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Strategies for ICT Use in the Public Sector in the Least Developed Countries: A Cross-Country Analysis

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Abstract

The adoption and effective use of information and communication technologies (ICT) has the potential to yield significant benefits in the least developed countries (LDCs), which are recognized as the most vulnerable in the international community. The aim of this study was to investigate strategies to advance the use of ICT in the public sector in LDCs, with the aim of improving services and outcomes for government and citizens. A multi-level framework for analysis was developed, consistent with a structuration-type theoretical approach. A meta-analysis of data gathered in a UN study of e-government readiness was performed, focussing on the developing countries that have greatly improved their relative positions recently. In general, the findings support the multi-level approach. At the national level, a low level of economic development, poor infrastructure and political unrest are inhibitors of public sector ICT progress. At a base level, access by individuals and organizations to ICT tools and IT-related education is necessary for e-government to be feasible. Some strategies were observed to be linked to progress with e-government across a number of developing countries: leadership and willingness to initiate change within the government sector, an incremental, step-by-step approach to development, and some sensitivity to local and cultural needs.

Keywords

Least Developed Country (LDC), ICT adoption, Public Sector, e-government, ICT Strategy

INTRODUCTION

In the late 1960s the United Nations began paying special attention to the ‘least developed countries’ (LDCs) recognizing these countries as the most vulnerable in the international community. LDCs have low national income (gross domestic product under \$900 per capita), weak human assets (health, nutrition and education) and high economic vulnerability (instability of agricultural production and exports, inadequate diversification and a small economy)¹. The adoption and effective use of information and communication technologies (ICT) in a LDC has the potential to yield significant benefits in improving the economy and also to address deep-rooted problems such as corruption, transparency, and governance in public sector administration. Improved information systems (IS) could also play an integral part in improving business activity and international competitiveness with other nations (OECD 2003). However, the ‘Digital Divide’ between LDCs and developed countries appears to be widening, in spite of initiatives at national and international level and increasing globalization. Only a few of the 50 LDCs are approaching transition economies with most lagging far behind, particularly those located in sub-Saharan Africa and South Asia (Rice 2003).

¹ Fifty countries are currently designated by the United Nations as ‘least developed countries’ (LDCs) [UN-OHRLLS, 2005]. The list is reviewed every three years by the Economic and Social Council (ECOSOC). The criteria underlying the current list of LDCs are: low income, weak human resources, and a low level of economic diversification. ‘Developing Country’ is a broader term and less clearly defined. It refers to the countries (about 125) whose per capita income is low compared to the world average.

The importance of ICT in developing countries is increasingly being recognized in academic literature although as yet no clear and comprehensive framework or theory has emerged for dealing with the very complex issues involved. Kelgai (2003 p. 114) concludes that '*IS research in this area has been non cumulative and fragmented, lacking an overarching framework regarding the context in which effectiveness criteria are applied*'. Heeks (2002 p. 102) states that '*until very recently, the entire literature on IS and developing countries would struggle to fill a single bookshelf*'. Empirical research studies are few and scattered, although a number of international bodies and organizations including the United Nations Development Program (Accenture 2001; ASPA and UNDPEA, 2001) International Telecommunication Union (ITU 2002) and the World Bank (2003, 2005) have carried out more comprehensive investigations of ICT in LDCs.

The current study focuses on the use of ICT in the public sector in LDCs. The public sector plays a leading role in ICT adoption and use in LDCs, being the largest user of computers and able, through its policies and regulations, to exert considerable influence on the diffusion of ICT throughout the country (Flamm, 1987; Nidumolu et al 1996). Adoption and implementation of ICT in public sector government agencies can pave the way for ICT diffusion in the country as a whole. The spheres of influence for public sector organizations using ICT include (i) improving government processes (*e-Administration*); (ii) connecting citizens (*e-Services*); and (iii) building external interactions (*e-Society*) Taken as a whole these activities can be referred to as *e-government* (Heeks, 2004).

The lead author was personally motivated to undertake this research by his own experience working with ICT in the government sector in Bangladesh (LDC). It was observed that ministerial departments felt unable to take full advantage of ICT to increase efficiency or improve citizen access to government. The gap between government and citizen were increasing, allowing bureaucracy, lack of transparency and potentially corruption. The use of legacy systems meant that having to queue for hours to collect a government form was still a common occurrence. A need for further knowledge and strategic direction was strongly felt within the government sector.

Against this background, the aim of the current study is to investigate strategies to advance the use of ICT in the public sector in LDCs, with the aim of improving services and outcomes for government and citizens.

The paper proceeds as follows. Relevant prior research is reviewed to give a framework for the study. The meta-analysis of changes in e-government readiness across a number of LDCs is then described and conclusions drawn as to the strategies that are proving effective for use of ICT in the public sector.

CONCEPTUAL BACKGROUND

The theories drawn upon for studying globalization, the Digital Divide and e-government are diverse and no single theoretical approach has yet found favour (Walsham and Sahay 2005). Theories used include the Theory of Reasoned Actions (TRA) (Fishbein and Ajzen 1980), the Technology Acceptance Model (TAM) (Davis 1989) and Diffusion of Innovations Theory (DoI) (Rogers 1995). Other theorists drawn upon include Castell's (1996, 2000) perspectives on globalization, theory relating to information infrastructure (Rolland and Monteiro 2002) and broad meta-theoretical perspectives such as structuration theory (Giddens 1984) and actor-network theory (Latour 1991). Theory on how the government sector in particular in LDCs should operate appears to be almost entirely lacking, although some practical guidelines for e-government are presented by international agencies (World Bank 2002).

Problems have been noted with a number of the theories used. One problem is that they have been developed and tested primarily in the context of developed or western countries and are possibly not relevant in the context of many developing countries and LDCs. The Diffusion of Innovations theory grew out of the diffusion of farm innovations across a number of countries (Rogers 1995 p.59). Rose and Straub (1998 p. 40) notes that: '*Of the 70 IT based studies which either confirmed or extended the Rogers diffusion of innovation (DOI) model surveyed by Pascot and Conger (1995), none were conducted within developing nation*'. Straub and his associates carried out a series of investigation in Arab countries using TAM and initially found it was applicable (1998). Further studies, however, pointed out that a culture-influence modelling approach was needed to understand the effect of cultural beliefs by examining them individually in their respective cultural contexts (Straub et al 2003). A second problem is that the unit of analysis in many studies is not clearly specified and the complexities of the interrelationships among differing units of analysis are not well understood. Studies have taken as their focal units the individuals in a country, particular projects or organizations, or the country as a whole.

In light of the paucity of theoretical guidance in the extant literature, this study adopts a grounded approach (Glaser and Strauss 1967) within a contextual framework derived from the literature. The approach adopted is compatible with Giddens' structuration theory, which argues that action and structure operate as a duality, simultaneously affecting each other. Giddens defines structure as '*rules and resources recursively implicated in social reproduction; institutionalized features of social systems have structural properties in the sense that relationships are stabilized across time and space*' (1984, p. xxx1). A structuration-type theory is attractive as a means of advancing our understanding of the use of ICT in the government sector as it provides a means of

handling the complexity of the interactions between citizens, organizations, the government and other industry sectors, and the national and international context. It also allows for the reflexivity of these interactions. Although our study focuses on government use of ICT, it is necessary to consider the government sector in interaction with entities and structures at other levels, which will both constrain and enable the actions a government can take. Figure 1 depicts the multi-layered approach to the problem, envisaged as something like the successive layers of an onion. At each level the actions of entities within that level are both constrained and enabled by the structures of the levels above them, and in turn, through their actions, affect the structures that are in their immediate environment through cycles of reciprocal change.

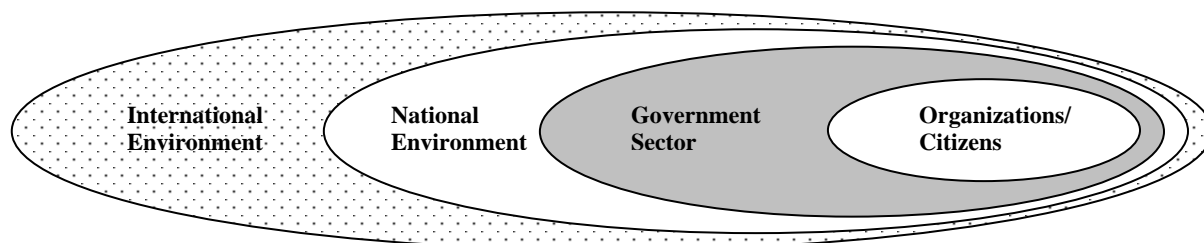


Figure 1: A multi-level approach to the use of ICT

Table 1 shows a summary of the influences at these different levels of analysis that have been implicated in ICT adoption and use in developing countries in prior studies. As the number of studies of LDCs is limited, we have included studies both in developing countries (DCs) and LDCs, with a belief that they share a number of common features and characteristics.

Table 1: Multi-level influences on ICT adoption in developing countries

Level	Influences on ICT related activities	Countries studied	Influences and studies
International	International agencies	India	Promotion of IT through domestic and foreign investment should be the first area of policy (Nair and Prasad, 2002).
National	Economy	World	Lack of economic environment conducive to investment is a problem (Rodriguez and Wilson 2000).
		Nigeria	Political economy is the mainly differential between DCs and LDCs, not culture (Korpela 1996).
		World	Need a climate of civil liberties conducive to research and expansion of communication (Rodriguez and Wilson 2000)
		Asia	Authoritarian regimes shape diffusion of ICTs to their political advantage by exerting control and censorship (Kalathil et al 2001).
		Malaysia	Political stability is an important factor (Raman and Yap 1996).
		Bangladesh	Political will from the top is very important (BEI 2004).
	Culture	5 Arab Countries	Socio conflicts occur because technologies are culturally biased in favour of developed countries (Hill et al 1998).
		Arab	Culturally appropriate IT design can enhance transfer (Straub and Hill 2001).
		Jamaica & Tanzania	Socio-cultural aspects can be highly influential (Hageenaars, 2003).
	Infrastructure	Many countries	Lack of infrastructure is a primary problem. Asian countries lag than non-Asian countries. (UN, 2004, Wong 2002, Wresch 2003)

	ICT policy/ strategy	Nepal	Government needs to provide a lead (Pradhan 2002).
		Pakistan	Development policy and economic aspirations have strong linkages between direct ICT interventions (Mujahid, 2002)
		Malaysia	Step-by-step approach could be a model for countries with agricultural and natural resources (Raman and Yap 1996).
		World	Policies need to be: (i) long term; (ii) aimed at building capabilities; (iii) adaptive to changing context; and (iv) synergistic with other ongoing national programs (Checchi et al 2003).
		LDCs	Avoid over ambitious top-down approaches and stress virtues of multi-stakeholder involvement (Accenture 2001).
		Many	Need to facilitate local cultural content (UN 2004).
Government sector	Administrative practice/ reform	Sudan	Lack of systematic principle and procedures in the system is a hindrance, embodying working procedures, managerial style and HRM policy (Higgo 2003).
		Asia	There is a close relationship between e-government and administrative reform (DOI 2001).
		World	The administrative reform process must be continuous (OECD 2003).
	Bureaucracy	Developing Country	Bureaucratic establishments pose insurmountable obstacles for introducing and sustained use of IT (Avgerou, 1990).
	e-government strategy	World	Government needs to take the lead in establishing, reforming and regulating (UN 2004).
	Government regulation	LDCs	Necessary, since social counter pressures are unable to soften the impact (Fiho et al 1982)
	Knowledge of ICT	Bangladesh	Need awareness and knowledge of ICT among government officials (BEI 2004, Taifur 2004)
Organizational	Top management support	Indonesia	Most important factor for successful development of IS (Kandelin et al. 1998)
		Malaysia	Support from top management is a success factor.(Zaitun et el 2000)
		Bangladesh	Initiative from top level officials is crucial (Taifur, 2004).
	Management knowledge	Papua New Guinea	Lack of understanding of ICT amongst top management is a drawback (Kelgai and Middleton 2003).
	Organizational culture/ values	Kuwait	IS managers in different countries focus on different management areas based on local conditions (Alshawaf et al. 2002).
		Egypt	Understanding existing organizational culture has a direct and positive impact (Serour et al. 2002).
	Institutional development / capacity	LDCs	Institutional development is more important than ' <i>bridging the digital divide</i> ' (Daly, 2004).
Individual citizens	Penetration of IT Technology tools	All	A core set of basic tools (personal computers, mobile/handheld devices, hybrid devices) must be affordable to the majority of the population (UN 2004).
		LDCs	Develop innovative behaviour in the societies to achieve pervasive ICT adoption (Corea, 2000).

	Education	All	Education related to technology is needed (Rice 2003, UN 2004)
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Of particular interest for this study are the strategies that can be used to promote more effective use of ICT in the government sector (e-government). The strategies implicated in prior studies include reform of administrative procedures, lessening of bureaucracy and increased knowledge of ICT within government agencies. The government sector is also expected to take a leadership role in promoting ICT and building a regulatory regime and organisational environment that allows ICT use to flourish. The public sector can promote ICT use indirectly through its influence over the enabling conditions at other levels in our analytical framework, including encouragement of foreign investment, multinational involvement and ICT educational programs. Network effects mean that the citizens and organizations in a country must be in state of readiness to use ICT before they can take full advantage of public sector initiatives to provide government services electronically.

The ICT uptake by the government sector internally, which is our focus of study, is a precondition for the ultimate success of e-government, which largely depends on connecting citizens to government systems. To reach that stage, governments need to develop their own structures and mature systems with intra- and inter-agency IS implementations.

METHODOLOGY

Prior academic research studies have tended towards in-depth case studies of single countries (Walsham and Sahay, 2005). While this approach gives valuable insights into particular projects and initiatives, it does not give cross-country comparisons. In this study we have performed a meta-analysis of the data available in the *UN Global e-Government Readiness Report* (UN 2004), which gives data on the 191 member states for 2003 and 2004. In this report each member state is given an *e-Government readiness index* based on a weighted average composite figure calculated from a website assessment, telecommunications infrastructure and human resource endowment.

Our interest is in assessing what government strategies have been associated with a greater use of ICT for e-government in developing countries. An indication of the advance in e-government in a country can be found by comparing the rankings of a country from one year to the next (from 2003 to 2004) and examining the strategies employed in those countries that have exhibited the largest jumps from one rank to a higher rank. Countries are ranked relative to each other, so a position of number 10, means that a country is the 10th ranked country of the 191 studied. As prior work has shown that there are dramatic differences in ICT adoption between developed and developing countries, we have focussed on the ten developing countries which had the greatest change upwards in their readiness index. Further analysis of qualitative data in the UN report allowed identification of trends and patterns across the more successful countries.

EFFECTIVE STRATEGIES FOR THE GOVERNMENT SECTOR IN DEVELOPING COUNTRIES

The UN global e-government readiness report (2004) gives data for all the 191 member states. The e-readiness index shows the leading countries as the United States, Denmark, the United Kingdom and Sweden. Australia was ranked 6th. Widespread disparity among countries and regions was observed. The regions of Africa and South and Central Asia were far behind the rest of the world in almost all aspects of ICT development for e-government access.

Table 2 shows those developing countries that rose most markedly between 2003 and 2004, with a change in ranking of +10 or greater. The 10 countries that were ranked lowest in 2004 were Chad, Ethiopia, Afghanistan, Mali, Niger, Timor-Leste, Micronesia, Marshall Islands, Palau and Nauru.

The results of this survey overall support the multi-layered model presented in Figure 1. The obvious effects of factors at the national level that affect uptake of ICT in government include the political situation and the economic situation. Governments in high-income countries were well advanced in terms of their provision of public information, online services, and electronic access to government. The bottom 40 countries had made relatively little progress between 2003 and 2004. The UN report comments on the problems with the countries of South and Central Asia:

Despite progress, the lack of infrastructure and education is the most serious barrier to further expansion of e-government. The enabling environment in many countries in the region is characterized by irregular or non-existent electricity supplies, especially outside large cities, telephones remain luxury items and internet access is available to only the privileged few in the upper income bracket. South and

Central Asia is home to about 25 percent of the world's population but has a GDP per capita equal to 10 percent of the world average and 1.6 percent of the United States (UN 2004 p. 43).

Table 2. Developing countries with the greatest advance in e-government readiness rank

Country	Region	Index	Rank 2004	Rank 2003	Change	Characteristics of strategies employed
Uzbekistan	S/Central Asia	.3965	81	Not ranked	>173	Effort to avoid language barriers with multi-language sites.
Kyrgyzstan	Central Asia	.4468	66	110	+44	Provision of e-services according to indigenous priorities and development plans.
Venezuela	S America	.4898	56	93	+37	A strong commitment to education, online services, interactive features, poll and open discussion forums.
Mongolia	SE Asia	.4152	75	103	+28	Priorities and political willingness allowed 'leapfrogging' to higher stages and bypassing of intermediate stages.
Saudi Arabia	W Asia	.3858	90	105	+15	Expansion and improvement of overall sectoral presence online.
Pakistan	S/Central Asia	.3042	122	137	+15	A simple and illustrative model of steady incremental development
Kazakhstan	S/Central Asia	.4344	69	83	+14	Heavy investment in designing e-strategies and programs with an outreach message.
Columbia	S/Central America	.5335	44	57	+13	A much improved one stop-shop e-government portal.
Barbados	Caribbean	.4563	65	76	+11	Commitment to e-services online even with limited resources.
Honduras	S/Central America	.3301	113	124	+11	Impressive education sector services and discussion forums.
Botswana	Africa	.3827	91	101	+10	Proves incremental implementation can be highly successful if done professionally and strategically.

Some of the variation in rankings amongst the LDCs could also be traced to the political situation. A number of the countries that had dropped significantly from 2003 to 2004 had some kind of political instability, unrest and poor governance in the country: for example, Afghanistan (-3), Benin (-8), Burundi (-14), Lesotho (-15), Solomon Islands (-12), Nepal (-2) and Sudan (-1).

The interrelationships among the levels is also obvious, with countries that make an advance in e-government also showing a rise in factors operating at the level of individuals and organizations, such as the degree of penetration of technology tools and ICT literacy. It is instructive to consider some of the strategies employed in those developing countries with a significant improvement in more detail. Although these countries suffer the same problems as other LDCs with respect to lack of infrastructure, low income and weak human assets, they have managed to improve their position in public sector use of ICT. All have the problem of using technologies that were designed in developing countries and differing cultures, yet have managed some success.

Uzbekistan showed the greatest rise, going from no government online presence to 81st in the world. The progress made in Uzbekistan is a response to the growing number of Internet users in the country, which has doubled in the recent past. Approximately 73% of users are in the capital of Tashkent and rely on Internet cafes

for access. The government has attempted to ameliorate language barriers by providing content in native Uzbek, Russian and English. Even though the government web site provides only limited information, it encourages feedback with a web content form and clear and accessible information. The UN report sees Uzbekistan as a good illustration of what a country can accomplish with e-government with even a modest level of resources and planning effort.

Kyrgyzstan, a relatively new independent state with low economic status, made a breakthrough within a year to raise 44 places in the global rankings. Kyrgyzstan provides an example of the provision of government services focussed on indigenous priorities and development plans.

Mongolia made the greatest advance among the countries in South and Eastern Asia, jumping 28 places from 103 to 75. It provides an interesting example:

Mongolia's e-government efforts prove that stages of e-government need not be additive. Depending on their priorities and the political willingness, countries can 'leapfrog' to higher more mature stages of service delivery even bypassing transactional stages which require, among other things, sophistication of financial systems... Unlike most other countries, the Mongolian site has advanced into the networked presence without the typical incremental coverage of all the basics. The e-participation mechanism includes an online legislative and online policy forum. Both are frequently used and appear to be very popular (UN 2004 p. 33).

However, although some Central and South East Asian countries demonstrated best practices and steady progress, other countries located in the same region are lagging and falling further behind: For example, Indonesia (-15), Philippines (-14), and Vietnam (-15). Some countries in this region showed no change, including Nepal, Bangladesh, Bhutan, Myanmar, and Laos.

Overall, our analysis identified a number of themes that were common in a number of the LDCs showing improved rankings compared with others. These themes were:

- (1). *Leadership and political willingness to initiate change within the government sector*, was evident in the majority of countries with improved positions. Malaysia for example, has a Malaysian Administrative Modernization and Management Planning Unit that seeks to enhance the use of ICTs and has mandated that each government agency create an IT strategy to help facilitate greater communication between agencies and the public.
- (2) *An incremental step-by-step approach to development* was also common across the majority of the LDCs with a step up in ranking. Examples include Pakistan (+15), Saudi Arabia (+15), China (+7), and Thailand (+6). There was limited evidence of top down long-range planning approaches that worked.
- (3) *'Leap frogging' is possible*, it is not necessary to go through steps or stages in a fixed sequence. Mongolia is an illustration, advancing considerably although it bypassed a transactional stage.
- (4) *Sensitivity to local and cultural needs in the development of web sites*, evident in countries including Uzbekistan (>173) and Kyrgyzstan (+44).

Overall, the finding from this analysis are congruent with the framework established from prior studies, with all three of these themes having been identified in prior work (Table 1), the exception being the 'leapfrogging' effect. In contrast, administrative reform was identified by Higgs (2003) as a hindrance to advancement, but was not detected in the UN report.

CONCLUSION

The aim of this study was to investigate strategies to advance the use of ICT in the public sector in LDCs so as to improve the services and outcomes for government and citizens. A conceptual framework for the study was developed from prior literature with a structuration-type approach and multi-level analysis, depicting influences on the ability of the government sector to engage in e-government at the international and national levels and reciprocal relationships with the preparedness at the organizational and individual level in terms of the penetration of IT tools and appropriate education.

A meta-analysis of data gathered in a UN study of e-government readiness was performed, focussing on the developing countries that had exhibited the greatest change in their ranking from 2003 to 2004. Patterns that typified the more successful LDCs in comparison with their less successful counterparts were extracted by studying the qualitative data in the report. In general, the findings support the multi-level framework that was suggested by prior literature. At the national level, a low level of economic development, poor infrastructure and political unrest are inhibitors of public sector ICT progress. At the lowest level, individuals require access to ICT tools and IT-related education to set up the conditions under which e-government is feasible. The only level where there was no data to support expected relationships was at the international level, where none of the case

studies mentioned international investment or multi-national firms. Possibly these factors are less evident when studying government sector advances, rather than the private sector.

However, even amongst the LDCs, which all suffer to some extent from an environment inimical to e-government growth, some strategies appear to lead to success: leadership and willingness to initiate change within the government sector, an incremental, step-by-step approach to development, and some sensitivity to local and cultural needs in the development of web sites. Our results suggest some strategies can be used with success in more than one country. These strategies provide a general direction that can guide actions to be adapted by respective governments. However, one has to be cautious, as some studies reinforce the idea that the environment of each LDC is unique (Montearlegre 1999) and that there is no 'one size fits all' approach (Accenture 2001).

There are a number of limitations to this study. For empirical evidence it has relied on secondary sources, with a meta-analysis of data in a worldwide UN study. Although the UN study was comprehensive and rigorous, its purpose was not the same as ours and so the data we could glean is necessarily limited. The absence of evidence for relationships may be because relevant data was not collected, not because the relationship does not exist. Further, the use of the change in eReadiness ranking as a sign of progress is indicative rather than a firm measure. As the majority of the developing countries are at very low levels of eReadiness, even modest development in e-government can result in a dramatic change in ranking. However, the lack of prior academic research on a world-wide scale means that our approach has some justification.

The study is a preliminary one, and further work is anticipated using the framework developed here as a base, with on ground case studies of LDCs.

The study is significant in that it contrasts findings from a large scale study with a framework of influences derived from a scattered literature. It brings together literature from both academic resources and reports funded by international agencies to give a good base for understanding the complex phenomenon involved.

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