models are constructed. Figure 1 depicts the macro-level model for the 86-nation comparative analysis. Figure 2 represents the model used to compare the 21 Arab countries.

3.1   The 86-nation world and inter-Arab models

According to the Figure 1, 86-nation world model, the digital divide results from the economic, socio-demographic, political, and cultural disparities.
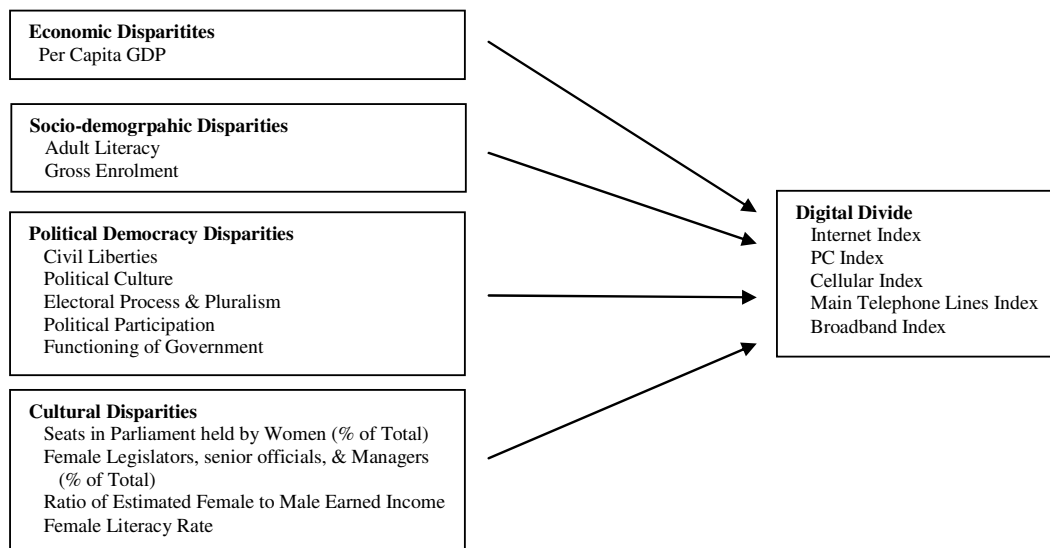

Figure 1 86-nation model of the antecedent factors of the digital divide

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[3] The 86 countries were drawn from a total population of N=198. The 21 Arab countries include: Saudi Arabia, Egypt, Algeria, United Arab Emirates, Kuwait, Morocco, Iraq, Syria, Sudan, Tunisia, Qatar, Libya, Oman, Yemen, Lebanon, Jordan, Bahrain, Mauritania, Somalia, Djibouti, and Comoros. The Palestinian territory is excluded because there is a significant amount of missing data for these four categories of variables.

The simplified inter-Arab countries model depicted in Figure 2 below measures the Internet penetration rate between the 21 Arab countries.
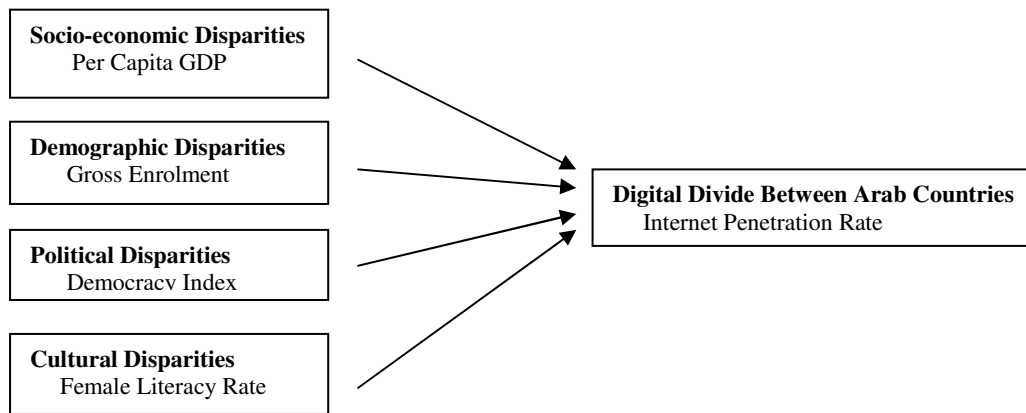

Figure 2 Inter-Arab countries model of the antecedents of the digital divide

3.2   Methods and results

To ensure that the construct validity of the formative multidimensional constructs is respected, we applied Loch's et al.'s (2003) variation of the multitrait-multimethod matrix. We multiplied values by their individual PLS weights and summed them for each construct. Then we created a weighted score for each measure and a composite score for each of these five formative constructs: digital divide, gender, democracy, education, and economic disparity. We used these new values to run inter-item correlations and item-to-construct correlations (Loch et al. 2003). Table 1 below presents the path coefficients and the significance levels for the 86 nation inter-countries and 21 Arab nation inter-countries analyses.

Using an inner model path weighting scheme indicates a good R^2 of 0.884 for the 86 nation inter-countries model (Figure 1). In order to test the significance testing of path estimates, we opted to use bootstrap resampling (200 resamples). All structural paths were found to be significant (results available from the authors). This 86 nation inter-countries model explains 88.4% of the telecommunication infrastructure index. Results show that the most significant factor that affects the telecommunications infrastructure index is the democracy index (path = 0.4430), followed by the GDP per capita (path = 0.2630), human capital index (path = 0.2360), and the gender equality index (path = 0.1540).

Using an inner model path weighting scheme shows a good R^2 of 0.658 for the 21 Arab nation inter-countries model (Figure 2). We tested the significance of path estimates with bootstrap resampling (200 resamples). All structural paths were found to be significant except the gross enrolment ratio. The Arab inter-countries model explains 65.8% of the Internet penetration rate. Results show that the most significant factor that affects the Internet penetration rate between the Arab countries is the female literacy level (path = 0.518), followed by the civil liberty index (path = 0.328) and per capita GDP (path = 0.170). The relationship between the gross enrolment ratio and the Internet penetration rate in the Arab world is not significant.

Table 1 below shows that the formative items load more highly on their respective construct than on other constructs for both models depicted in Figures 1 and 2. All formative items correlate significantly to their constructs (available from the authors).

Comparison of 86 Countries				Comparison of 21 Arab Countries			
Hypotheses	Path co-efficient	T-value	Hypothesis Supported	Hypotheses	Path co-efficient	T-value	Hypothesis Supported
H1a. The higher per capita GDP, the higher the telecommunications infrastructure index. Per capita GDP/ → TII	0.2630*	6.363	YES	**H1b**. In the Arab World, the higher GDP per capita, the higher the Internet penetration rate.	0.170*	4.970	YES
H2a. The higher the human capital index, the higher the telecommunications infrastructure index. HCI → TII	0.2360*	7.691	YES	**H2b**.The higher the gross enrolment ratio, the higher the Internet penetration rate.	0.044	1.288	NO
H3a. The higher the democracy index, the higher the telecommunications infrastructure index. DMI → TII	0.4430*	10.26	YES	**H3b**. The higher the civil liberties the higher the Internet penetration rate.	0.328*	8.043	YES
H4a. The higher the gender equality index, the higher the telecommunications infrastructure index. GEI → TII	0.1540*	5.297	YES	**H4b**. The higher the women literacy level, the higher the Internet penetration rate	0.518*	26.00	YES
$R^2 = 0.884$				$R^2 = 0.658$			
*significant at $p < 0.05$ We used bootstrapping with a 200 re-sampling procedure to determine the T-values.							

Table 1   Summary of path coefficients and significance levels (86 inter-countries and 21 inter-Arab countries)

3.3   Limitations of the study

The availability of secondary data published by official government sources is a serious limitation; this has always been a pervasive problem in macro, country-level investigations that depend on official government sources. National reporting practices differ considerably. We selected countries for our 86-nation sample for which complete data were available. That is, were data missing—and they were, particularly for small, poor countries, those countries were eliminated from our analysis. Future analysis should estimate the extent to which incomplete data introduces bias that affects our conclusions and also test alternative models for incomplete data (see Raghunathan 2004).

In addition, the study was conducted with 2008 data; these represent static measures of the indicator growth rates, as Vehovar et al. (2006) note. However, we recognize that dynamic changes in penetration rates have taken place: high-speed Internet connections (ADSL) and other ICT have become available, as some of the tables for 2010 Internet Usage Statistics indicate. Future research needs to take account of a time-distance methodology.

4   Concluding remarks

Our aim was to extend and enrich the research literature related to the digital divide. Specifically we sought an answer to the question of whether economic, socio-demographic, political, and cultural factors predict a country-level and regional-level digital divide. We carried out two comparative macro-level studies: One study examined factors that predict an 86 country-level digital divide and the second study examined factors that predict an inter-Arab countries digital divide. We advance macro-level studies of the digital divide by creating a telecommunications infrastructure index composed of five primary indices that define a country's ICT infrastructure capacity and developed two models of economic, socio-demographic, political, and cultural antecedent factors that influence a country's digital divide. The small number of Arab countries precluded application of all the factors utilized for the 86 nation study. We tested these models using secondary data published by international government agencies.

This macro-level research illustrates the importance of democracy in the diffusion of ICTs in the World (path = 0.4430) and in the Arab countries (path = 0.328). The democracy index has the strongest predictive power in the 86 nation analysis and the civil liberties factor is a strong predictor of Internet use in the Arab World, as recent events in the Middle East demonstrate.

Several years ago per capita GDP had greater predictive power in the world; but the divide related to a country's wealth is shrinking. In Arab countries, however, per capita GDP continues to have predictive power. This divide related to a country's wealth remains significant because Arab countries comprise some of the richest oil-producing as well as some of the poorest nations of the world (Weir 2002).

This study also demonstrates that cultural factors influence the ICT penetration rate. Why does the female literacy rate have such strong predictive power in Arab countries? One potential explanation is the important social role of Arab women in the transmission of education to their children, which is assumed to be a factor in access to knowledge and the Internet. Explaining the influence of the Arab woman will, however, require qualitative studies to understand the strength of their educative role in the family and in the larger society.

The country-level digital divide continues to be an important topic for IS researchers, public managers, and policy makers. This study emphasizes the critical role of context for designing and implementing information systems (see Harfouche & Robbin, 2011; Heeks 2002). All too often economic factors are the sole ones that are taken into account in forecasting future use of public e-services, for example. But as our study demonstrates, demographics characteristics of citizens, a nation's political culture, and the role of women in society all matter.

As such, this research has practical and managerial implications for public management and for policy makers. Public managers can use our findings to segment citizens into more refined groups to facilitate better resource allocation across different groups. It is important that no citizen be left behind as governments develop and transition to e-government services. Government initiatives might include various policies designed to raise the literacy level and ones that are specifically targeted at educating women. Other policies are needed to develop pedagogy and training to educate the underserved about technology and provide subsidized access to disadvantaged people. What policy makers do to encourage people to use ICTs will have a critical impact on how, how much, and when citizens will benefit from public e-services.

References

Ali, A. (1995). Cultural discontinuity and Arab management thought. International Studies of Management & Organisation, 25 (3), 7-30.

Antoun, R. (2009). Towards a National Anti-Corruption Strategy. The Lebanese Transparency Association (LTA) and the UNDP. Available at: http://www.undp.org/lb/communication/publications/downloads/Final_book_en.pdf

Beilock, R. and Dimitrova, D. V. (2003). An exploratory model of inter-country Internet diffusion. Telecommunications Policy, 27 (3-4), 237-252.

Bertot, J.C., McClure, C. R., Wright, C. B., Jensen, E., and Thomas.S. (2008). Public Libraries and the Internet 2008: Study Results and Findings. Florida State University, Information Use Management and Policy Institute, Tallahassee, Florida.

Carvin, A. (2000). The Internet: From ARPAnet to the NII. Available at: http://www.edwebproject.org/ibahn/ (accessed February 2008).

CIA. (2008). The World Factbook. Central Intelligence Agency, Washington, D.C. Available at: http://www.cia.gov/library/publications/the-world-factbook/

Çilan, Ç. A., Bolat, B. A., and Coşkun, E. (2009). Analyzing the digital divide within and between member and candidate countries of the European Union. Government Information Quarterly, 26, 98–105.

Corrales, J. and Westhoff, F. (2006). Information technology adoption and political regimes. International Studies Quarterly, 50 (4), 911–33.

Dewan, S., Ganley, D., and Kraemer, K. L. (2005). Across the digital divide: A cross-country multi-technology analysis of the determinants of IT penetration. Journal of the Association for Information Systems, 6 (12), 409-432.

DiMaggio, P., Hargittai, E., Celeste, C., and Shafer, S. (2004). Digital inequality: From unequal access to differentiated use. In Social inequality (K. Neckerman, Ed.), pp. 355-400, New York: Russell Sage Foundation.

The Economist. Economic Intelligence Unit. (2008). The Economic Intelligence Unit's Index of Democracy. Available at: http://graphics.eiu.com/PDF/Democracy%20Index%202008.pdf

El Louadi, M. (2008). The Arab world, culture, and information technology. In Information Communication Technologies: Concepts, Methodologies, Tools, and Applications (V. Van Slyke, ed.) Information Science Reference, New York, N.Y.

Gefen, D., Straub, D. W., and Boudreau, M-C. (2000). Structural equation modeling and regression: Guidelines for research practice. Communications of the Association for Information Systems, 4 (7), 1-70.

Harfouche, A. (2010). The same wine but in new bottles: Public e-services divide and low citizens' satisfaction. An example from Lebanon. The International Journal of Electronic Government Research, 6 (3), 73-105.

Harfouche, A. and Robbin, A. (2011). Inhibitors and enablers of public e-services in Lebanon. Journal of Organizational and End User Computing. (in press).

Hargittai, E. (2002). Second-level digital divide: Differences in people's online skills. *First Monday*, 7 (4). http://firstmonday.org/issues/issue7_4/hargittai/index.html

Heeks, R. B. (2002). Information systems and developing countries: Failure, success and local improvisation. The Information Society, 18 (2), 101-112.

Heeks, R. B. (2005). E-government as a carrier of context. *International* Journal of Public Policy, 25 (1), 51-74.

Helbig, N., Gil-García, J. R., and Ferro, E. (2009). Understanding the complexity of electronic government: Implications from the digital divide literature. Government Information Quarterly, 26, 89–97.

Hofstede, G. (1980). Culture's Consequences: International Differences in Work-related Values, Sage Publications, Beverly Hills, CA.

Hofstede, G. (1983). Dimensions of national cultures in fifty countries and three regions. Studies of Management and Organizations, 13 (1-2), 46-74.

Hofstede, G. (2001). Adoption of communication technologies and national culture. Systèmes d'Information et Management, 16 (3), 55-74.

Howard, P. N., Anderson, K., Busch, L., and Nafus, D. (2009). Sizing up information societies: Toward a better metric for the cultures of ICT acceptance. The Information Society, 25, 208–219.

Internet Usage Statistics (2010). The Internet Big Picture.World Internet Users and Population Stats. Available at: http://www.internetworldstats.com/stats.htm

James, J. (2008). The digital divide across all citizens of the world: A new concept. Social Indicator Research, 89, 275–282.

Jarvis, C. B., MacKenzie, S. B., and Podsakoff, P.M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. Journal of Consumer Research, 30, 199-218.

Karake Shalhoub, Z. (2004). Women and ICT: Challenges Facing UAE Women. Available at http://www.ituarabic.org/

Loch, K., Straub, D. W., and Kamel, S. (2003). Diffusing the Internet in the Arab world: The role of social norms and technological culturation. IEEE Transactions on Engineering Management, 50 (1), 43-63..

Mann, C. L. and Rosen, D. H. (2001). The new economy and APEC, APEC Secretariat, Singapore.

Milner, H. (2006). The digital divide: The role of political institutions in technology diffusion. Comparative Political Studies 39 (2), 76-99.

Norris, P. (2001), Digital divide: Civic Engagement, Information Poverty and the Internet Worldwide. Cambridge University Press, Cambridge, England.

NTIA (2000). Falling through the Net: Towards Digital Inclusion, Economics and Statistics Administration and the National Telecommunications and Information Administration, Washington, D.C.

OECD (2001). Understanding the Digital Divide. OECD, Paris.

Raghunathan, T. E. (2004). What do we do with missing data? Some options for analysis of incomplete data. Annual Review of Public Health, 25, 99-117.

Raghbendra, J. and Majumdar, S. (1999). A matter of connections: OECD telecommunications sector productivity and the role of cellular technology diffusion. Information Economics and Policy, 11, 243-69.

Robison, K. K. and Crenshaw, E. M. (2001). Post-industrial transformations and cyber-space: A cross-national analysis of Internet development. Working Paper, Ohio State University, Columbus, OH.

Straub, D. W. (1994). The effect of culture on IT diffusion e-mail and FAX in Japan and the U.S. Information Systems Research, 5 (1), 23-47.

Strite, M. and Karahanna, E. (2006). The influence of national culture on the acceptance of information technologies: An empirical study. MIS Quarterly, 30, 679-704.

Stump, R., Gong W., Li Z. (2008), Exploring the digital divide in mobile-phone adoption levels across countries: Do population socioeconomic traits operate in the same manner as their individual-level demographic counterparts? Journal of Macromarketing, 28 (4), 397-412.

UNDESA (2008). UN E-government Surveys: From E-government to Connected Governance. Report: ST/ESA/PAD/SER.E/11, United Nations, New York.

UNDP (2009). Human Development Report 2008, United Nations, New York, N.U.

UNPAN (2005). UN Global E-government Readiness Report 2005: From E-government to E-inclusion. UNPAN/2005/14, United Nations, New York, N.Y.

UNPAN (2008). The Global Information Society: A Statistical View. Partnership on Measuring ICT, United Nations, New York, N.Y.

Van Birgelen, M, Ruyter, K. D, Jong, A. D., and Wtzels, M. (2002). Customer evaluations of after-sale service contact modes: An empirical analysis of national culture's consequences. International Journal of Research in Marketing, 19, 43-64.

Van Dijk, J. and Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. The Information Society, 19, 315–326.

Vehovar, V., Sicherl, P., Hüsing, T., and Dolnicar, V. (2006). Methodological challenges of digital divide measurements. The Information Society, 22, 279–290.

Weir, D. (2002). Management in the Arab World: A fourth paradigm. The European Academy of Management, (EURAM 2002), Stockholm, Sweden.