Functionality and Challenges of e-Governance Readiness

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Abstract

The digital duality is a dynamic concept. It refers to the gap between people who have access to the Internet and those who do not. It can have global , national and regional dimensions. The digital divide can never be contained in isolation but the effort has to be multi-dimensional and multi-pronged. ICTs are one of the enabling tools to bridge digital divide. It is argued Internet to be a true mass medium, it will have to achieve harmony among all consumer segments. The e-Governance indices are benchmarking and ranking tools . The four stages of e-government : (1) cataloguing, (2) transaction, (3) vertical integration, and (4) horizontal integration offer a path for governments to follow and suggest challenges, both in terms of the organization and technical aspects. This paper argues that continuous assessment and reconsideration of e-Governance benchmarking frameworks is crucial for sustained improvement.

Keywords: **Digital Duality, Benchmarking, Digital Divide, Vertical Integration, Horizontal Integration, Online Trading**

Introduction

The dichotomy of 'digital divide' exists between those in cities and rural areas, educated and uneducated, economically well off and deprived classes; developed, developing and least developed countries. It has social consequences. The other observations that further help in explaining digital divide are: differences based on race, gender, geography, economic status and physical ability; in access to information, the Internet and other information technologies; in skills, knowledge and ability to use information and other technologies. Further, the stress is on access, knowledge and content. Thus any endeavor to reduce digital divide should take care of these three aspects together.

The digital divide is a term used to refer to the gap between people who have access to the Internet and those who do not. The 'digital divide' is a dynamic concept, which evolves over time. It can also refer to the skills people have-the divide between peoples who are at ease using technology to access and analyze information and those who are not. The Internet users account for only 6% of world population and out of that 85% of them are in developed countries where 90% of all Internet hosts are located. This is the essence of global digital divide that needs to be transformed into global digital opportunity. For the Internet to be a true mass medium, it will have to achieve harmony among all consumer segments. There are different dimensions to digital divide such as economic level of individuals, economic prosperity of a nations, ethnicity, age (young/old), rural/urban, gender, geographic location, quantitative and qualitative aspects, dial-up and broadband access.

Digital Dualism

Digital duality exists between those in cities and rural areas, educated and uneducated, economically well off and deprived classes; developed, developing and least developed countries. It has social consequences. The other observations that further help in explaining digital divide are: differences based on race, gender, geography, economic status and physical ability; in access to information, the Internet and other information technologies; in skills, knowledge and ability to use information and other technologies. Further, the stress is on access, knowledge and content. Thus any endeavor to reduce digital duality should take care of these three aspects together. The digital duality can be classified as:

Regional digital duality : Within Asia, 50% of South Korea is expected to be online by 2004, while Indonesia will be a mere 1%. India will be in between these two; and

National digital duality : Within India, states such as Maharashtra, Karnataka, Tamilnadu and Andhra Pradesh

are more digital than Bihar and Uttar Pradesh and population proportion wise also the disparity is much wider. Also, within a state, there is an urban–rural digital divide; within urban, there is educated–uneducated digital divide; amongst educated there is rich–poor digital divide.

Global digital duality: This is the first divide where-in the Internet users account for only 6% of world population and 85% of them are in the developed countries where 90% of the Internet hosts are located;

There is a general consensus in the International Development Community about the need to lessen the strikingly differential extent to which rich and poor countries are enjoying the benefits of Information and Communication Technology (ICT), a differential that is often referred to as the digital divide (James, J., 2001). Further the fruits of IT sector yielded results only to the most developed and computerized economies. On the other hand, the Internet, on-line trading, etc. failed to cure century old malaises, viz. illiteracy, poverty, and unemployment in developing countries. In developing countries the digital divide is not only restricted to undeveloped district/state with traditionally weak infrastructure but also developed district/state. Hence, with some basic facts about digital divide based on global perspective, its definition and types, societal implications including reasons in developing countries, in first fold we will discuss the efforts of developing countries for bridging the digital divide through governmental policies and implementation of several projects. Technology allows government to service citizens in a more timely, effective, and cost efficient way.

Benchmark of e-Governance

The e-Governance index is a benchmark and ranking tool that retrospectively measures the achievements of a class of entities, such as government agencies or countries, in the use of information technology. Policymakers and researchers use e-Governance benchmarking studies to help monitor implementation of e-Governance services, using the information to shape their e-Governance investments (Heeks, 2006). The results of benchmarking and ranking studies, particularly global projects conducted by international organizations, attract considerable interest from a variety of observers, including governments (ITU, 2009). E-Governance benchmarks are used to assess the progress made by an individual country over a period of time, and to compare its growth against other nations.

"*E-governance is defined as utilizing the low cost infrastructure of ICT including Internet for delivering government information and services to citizens in a more timely, effective and cost efficient way"*

Stages of E-governance

Based on organizational ,technical and managerial feasibilities, this fold can perceive that e-governance is an evolutionary phenomenon and therefore e-governance initiatives should be accordingly derived and implemented. In this regard, four stages of a growth model for e-government: (1) cataloguing, (2) transaction, (3) vertical integration, and (4) horizontal integration can be adopted in developing countries like India. These four stages are explained in terms of complexity involved and different levels of integration as shown in Figure 1.

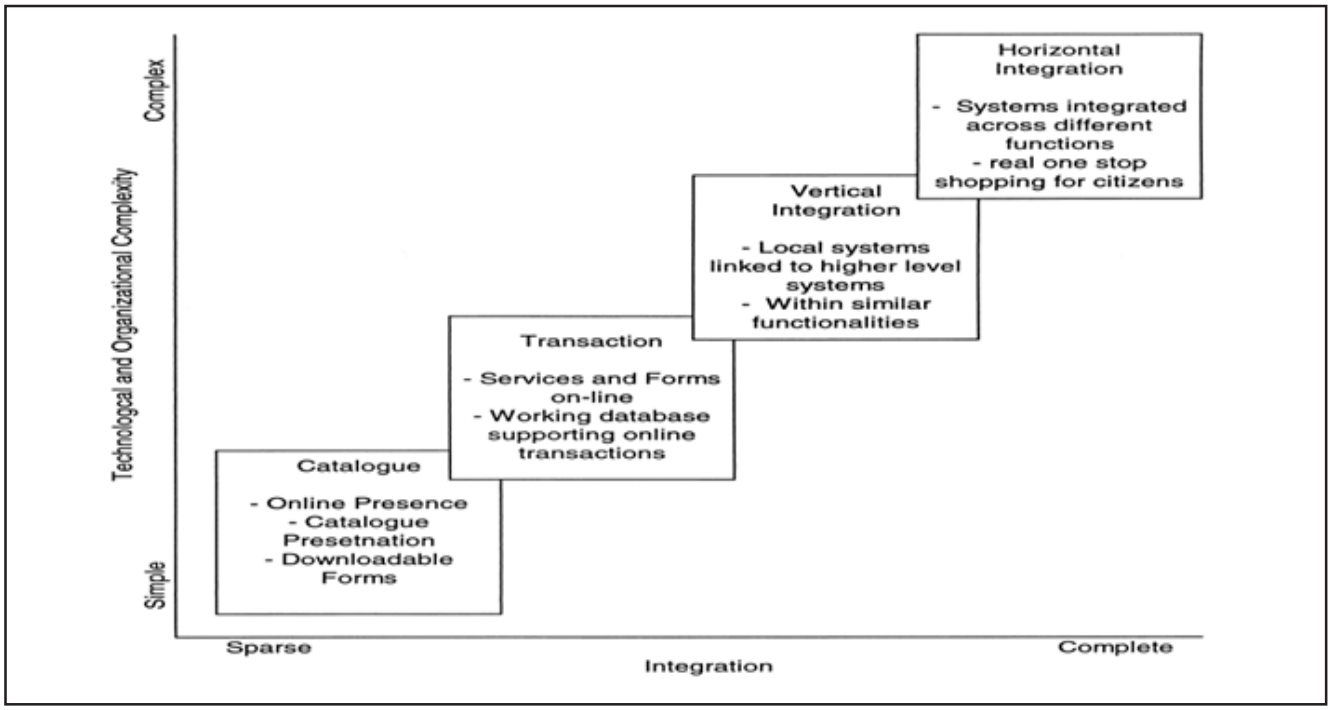

Figure 1: Dimensions and Stages of E-government (Layne, K. & Lee, L., 2001)

The analysis and examples here are based on a developed country model with its multi-layering of governments, however it can be easily adopted in developing country like India. The discussion initiates from state government because it is the one in the middle of this structure, but the model is also applicable to local level such as district/block/gram-Panchayats.

Functionalities and Challenges (Stage i)

In stage one of cataloguing, initial efforts of state governments are focused on establishing an on-line presence for the government. Many state governments' efforts on web development and forms-on-line initiatives belong to this stage. Examples of functionalities at this stage are mostly limited to on-line presentations of government information. Sometimes, this information is very limited. Toward the end of this stage, mostly pushed by citizens' demands, governments begin to establish index pages or a localized portal site in which scattered electronic documents are organized so that citizens can search for and view detailed government related information and download necessary forms. This first stage is called 'cataloguing,' because efforts are focused on cataloguing government information and presenting it on the web.

Though the technology at this stage is relatively simple, there are several challenges on managing these sites. Different departments require different amounts of on-line presence and demand resources allocated to them. Resource allocation in a political organization is always a problematic issue. Another important issue is the maintenance of the information. Along with procedural and policy changes, web pages need to be maintained and some data presented on government websites may be temporal. Date and time stamping may be essential at this stage, along with issues of consistency in format and user-interface from one agency to the next.

Privacy will also surface as an issue at this stage, as it is possible for the government to track on-line activities like frequently accessed products, the length of time spent on each page, and the length of time spent searching. While this tracking information can be used toward improving the website and its offerings, the temptation to sell this information to external parties may also exist. Thus, several policy issues must be decided by the agency in establishing the site.

Based on the reduced scope of the web site under this stage, organizational challenges are limited. The first challenge is assigning responsibility for the overall coordination and planning of services on the state web site as well as having each agency assign responsibility for the maintenance of a web site. One central agency may assume responsibility for the coordination and planning efforts, such as a department of information technology, or an ad hoc group may be convened for this purpose. Individual agency assignment of website development and maintenance is more problematic. Outsourcing to a private vendor or state information technology agency is one solution. Outsourcing at this level may present problems in terms of the allocation of maintenance responsibility once the site is developed. In many cases, at this stage, an internal champion emerges among internal employees who have non-technical job classifications.

The second problem is assigning responsibility for the answering of e-mails. Web sites often include an email address for questions from site users. Often these questions may be wide ranging and beyond the ability of the web master. Some procedure must be established to address how these emails will be handled and how quickly.

Functionalities and challenges (stage ii)

In the second stage, e-government initiatives will focus on connecting the internal government system to on-line interfaces and allowing citizens to transact with government electronically. This stage can be called 'transaction-based' e-governance, and at this stage, e-government efforts consists of putting live database links to on-line interfaces, so that, for example, citizens may pay their telephone bills on-line.

The issue of transaction fulfillment is most critical at this stage. Government must answer a lot of questions. Should fulfillment be outsourced? How will the responsiveness and quality of the on-line system compare to the off-line system? The issue of integration comes onto the scene. Governments must answer questions like "should the web interface be integrated with existing functional systems?" If not, what kind of legacy system information is necessary to support the on-line activities? When and how are on-line and offline systems going to be integrated? How expensive will the integration be? How long will it take? As much of the information collected by governments may be politically sensitive, installation of appropriate security mechanisms may be an important technical consideration. At the same time, many other policy issues need to be resolved, such as authentication and confidentiality. Organizational challenges are much greater in this stage. Existing electronic databases must be reprogrammed to handle such changes requiring internal committees to assess user demands and user interfaces in current systems. Issues of confidentiality and security must be addressed by the organization as a whole. This requires study of existing legislation to determine how public or private the database is for the agency. Although many public applications were no doubt upgraded during the Y2k crisis, many legacy systems still remain. It may not be possible to provide an interface for the citizen-customer without considerable investments.

Functionalities and Challenges (Stage iii and iv):

When the volume of these e-transactions increase in stage II, governments will be pressed to integrate the states' systems with these web interfaces, or in some cases, build on-line interfaces directly connected to their functional intranet. In ideal cases, web transactions should be posted directly to the internally functioning government systems with minimal interaction with government staff. However, citizens' demands and changes in society will push governments to go further as the critical benefits of implementing e-government are actually derived from the integration of underlying processes not only across different levels of government but also different functions of government. By having similar agencies across different levels of governments and by

having different agencies with different functionality talk to each other, citizens will see the government as an integrated information base. Ultimately a citizen can contact one point of government and complete any level of governmental transaction - a "one-stop shopping" concept. Also, from the viewpoint of all levels of government, this could eliminate redundancies and inconsistencies in their information bases for citizens.

There are two types of integration. It may happen in two ways: vertical and horizontal. Vertical integration refers to local and state governments connected for different functions or services of government. As an example of vertical integration, a passport issuing system at a state office might be linked to a national database of passport office for cross checking. Another example would be the business licensing process. In contrast, horizontal integration is defined as integration across different functions and services. An example would be a passport officer make a query of a particular candidature criminal activity to local district police station because systems in both offices talk to each other before issuing an authenticate passport.

By defining the stages of e-governance development, the vertical integration across different levels within similar functionality is posited to precede the horizontal integration across different functions. Since the discrepancy between different services of government is larger than the discrepancy between levels of government, vertical integration will be attained first before horizontal integration. Movements towards vertically integrated government systems within similar functionality are already visible, such as the national crime databases which take information from local crime databases and forward that information to the states which in turn compiles the data from all localities and forwards those statistics to a central database. This last stage of e-government-vertically and horizontally integrated-represents an ideal situation for citizens, in which citizens have on-line access to ubiquitous government services with levels of government and the functional walls inside government transparent to them.

When the country reaches third stage, communication and integration-oriented technologies become more important. As stage three targets to integrate agencies in state governments with their local counterparts, technically, a web of remote connections is a prerequisite. In this remote connection and virtual transactions, several technological issues emerge: signal authentication, format compatibility of electronic data interchange, exposure level of internal legacy system to outside, etc. A critical issue of where to stop arises when integrating the entire 'value chain' of governmental levels. As systems in state and local governments become vertically integrated, boundaries at different levels of government become less distinguishable as the lines between them blur and functions move back and forth between what was once the state from a citizen's perspective.

The role played by the government employees changes accordingly. In the old traditional off-line government, many government employees are responsible for processing localized governmental transactions. Once systems are integrated and automated, most transactions are automated, and government employees are now becoming more an overseer of the process than a simple task-oriented assembly-line worker. The scope of activities performed by each employee will extend beyond functional department boundaries. Even though stage three may provide improved efficiencies, privacy and confidentiality issues must first be considered. Technically, integration of heterogeneous databases and resolving conflicting system requirements across different functions and agencies are major stumbling blocks for any government to reach this stage. Data and process requirements in health systems may not be comparable to the requirements in transportation systems.

However, it is not only a technical challenge but also a management challenge. Horizontal integration requires a change in the mindset of government authorities. When thinking in terms of information needs or transactions, many public authorities perceive their department as most important and disregard other agencies. This 'silo' structure may have worked well in industrial settings in which functions and services are specialized for economies of scale. However, with the support of the Internet, the government processes defined by specialization may not be efficient, effective, or citizen friendly. The concept of governance and management of government staff may be subject to re-evaluation from the perspective of e-government. Functional specialization may not be suitable as a governing structure in e-government.

Emerging trends ,in view of these, will turn public management both inside out and upside down. Public management will be turned inside out as the largely internal focus of management in the past is replaced by an external focus, specifically a focus on citizens and citizenship. Public management will be turned upside-down as the traditional top-down orientation of the field is replaced—not necessarily by a bottom up approach, but by a system of shared leadership. In many respects, horizontal integration provides more access for other governments and possibly businesses than it does for the citizen. The individual remains in control because it is the individual who chooses to use or not use the capabilities of a website.

Framework for E-Governance Index

Here we analyse the different frameworks in order to compute e-governance index of a country

Framework 1

Let us start with West's method of computing an e-Government index (2007a), hereafter referred to as framework 1. West follows a two-step process. First, a value (between 0 and 100) is computed for each website sponsored by a country. These individual website e-Governance index values are then averaged to compute a single index for the country. Equations (1.1) and (1.2) encapsulate West's procedures (2007a).

e-Governance index for website i: $EW_i = 4A_i + y_i$, ...(1.1)

where, A_i = The number of features present on website i, $0 \leq A_i \leq 18$ and y_i=The number of online executable services on website i, $0 \leq y_i \leq 28$.

Hence, e-Government index for country j;

$$EC_j = \frac{\sum_{i=1}^{n} EW_i}{n}, \quad \text{..... (1.2)}$$

where, $0 \leq EW_i \leq 100$ and it is computed by equation (5.1) and n is the total number of websites for country j, $n \geq 1$.

On the positive side, West's e-Governance index is based on objective measures and is quite straightforward. On the other hand, West's approach has a number of limitations:

Uneven Multiplication

By choosing to multiply A_i by four while not doing so to y_i, West significantly values website features over online executable services. Given that websites with more executable services are likely to provide higher levels of e-Governance service than those with only simple features, weighting features over services appears inappropriate.

ii) Feature Limits: With A_i set at a maximum value of 18, equation (1.1) cannot account for a website with more than 18 features.

iii) Service Limits: With y_i set at a maximum value of 28, equation (1.1) cannot account for a website with more than 28 online executable e-Governance services.

iv) Quality or Functionality Ignored: No weight is given to the quality or functionality of the e-Government service websites. Each website is afforded the same weight in the indices whether it is a static page with very little information or a fully fledged portal.

After using the hypothetical data from Table 1.1, West's approach results in identical e-Governance indices for the two countries (30). This equivalence comes despite the equal or higher website e-Governance index value for three of country A's websites (websites 1, 3, and 4). Country A's superior and more numerous websites are undermined by its two sub par websites.

In handling the hypothetical data, West's framework 1 reveals some weaknesses. To address this, the remainder of this section presents modified versions of West's framework 1 that incorporate the level of e-Governance service development. To differentiate among static sites and portals, and to accentuate the level of e-Government services development, the alterative frameworks use weights proportional to the level of development.

Framework 2

The first alternative to West's approach – framework 2 – incorporates a weighting of websites proportional to their stage of e-Governance service development. As such, these calculations enhance the e-Governance ranking of a country that possesses more websites at higher levels of development and diminishes the ranking of a country that possesses fewer websites at a lower level of development.

E-Government index for country j;

$$EC_j = \frac{\sum_{i=1}^{n} w_i EW_i}{\sum_{i=1}^{n} w_i}, \quad \text{..... (1.3)}$$

where, $0 \leq EW_i \leq 100$ and is computed using equation (1.1), w_i = Level of e-Governance service development of website i, $1 \leq w_i \leq 4$. The total number of websites for country j is n, $n \geq 1$.

The specific method chosen for weighting the level of e-Governance service development is not inviolate. Theoretically, w_i's maximum (see equation (1.3)) could be set at any number; doing so would vary the relative weights of stages of development. As we have chosen to use a four-stage classification of e-Governance website services (Affisco & Soliman, 2006; Al-adawi et al.,2005), four is a reasonable maximum. Note that a direct mapping of stage to number (i.e., publishing=1; interacting=2; transacting=3; and transforming = 4) assumes that consecutive levels of e-Government development are equidistant. Such assumption may understate the value of the higher stages of development. For example, a website that jumps from stage 3 to stage 4 may have to undergo tremendous changes requiring massive efforts and resources compared to the transition from websites from stage 1 to stage 2. Further research is necessary to confirm this. If so, a greater maximum could be assigned to w_i, creating a proportionately greater impact for higher stages of development to have a greater weight in the formula (i.e., publishing=1; interacting = 2; transacting = 5; and transforming = 8). The exact magnitude of any proportionate weighting would have to be considered carefully.

Framework 3

This approach is built on framework 2 by removing the overweighting of website features over executable services. This results in far lower values for ei. Indeed, if West's limits are retained (maximum number of features=18; and maximum number of services=28), EW_i would range from 0 to 46, instead of 0 to 100. These lower numbers allow for an adjustment or elimination of West's maximums, but that issue is irrelevant to the analysis here.

e-Governance index for website i; $EW_i = A_i + y_i$, (1.4)

e-Governance index for country j; .....(1.5)

where, EW_i = e-Governance index for website i (computed using Eq. (1.4)), $EW_i \geq 0$; w_i= Level of e-Governance service development of website i, $1 \leq w_i \leq 4$; n = Total number of websites for country j, $n \geq 1$.

When applied to the hypothetical data (see Table 3), framework 3's equations resulted in country A's index (11.3) being 25.56% higher than country B's index (9). By using formulas that discount online executable services by a much smaller degree compared to website features, the greater functionality of Country A's more numerous websites is represented better. Even so, framework 3 continues to ignore the greater web presence of country A compared to country B.

Framework 4

Framework 4 computes a relative e-Governance index value for each e-Governance website (eRi), factoring in a comparison between the website being measured and the most robust website in the study. As a result, when the individual website e-Governance index values are combined to create a country e-Governance index, a country that offers a greater degree of e-Governance presence and functionality, compared to other countries being considered for ranking purpose, will be rated higher. Because the individual website e-Governance index value is calculated relative to the most robust website in the dataset, the value of EW_{Ri} ranges from 0 to 1. This framework avoids the need to choose an arbitrary weighting factor and apply it to the number of features in order to rescale the values to fall between 0 and 100. By default, the computed relative e-Governance index value for each country (EC_{Rj}) also falls between 0 and 1, and could easily be rescaled to a value between 0 and 100, multiplying it by 100.

Relative e-Governance index for site i;

$$EW_{Ri} = \frac{EW_i - Min(EW_i)}{Max(EW_i) - Min(EW_i)}, \quad \text{..... (1.6)}$$

where, the value of EW_i can be computed by equation (1.4), $EW_i \geq 0$; Min(EW_i) = Minimum value of all EW_i's for websites of all countries in the sample, Min(EW_i) $\geq$ 0; Max(EW_i) = Maximum value of all EW_i's for websites of all countries in the sample, Max(EW_i) $\geq$ 0. Similarly, EW_{Ri} = 1 if Max (EW_i) = Min (EW_i) .[2]

Relative e-Governance index for country j;

$$EC_{Rj} = \frac{\sum_{i=1}^{n} w_i EC_{Ri}}{\sum_{i=1}^{n} w_i}, \quad \text{..... (1.7)}$$

where, EW_{Ri} = Relative e-Governance index for site i (calculated using equation (1.6), $0 \geq EW_{Ri} \geq 1$; w_i = Level of e-Governance service development of website i, $1 \leq w_i \leq 4$; n = Total number of websites for country *j*, $n \geq 1$.

Under framework 4, the relative e-Governance index value for country A (0.573) is greater by 57.5% than the relative e-Governance index value of country B (0.364). That is entirely appropriate given country A's more numerous websites with higher levels of e-Government service development and more online executable services.

Framework 5

Framework 5, like framework 4, uses a relative index. In an effort to place greater weight on websites that offer executable services, however, the formula for calculating a website's individual e-Governance index (EW_i) multiplies (instead of adding) the number of features by the number of executable services (Eq. (1.8) .

e-Government index for site i;

$$EW_i = A_i * y_i, \quad \text{..... (1.8)}$$

where, EW_i e" 0.

Other than this adjustment in EW_i, the remaining computations (Eqs. (1.6) and (1.7)) of framework 4 are repeated. Although this adjustment favors websites with a greater number of executable services and with greater equivalence between services and features, it raises a novel limitation. A country with a far greater web presence composed of websites with a high number of features may have an e-Governance index of zero if none of its websites offer online executable services.

Applying the hypothetical data to framework 5, country A's relative e-Governance index (0.516) is greater by 0.297 than the relative e-Govern index value of country B (0.219). This is a superiority of 135.71%, the most significant difference yet calculated.

Framework 6

In order to remove the anomaly of completely discounting websites that have no executable services, framework 6 slightly adjusts the computation of e-Governance indices (ei) for individual e-Governance websites. The new formula (Eq.1.9) combines the ei calculations from frameworks 4 and 5.

e-Governance index for site i;

$$EW_i = (A_i * y_i) + (A_i + y_i) \quad \text{..... (1.9)}$$

where, $EW_i \geq 0$.

As in framework 5, other than this adjustment in ei, the remaining computations (Eqs. (6) and (7)) of framework 4 are repeated. Turning to the hypothetical data, the relative e-Government index for country A under framework 6 (0.524) is greater by 0.284 than that of country B (0.24), a difference of 118.33%. The relative difference is not as high as the difference in framework 5, but it is still significantly higher compared to frameworks 1 through 4.

Table 1: Six Frameworks of e-Governance Indices (Hypothetical Data)

Country	Attributes				e-Governance index by Frameworks								
					1	2	3	4		5		6	
					EW_i	EW_i	EW_i	EW_i	EW_{Ri}	EW_i	EW_{Ri}	EW_i	EW_{Ri}
A	Site	Ai	yi	wi	30*	32*	11.3*		0.573*		0.516*		0.524*
	1	7	7	2	35	35	14	14	0.82	49	0.766	63	0.773
	2	6	1	2	25	25	7	7	0.18	6	0.094	13	0.107
	3	7	2	2	30	30	9	9	0.36	14	0.219	23	0.24
	4	8	8	3	40	40	16	16	1.0	64	1.0	80	1
	5	5	0	1	20	20	5	5	0.0	0	0.0	5	0
B					30*	30*	9*		0.364*		0.219*		0.24*
	1	7	2	1	30	30	9	9	0.364	14	0.219	23	0.24

Conclusions

The gap of digital duality in India describes four developmental stages of e-governance based on observations of current practices. Technological and organizational challenges have been discussed for each stage. Currently, e-governance initiatives at central and state levels are rapidly evolving, but many challenges are still to be met. Among these challenges, the following three issues are fundamental ones governments have to take into consideration as they want to evolve into efficient and effective e-government in support of citizens' demands: (1) universal access, (2) privacy and confidentiality; and (3) citizen focus in government management.

The digital duality can never be contained in isolation but the effort has to be multi-dimensional and multi-pronged. ICTs are one of the enabling tools to bridge digital divide. Creation of ICT infrastructure and content are core methodologies and a thrust to technology growth in a planned manner will certainly lessen the gap. The four stages offer a path for governments to follow and suggest challenges, both in terms of the organization and technical aspects. In addition, these stages emphasize the citizen as a user of governmental services. In so doing, they suggest that major rethinking about how governments provide services may be needed. Finally, universal access and privacy and confidentiality issues as well as citizen-focused change must be considered throughout e-government development.

Some current e-Governance ranking and index computation procedures do not recognize that e-Government websites evolve over time from static catalogs of information to fully integrated portals. In this article, we contrast six frameworks, designed to account for the websites' e-Governance service development. Under frameworks 2 though 6, countries with websites at a lower level of development, even when more numerous, are not assessed as highly as countries with fewer sites overall but higher levels of e-Governance development.

Among the preferred frameworks (2 through 6), we believe that framework 6 is superior because it incorporates the strengths of the other frameworks while overcoming their limitations . This last framework produces relative e-Governance index values that more fully reflect the features and functionality of e-Governance websites. It allows for an easier rescaling to values between 0 and 100 (which is a common practice for most indices). It is achieved using framework 6. The success of any benchmarking study is partly dependent on the availability of relevant data. As long as a country has some governmental presence on the World Wide Web, West's (2007a) mechanisms (framework 1) and others based on this framework (e.g., frameworks 2 through 6 and other Web-based indices) can be applied. These frameworks compute indices based on objective measures compiled and computed with ease and in a relatively short time, even by countries or groups with limited resources. We believe a firm objective basis is one of the strongest components of our frameworks.

Developing more comprehensive approaches are good , but frameworks based on simple, grounded, and broadly applicable measures (such as those presented in this article) serve well as the basis for building more complex frameworks that account for additional factors such as technology adoption and use. Given the widespread use of benchmarking results by policymakers, practitioners, and funding agencies, future work should continue our focus on mitigating the various limitations of frameworks used to compute e- Government indices and to produce rankings. A continuous assessment and reconsideration of e-Governance benchmarking frameworks is crucial for sustained improvement. The assessment approach and the alternative frameworks presented here stimulate such efforts, helping to ensure that benchmarking systems, and the limitations of those efforts, are well appreciated.

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