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Towards a Framework for Assessing the Maturity of Government Capabilities for 'E-Government'

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Abstract

The new reality of the 21st Century is characterised by increasing centrality of information and knowledge and pervasive application of new information and communication technologies (ICTs). The unavoidability of the new applications on the one hand, and their considerable complexity and costliness on the other, compel organisations to seek better understanding of these applications to guide their successful development and implementation. The ability to accurately establish and articulate needs and prioritise them on the basis of their potential benefits and challenges, within a framework of institutional capabilities, is an important dimension of this understanding. This is where assessment comes in. This paper proposes a framework for assessing the maturity of government capabilities for "e-government." It first traces the conceptual development of e-government, noting a successive broadening of the conceptual scope and a shift in focus from technology to government. It reviews pertinent literature on "e-readiness" assessment and "capability maturity" assessments, noting their strengths and limitations in a government institutional environment. It proposes an e-government capability maturity assessment framework based on six capability factors (development and business agenda, ICT application portfolio, ICT infrastructure development, human and intellectual capital, governance and institutional infrastructure, and leadership and management), six levels of maturity (business as usual, on-line information services, on-line interactivity, on-line transactional services, service integration, and organisational transformation), and a mapping function that traces the logistic trajectory of resulting growth curves.

1. Introduction

The 21st Century has ushered in a new reality defined by the new information and knowledge economy and rapid and pervasive proliferation of information and communication technology (ICT) applications. The new reality creates new opportunities and challenges that require new knowledge competencies and institutional capabilities, and the application of new ICT enables their effective acquisition and utilisation (Melody, 2002). Electronic applications ("e-applications") or on-line applications, as the new range of ICT applications have become known, are transforming not only the business that is done but also the way it is organised. These applications are increasingly becoming an integral part of the new organisational environment and therefore unavoidable. Furthermore, due to their dependence on the Internet and related technologies, e-applications have a global scope and reach, which make them considerably more sophisticated and complex than conventional ICT applications of the recent past.

While presenting new opportunities to organisations, private and public, e-applications also present major challenges that must be overcome. Being pervasive and unavoidable on the one hand, and complex and costly to successfully develop on the other, e-applications present a serious dilemma to both private and public organisations, and perhaps more so to the latter. The dilemma brings into focus the need for a better understanding of these e-applications together with the organisational and institutional environment of their use. To some governments, especially those

in the developing world, this understanding is a critical consideration, as it provides a basis for the efficient allocation of scarce resources. The ability to accurately establish and articulate e-application needs and prioritise them on the basis of their potential benefits and challenges, within a framework of institutional capabilities, is an important dimension of this understanding. While various assessment tools have been developed to assist in this important task, those developed to date do not have a sufficient level of specificity to be able to provide the required information and knowledge to assist decision-making. This is the problem that forms the basis of an ongoing research work.

This paper discusses the theoretical aspects of the research work, which looks at the development of appropriate tools for assessing the levels of maturity of government capabilities for "e-government." The study is premised on the need for a better understanding of the capability of government agencies and departments for identifying, planning and implementing e-government initiatives. It is motivated in part by the observed inadequacies and weaknesses of existing electronic readiness assessment tools for application in e-government analysis.

As the term "e-government" is relatively new, with yet-to-solidify conceptual foundations, the paper explores first the underpinning conceptualisation of e-government. This discussion examines the conceptual development of e-government and the key categories of e-applications. This is followed by a review of pertinent literature on institutional/organisational assessment and analysis, with a view to identifying the distinctions between "readiness" assessment and "capability maturity" assessment. This examination provides a theoretical basis for the formulation of a framework for assessing the maturity of government capability for e-government in several important and interrelated areas.

2. Conceptual Development

E-government is a new addition to the rapidly expanding vocabulary of e-prefixed terms that reflect the expanding range of ICT applications in organisations and societies. Within the context of public management, e-government has joined such terms as "e-health," "e-procurement," "e-services," and even "e-housing" in gaining high levels of common use. Unlike most of these other more specific e-applications, e-government is still undergoing conceptual development to provide an overarching conceptual framework. The locus of its conceptual development has moved at least one step above its original conceptualisation and is evidently still undergoing re-conceptualisation in a dynamic environment. The initial conceptualisation assumed a more technological flavour, thus allowing the term to mean different things to different people. Furthermore, the definitions presented provide ideas only on what the term possibly means, thus leaving a degree of uncertainty as to what the definition does not include. While this type of definition is often sufficient, it becomes problematic when different meanings are presented, and more so when some of these interpretations are conflicting. Under these conditions, clarification of those aspects that are clearly not part of the definition reduces uncertainty and identifies the aspects that must still be subject to contextual interpretations. In light of this consideration, I will first conceptualise e-government both in terms of what it is and what it is not.

2.1 E-Government: What It Is

The conceptual development of e-government has so far gone through two distinct phases, and is presently witnessing the emergence of a third. In the first phase, the term e-government was used to mean the application of advanced ICT to deliver public services. This conceptualisation emerged from the relative successes of "e-commerce" applications, resulting in pressure being placed on

government organisations to improve their service delivery systems in the same way that some business organisations were doing. As a public sector equivalent of e-commerce, e-government is viewed primarily as a tool for electronic delivery of public services. This view has been the primary driver of e-government initiatives throughout the world. Through such initiatives, governments transfer a range of services into electronic formats, so as to make them more conveniently accessible over the Internet. Proponents of this conceptual view include Holmes (2001), Cook (2000) and Carrow (2001). According to Holmes (2001, p. 2), "Electronic government, or e-government, is the use of information technology, in particular the Internet, to deliver public services in a much more convenient, customer-oriented, cost-effective, and altogether different and better way." He further points out that cutting costs and improving government efficiency, meeting and improving citizen expectations and relationships, and facilitating economic development are some of the important considerations driving e-government. Note that technological rather than institutional and organisational considerations have driven this conceptualisation. It is the view that most technically-oriented individuals and institutions hold.

The second stage in the conceptual development of e-government has emerged from the consideration that electronic service delivery is a new way of doing business in government, and is therefore part of the ongoing reforms and transformation of government. The past two to three decades have witnessed major reform and transformation of government processes, systems and structures. Some of these initiatives have been fundamental enough to be considered a re-invention of government (Obsorne & Gaebler, 1992; Heeks, 1999). Osborne and Gaebler see government re-invention as the building of new government organisations with features including being catalytic, community-owned, competitive, mission-driven, result-oriented, customer-driven, enterprising, anticipatory, decentralised and market-oriented. It is interesting to note that Osborne and Gaebler made no mention of a role or application of IT or ICT in the re-invented government. Richard Heeks (1999) made this observation and attempted to fill this vacuum by focusing on new ICT applications in government. Other proponents of this view include Caldow (2001), Okot-Uma (2000) and Riley (2001).

Locating e-government in the context of ongoing reforms and transformation in government provides for its definition as the application of ICT to transform government organisations and relationships with the citizenry, the business community, and with other arms of government (UNDP, 1997). This perspective broadens the conceptualisation of e-government beyond electronic service delivery to include such other things as enabling participatory governance and collaborative arrangements to stimulate social and economic growth, outsourcing of some state functions to improve efficiency and effectiveness, and even privatisation of state enterprises. The aim of e-government in this regard is to assist in a broader programme to make government organisations more effective, responsive and accountable.

The third stage in the conceptualisation of e-government locates it within the context of the emergent information and knowledge age. The new reality alluded to in the introduction results from the ongoing transformation of the economy and society that has been widely articulated in the past four to five decades (Drucker, 1988; Castells, 1996). It is the subject of the World Summit on the Information Society (WSIS), the first part of which took place in Geneva in December 2003, with the second part scheduled for Tunis in November 2005. The WSIS confirms that the new socio-economic order is required at the highest level of government, and that its consequences, positive and negative, require the attention and intervention of global leadership for effective management.

E-government is viewed here as a kind of "new age bureaucracy," with systems and structures that adapt government organisation to the new environment. The argument is that existing

government bureaucracies, and in particular their deep vertical hierarchies, were designed for the industrial economy and society. The new information and knowledge society therefore requires new organisational arrangements and management paradigms (Nolan & Croson, 1995; Limerick & Cunnington, 1993). Such arrangements will be built from existing ones through progressive adaptation processes that incorporate the best of their functional features, abandon dysfunctional ones and introduce new features required to strengthen the capabilities for effective and efficient operation in the new environment. The ongoing reforms and transformation in government are therefore seen in this context to be part of the ongoing transformation in the broader society, and as a response to the disorientation of existing arrangements. This view casts e-government as the ultimate form and structure that government organisations will assume when the ongoing reforms and transformation are complete.

2.2 E-Government: What It Is Not

The conceptual development of e-government presented above provides three definitional locations for the term. Definitions such as these, however, fail to remove all uncertainties, especially when the concept in question displays an expansionary trend, such as is the case with e-government. Under such conditions, it is necessary and helpful to specify elements that are excluded from consideration, especially as e-government has been presented to mean many different things. Identifying what is not included in the concept of e-government to be employed here will have the beneficial effect of isolating inherent and potentially confusing ambiguities, so as to enable a better understanding than could otherwise be obtained.

While accepting that the concept of e-government can mean, and has meant, different things to different people, it is increasingly becoming apparent that:

- It is not about technology; it is about applications of technology, specifically ICT, in government. It is the enabling power of technology more than anything else that is of central interest, as it expands the capacity to accomplish more, in the same way industrial machinery is used to multiply force and energy in commercial farming or manufacturing establishments. It also means that decisions relating to the application of the technology are taken outside the scope of technological considerations.

- It is not so much about what the government does as it is about how the government accomplishes what it does. The important consideration here is that e-government reverses conventional government orientation from government-centricity to citizen-centricity, in the sense that the needs and convenience of citizens are intended to drive and define government business philosophy and strategies.

- It is not so much about power and control in government as it is about empowerment of others through information, knowledge and convenient service delivery. It is creating an environment that permits individuals, organisations and communities to realise their potentialities in exploiting the opportunities at their disposal. More importantly, the increasing number of channels of information and knowledge make the citizenry potentially more knowledgeable than ever before, and therefore more difficult to control or manipulate through denial of access to accurate information, or through misinformation.

- It is not about a political ideology or philosophy; it is about effective governance. While this assertion is contestable, especially by international development organisations and practitioners whose belief systems are rooted deeply in democracy and democratic principles,

one should note that China, for example, has embraced e-government, even though it is yet to embrace democracy (Chengyu, 2002; Lovelock & Ure, 2002). Furthermore, most oil-rich countries of the Middle East are non-democratic, yet they have embraced e-government. This being the case, e-democracy is clearly not necessarily an integral component of e-government. E-government cuts through political ideological orientations, though we recognise that it may have democratising effects, particularly when e-services components are used to improve the interactions between government and the citizens in a manner that empowers citizens.

- It is not about building a smaller government; it is about building a more efficient and effective government, in the sense that it is simpler, accessible, responsive, and transparent. Such a government is devoid of unnecessary bureaucratic red tape, and is therefore able to take action as and when required.

2.3 Main Categories of Applications

Even though the concept of e-government includes elements that are ordinarily outside the scope of technological considerations, the dominant role of ICT in enabling government systems and processes cannot be downplayed. The processes and systems that the technology enables define the range of interactions and relationship between the government and its stakeholders, of which citizens, the business community, the society in general, civil society in particular, and the government itself are principal. The interactions that define relationships between the government and these stakeholders have given rise to four main categories of e-government application: electronic administration, electronic business, electronic services, and electronic society. The descriptions that follow highlight the potential benefits of the different categories of e-government activities. The remainder of the paper then examines the reality of attempting to realise these benefits.

2.3.1 Electronic Administration ('E-administration')

The "e-administration" category of applications arises from the interactions within and between government agencies, as well as between different spheres of government (local, provincial and national). The interactions are generally referred to as government-to-government ("G2G"). These applications seek to improve the operational efficiency and effectiveness of government organisations, as they provide facilities to enable electronic communications and sharing of information and knowledge. E-administration applications permit simultaneous access to information, thus shortening the bureaucratic red tape associated with access to, and transmission of, information. This gives e-administration high potential for improving government efficiency and effectiveness, shortening the long turnaround times that are occasioned by waiting for information. It minimises situations where files go missing, and enables better integration of inter-governmental programmes and projects, potentially leading to considerable performance improvements.

2.3.2 Electronic Business ('E-business')

The "e-business" category of applications can improve interactions and relationships between the government and its customers and suppliers, who are considered here to be members of the business community. Although generally referred to as government to business ("G2B"), the interactions and relationships could be with business entities, citizens or any other legal entity with which the government has a business interest. Thus, citizens interacting with the government in a G2B mode are viewed in terms of their business relation to the government. E-business applications take most government procurement and disposal of assets to the electronic medium, thus cutting the red tape, the middlemen and the time required, and reducing operational costs,

unnecessary delays, paperwork and redundant data capture. Consequently, these applications can improve the business and economic competitiveness of a country. By permitting direct interaction between the parties, e-business cuts out the middleman and transfers the resulting cost benefits to the buyers. This leads to increased affordability of goods and services. In addition to speeding up the processing time, e-business creates a more transparent business environment, thus leading to better and timelier decisions and actions. It also leverages new technologies for better communication between the parties. E-business activities take different forms. They can be transactional, such as in licensing, permits, procurement, and revenue collection. They can also be promotional and facilitative, such as in trade, tourism, investment and campaigns.

2.3.3 Electronic Services ('E-services')

The "e-services" category of e-government applications enables interactions and relationships between the government and citizens, through which the latter gain access to a range of public services. Generally referred to as government-to-citizen ("G2C"), these interactions and relationships are not limited to citizens only. They include non-citizens and other legal entities that the government interacts with in the process of delivery of public services. Ideally, e-services enable all branches and levels of government to function as a single coordinated entity, thus expanding government availability and accessibility, moving government in the direction of anytime, anywhere and by any means. The goal of anytime service availability is basically a round-the-clock service, often expressed simply as "24-7," meaning 24 hours day, seven days a week. When compared to conventional government availability of eight working hours a day and five working days a week, or "8-5," e-applications have the potential to improve government availability dramatically.

The anywhere dimension of e-services accessibility puts choices in the hands of government customers as to how they wish to interact with, and do business with, their government. It gives them the convenience of accessing government services from wherever they are – at home, in the office, at a shopping mall or a local community center, or even overseas. Finally, the by-any-means dimension provides further choices, in that it allows consumers to use a variety of means and technologies to gain access. This could be by telephone, fax, e-mail, kiosks, face-to-face, or any other convenient means of reaching such services. Typical public services that can be delivered electronically include: permits and registration, directory services, public information and records, social grants, schools and library information, and revenue collection.

2.3.4 Electronic Society ('E-society')

The "e-society" category of applications enables the government to engage with the collective membership of communities and societies that comprise the nation. These applications create convenient channels for consultations and dialogues between the government and its stakeholders, thus enabling the interactions and relationships generally referred to as government-to-society ("G2S"). E-society applications can give these communities a collective voice in their dealings with the government, thus enhancing the quality and effectiveness of the communications, and encouraging active and productive participation in the governance process. The capacity of e-society applications to enable interactive participation and multiple consultations between the government and all its stakeholders explains why some, such as Okot-Uma (2000), choose to speak of these applications as e-democracy. It is, however, important to note that regardless of what this category of applications is called, its importance emanates from its capacity to enable stakeholders to engage their governments on a range of issues beyond service delivery. Through such a collective voice, stakeholders can influence government decisions and actions in a manner that can be seen to be democratising.

3. Readiness and Capability Maturity Assessments

3.1 General Overview

An assessment, or situation analysis, is purposeful information-gathering conducted as a learning process. Assessments seek to provide a better understanding of a given situation, and for a given purpose. They take different forms and assume different names, depending on the situation and intention, including appraisal, evaluation or feasibility study. All in all, assessments provide a snapshot of the state of affairs of a situation at a given point in time. The information content of such undertakings depends on the purpose, and can be brief or detailed.

When applied to proposed initiatives, assessments profile the environment so as to draw out needs, potential benefits, opportunities and challenges. Such information provides a basis for decisions about resource requirements. The information and knowledge gathered from an assessment are used to review, refine and re-focus institutional purposes and intentions, to determine resource requirements for an undertaking, and to formulate appropriate intervention strategies.

3.2 Electronic Readiness ('E-readiness') Assessment

"E-readiness" assessment is a recent development that accompanied the rapid expansion in Internet-based applications and their potential to influence social and economic development. The rapid proliferation of ICT applications in organisations and society that followed the commercialisation of the Internet brought with it numerous challenges and opportunities. The complexity of the emergent application environment is one of these challenges, and it to a large extent accounts for a significant number of failures in new ICT applications initiatives. While the critical importance of these applications makes their development an organisational imperative and therefore unavoidable, their complexity considerably increases the risks associated with their development and implementation. Electronic readiness assessment provides a better understanding of the target application environment, thus enabling effective management of associated risks.

E-readiness assessment has also been motivated by the increasing complexity and dynamic nature of the emerging ICT environment, the strategic value of the technology, and its high development and operating costs. While the strategic value of the technology and its high development costs demand that such developments succeed the first time, the complexity of the application environment increases the risk of failure. E-readiness assessment seeks to address both problems. By creating a better understanding of the application environment, the e-readiness assessment reduces the complexity and the associated risk-bearing uncertainty, thus increasing the likelihood of success.

A number of e-readiness assessment tools have been developed and used. Some tools have targeted communities and society (CSPP, 1998; CID, 2000), while others have focussed on countries (APEC, 2000; WITSA, 2000). Other e-readiness assessment tools were developed to assess the diffusion of ICT in developing countries.

The general popularity of the term "e-readiness" notwithstanding, a critical examination of its conceptual underpinnings and the available tools being applied reveal underlying inadequacies and inappropriateness of application.

At the most basic level, the concept of readiness tends to inspire a yes/no answer. Either a government is ready or it is not. This situation begs the question: so what? Whether the organisation is ready or not, what should it do?

Secondly, available e-readiness assessment tools have a fairly general applicability – to communities, societies, nations, economies and the like. When applied in a government situation, they carry the same level of generality, thus failing to provide adequate specific information beyond the tendency to conclude that an organisation is either e-ready or not. Such information is not so useful to an organisation wishing to determine priorities and required levels of investment for meaningful e-government initiatives.

Furthermore, available e-readiness tools are based on qualitative measures, the interpretation of which can be very subjective. Such situations permit different conclusions to be arrived at by different observers. Considering that such conclusions influence important decisions, they do not provide the necessary essential information relating to risk minimisation for such a fundamental institutional change.

3.3 'Capability Maturity' Assessment

Unlike readiness assessment, which tends to inspire a yes/no answer, a "capability maturity" assessment seeks to determine a point or a set of points on the maturity scale at which the unit of analysis is located. Although such scales are generally continuous, contiguous (distinct) locations can be established that define different levels of maturity in each of the capability factors.

The concept of "maturity" inspires a sense of progress and growth. To this end, a maturity assessment is viewed positively to suggest a direction in which to grow and improve. It thus provides richer and more useful information than a readiness assessment, which tends to generate a ready/not ready answer. On the basis of these considerations, a capability maturity assessment, when applied in an institutional analysis and profiling exercise, can provide better information than an e-readiness assessment. The information content of a capability maturity assessment includes the current maturity level, current capabilities and current challenges. Such information leads to a more accurate determination of strategies required to improve current levels of performance, to overcome the challenges, and to grow the capabilities to the next level of institutional maturity.

The need to determine what a given government agency can and cannot accomplish well, and what specific obstacles may inhibit its capacities, is an important step in assisting such organisations to improve and grow relevant capabilities. Moreover, the ability to differentiate organisations on the basis of their institutional capabilities permits determination of intervention strategies that are appropriate to the unique situation. This differentiation is generally captured in terms of levels of maturity in a given dimension of their strategic and operational capabilities.

A number of capability maturity models have been developed. Among these, the works of Greiner (1972), Gibson and Nolan (1974), Nolan (1979), the Carnegie Mellon University's Software Engineering Institute (Humphrey & Sweet, 1987), and the Software Engineering Research Centre (SERC, 2002) are notable. Greiner's work partitioned the growth of business organisations into five stages, each comprising a period of stability and steady growth (evolutions) followed by a period of turbulence and crisis (revolution). Greiner identified the age of the organisation, its size, its stages of evolution, its stages of revolution, and the growth rate of the industry to be the five key forces driving organisational growth. He defined the stages of growth as given in the table below:

Stage	Evolution	Revolution
1	Growth through creativity	Leadership crisis
2	Growth through direction	Autonomy crisis
3	Growth through delegation	Control crisis
4	Growth through coordination	Red tape crisis
5	Growth through collaboration	Crisis of ???
Source: Greiner (1972)		

Although Greiner's model may not be directly applicable to the growth of government organisations and institutions, its partition of the growth into distinct stages, each with certain capabilities, is an important concept with strong potential for general applicability.

Gibson and Nolan (1974) developed a model for the maturity of organisations involved in electronic data processing. Nolan revised the model in 1979 to include six stages from the original four. The six stages -- initiation, contagion, control, integration, data administration and maturity -- suggest that as the organisation matures, it becomes better able to manage its information systems and resources, with increasing focus on systems integration and data management (Nolan, 1979).

The Software Capability Maturity Model (SW-CMM), developed by the Software Engineering Institute (SEI) of Carnegie Mellon University, provides a framework for assessing the maturity of the software development processes of an organisation (Humphrey, 1987; Humphrey & Sweet, 1987). It identifies key stages of development that lead to maturity of these processes. The model defines a five-stage model reflecting the progressive maturity of the process capabilities of a software development house. These stages are: initial, repeatable, defined, managed and optimising. While SW-CMM was designed to assist software development companies to assess the maturity of their capabilities, and to plan the acquisition and institutionalisation of these capabilities, it has features that can be adapted for application in other organisations.

The IT Services Capability Maturity Model (CMM) is similar to the SW-CMM but applicable to organisations that provide IT services. The model seeks to enable IT service providers to assess their ability to deliver IT services and how to improve them. The Software Engineering Research Centre (SERC) of Vrije University developed the model between 1995 and 1999, through a collaborative research programme funded by the Dutch Ministry of Economic Affairs. (SERC, 2002)

Although the maturity models discussed above apply to different types of organisations, they all have two features in common. They define a set of capabilities against which the maturity of the organisation is assessed, and they partition the maturity spectrum into sequential contiguous stages within which the maturity of an organisation is located. The number of stages ranges between four and six.

3.4 E-Government Capability Assessment

Apart from being an assessment in the sense discussed above, an e-government assessment seeks

to determine the institutional capacity of a government agency or department for e-government. It should in this regard provide as much information as possible about the organisation. Such information and knowledge fall into three broad categories.

- Organisational resource capacity, level of performance, and what the organisation can and cannot do at its current level of resource capacity
- Existing opportunities that the organisation can beneficially exploit, and typical problems and challenges it is likely to face given its profile
- Appropriate intervention strategies the organisation needs to follow to improve its current level of performance, to effectively address the problems and challenges, and to build a new level of performance capabilities

KPMG Canada's (2000) E-government Capacity Check is one of the most comprehensive tools specifically developed to assess government capabilities for e-government. The tool defines six factors that define organisational e-government capabilities. These include: e-strategy, architecture, risk and programme management, organisational capabilities, value-chain management, and performance management.

It also defines five levels of e-government maturity that range from non-existent/underdeveloped capabilities (Level 1) to industry best practice (Level 5). The intervening maturity levels include early stages (Level 2), good management practice (Level 3), and advanced practice (Level 4). KPMG Canada developed and applied the model in assessing the maturity of Canadian government capabilities for e-government.

Accenture Consulting conducts on annual e-government survey and publishes its findings. In the 2002 survey, the third in the series, Accenture used the title "eGovernment Leadership – Realising the Vision," to underpin the "growing recognition that e-government is not just about technology – but about harnessing technology as just one of the tools to transform the way governments operate" (Accenture, 2002, p. 2). The 2002 survey focussed on the maturity of e-services and customer relationship management as key e-government capability factors. Using a weighting ratio of 70:30 for the data collection on the two factors, Accenture located each of the 23 countries surveyed into one of the following four maturity categories: platform-builders (Level 1); emerging performers (Level 2); visionary challengers (Level 3); and innovative leaders (Level 4).

4. E-Government Capability Maturity Assessment Framework

Building on the work in this field to date, I propose here a framework for assessing the maturity of government capabilities for e-government. The framework comprises a set of e-government capability factors, maturity levels for each capability factor, and a function for transforming quantitative data collected on each capability factor into a corresponding maturity level.

The assessment framework is premised on the conceptualisation of e-government as a new age government that must be built from existing government institutions. This is to say that any government organisation that has launched an e-government initiative has started the process of transforming itself into an e-government. It will achieve this goal by progressively acquiring e-government capabilities. To this end, the concepts of capability and progressive movement are central to the conceptualisation of the framework.

Capabilities are taken to be processes and functions that enable an organisation to deliver on its business mission and mandate. They may be business strategies and processes, or enabling institutional arrangements, or enabling technologies and other resources. Progressive movement, on the other hand, is a measure of the extent to which an organisation builds its e-government capabilities. It is a measure of the maturity of the organisation in these capability areas. Thus, capability factors, and levels of maturity in terms of each capability factor, are central to the conceptualisation of electronic capability maturity assessment.

4.1 Capability Factors

Capabilities form the building blocks for an e-government initiative. The literature reviewed on e-readiness and e-government assessments defined different categories of capability factors. The Computer Systems Policy Project (CSPP, 1998) e-readiness guide covers categories of capability indicators including: leadership, policy and regulations; connectivity and infrastructure; human capital and workforce skills; applications and services; ubiquity of ICT; and the economy and foreign investments. The Asia-Pacific Economic Cooperation group of nations (APEC, 2000) identified the following six categories of "enabling factors" in their guide for assessing the e-readiness of their member countries: basic infrastructure and technology; access to necessary services; current level and types of Internet use, promotion and facilitation; skills and human resources; and positioning for the digital economy. Similarly, as noted earlier, KPMG (2000) defined the following capability factors: e-strategy, architecture, risk and programme management, organisational capabilities, value-chain integration, and performance management.

These factors provided the background for the formulation of a set of capability factors for the framework of this study. This was achieved by weighting each of the factors defined by each model reviewed on the basis of its commonality across the various tools and models reviewed. Consideration was also given to the implications of the shifting focus of e-government from being about "e" to being about "government." This change in focus has required that consideration be given to typical government processes, the extent to which they can be ICT-enabled, and the impact and implications of this factor on the organisation and management of these organisations.

On the basis of these considerations, the following six factors were identified as constituting the most appropriate capability factors for e-government, and they are used in this study.

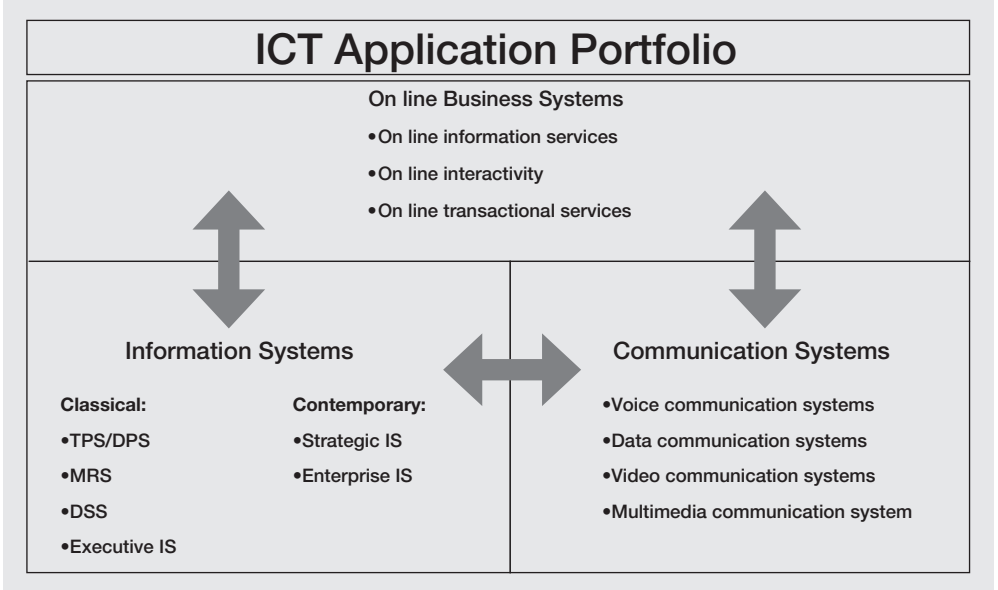
- Development and business agenda
- ICT application portfolio
- ICT infrastructure development
- Human and intellectual assets
- Governance and institutional infrastructure
- Leadership and management

4.1.1 Development & Business Agenda (DBA)

To the extent that defining e-government as a new age government makes sense, it is imperative for a government agency or department that has embraced e-government initiatives, or that

intends to do so, to have a clear statement of its development and business agenda (DBA). DBA statements normally take the form of national or corporate development policy, strategy and plans that include, among other things: national/corporate vision, mission, goals, and strategies; agency customer profile; a catalogue of products and services; delivery programmes and mechanisms put in place; business drivers and challenges; and critical success factors.

4.1.2 ICT Application Portfolio



Applications are the vehicles through which a selected range of services is delivered electronically. An organisation's application portfolio defines the capabilities of its ICT infrastructure in terms of electronic service delivery. In today's complex organisational environments, the application portfolio comprises the broad categories of applications, namely: information systems, on-line communication systems and on-line business systems.

Information systems are the older and most common set of applications found in any organisation. Conventional information systems seek to provide information for internal consumption and ensure that members have access to the right information at the right time, for the right purpose and at affordable costs. Emerging trends however suggest that information systems partitioned on the basis of classical organisational hierarchy have serious limitations – limitations that arise from their inability to integrate information across different functions, and across different levels of the same functions. Consequently, contemporary approaches seek to generate integrated information systems.

On-line communication systems are of four main types: voice systems, data systems, video systems and multimedia systems. Until recently, the first three tended to exist independently in organisations. The advent of digital information and communication technologies has given rise to convergent communication networks that process and transmit all forms of information – data, voice and video. The extent to which an organisation has moved in the process of integrating its hitherto disparate electronic communication systems is a measure of the maturity of its application portfolio.

Finally, on-line business systems (OBS) support delivery of services via electronic channels. OBS applications enable business transactions within and between organisations, thus transcending traditional organisational boundaries. They support direct interaction between the organisation and its business stakeholders and shorten turnaround times, leading to higher organisational productivity and cost savings.

Profiling the composition of an organisation's applications portfolio, and how specific applications are distributed into the three categories just outlined, provides a reasonable measure of the maturity of its e-government capabilities.

4.1.3 ICT Infrastructure Development

ICT infrastructure is the third capability factor for e-government. It provides the technical operating platform for the ICT applications portfolio. The ICT infrastructure generally comprises the following four components: ICT networks; access and connectivity; databases and data warehouses; and business continuity systems.

ICT networks conventionally comprise a combination of local area networks (LANs) and various forms of wide area networks (WANs). Emerging trends show moves towards the adoption of enterprise network architecture based on Internet TCP/IP protocols. This can provide organisations with a single network environment with three streams of service capabilities: Intranet (for internal organisational communications), Extranet (for communications between the organisation and its key stakeholders), and Internet (for public domain communications and global presence in cyber space).

Access and connectivity measure the extent to which organisational members and stakeholders have access to ICT hardware and services. For organisational members, it measures the extent of access to telecommunication services (both land-line and mobile), to the Internet and related services, and to personal computers or workstations. For stakeholders of the organisation, the same metric is used, but with a view to establishing the proportion of stakeholders that can gain electronic access to the organisation and its services.

Databases and data warehouses are key to all electronic interactions and transactions, in that databases and data warehouses contain and maintain the information required. Databases are repositories of organisational active business records. They capture and maintain data resulting from such activities. All active applications interrogate the databases, manipulating existing information and creating new information in the process. Data warehouses on the other hand are repositories of archival information, and have facilities that transfer dormant data from the databases to the warehouse. A data warehouse also has powerful search engines that assist active applications to locate archival records. These search engines harvest relevant knowledge and intelligence hidden in the massive data content of the warehouse. Although closely associated with applications, database and data warehouse facilities are a basic minimum requirement for effective use of organisational ICT resources, and thus they qualify to be considered as part and parcel of ICT infrastructure.

Business continuity systems (BCS) ensure that the electronic business environment is secure and not susceptible to threat or interruption. BCS infrastructure comprises three categories of interrelated systems, namely: security management systems, risk management systems and disaster management systems. Security management systems attempt to protect the electronic business environment from intrusions and threats, regardless of their source, by controlling

access. Risk management systems attempt to ensure that potential known threats specific to the organisational electronic environment are protected against, and that effects are minimised when disruptions occur. Disaster management systems attempt to ensure the establishment and maintenance of a state of preparedness in the organisation against any disaster that may disrupt proper functioning of the organisational electronic business environment. In the event of a disaster, the system puts in operation mechanisms to ensure that critical business systems are not affected, and provides for speedy recovery of all business systems to full functionality.

To the extent that an organisation's ICT infrastructure defines the nature and scope of its applications portfolio and therefore its e-applications, reviewing the organisation in these dimensions provides indications of the maturity of its e-government capabilities.

4.1.4 Human & Intellectual Assets ('Capital')

The capacity of an organisation to perform any task associated with its business is critically dependent on human intervention. Even when the most sophisticated technology is used to carry out a particular task, there will always be human intervention at one point or another. Such interventions are guided by the specialised knowledge and expertise that human experts bring to bear on such activities. Because such skills and expertise are deployable assets, we consider them as organisational capital, and therefore we speak of human and intellectual "capital." We therefore make a clear distinction between human resources and human capital. We consider human resources to be a potential yet to be developed for future exploitation, and human capital to be the finished product, ready for deployment and exploitation.

With regard to e-government, successful development and implementation of mission-critical initiatives will require skills, expertise and competencies in the areas of: business skills and competencies; conceptual competencies; technological competencies; institutional "capability development" competencies; social networking and "teaming" competencies; and leadership competencies.

The degree to which a government organisation has these competencies in its human and intellectual capital repository, or has access to them from external sources, is a measure of the maturity of its e-government capabilities.

4.1.5 Governance & Institutional Infrastructure

Governance and institutional infrastructure are essential for successful development and sustainability of e-government initiatives. While governance ensures the establishment of institutional arrangements, and distribution of institutional powers and authority in terms of roles and responsibilities, institutional infrastructure provides an effective framework that ensures predictability in the exercise of such powers and authorities. A strong governance and institutional infrastructure for e-government will require a number of components, including: institutional systems; a legal and policy framework; an ICT architectural framework; an information communication and knowledge management (ICKM) framework; a funding and resource mobilisation framework; and a capability development framework.

To the extent that governance and institutional infrastructure defines the culture and structures required to accomplish the business mandate of an organisation, it is imperative that these systems reflect the environmental dynamics of the organisation. They should be stable enough to create a sufficient level of internal predictability, and flexible enough to promote innovation and

organisational learning in response to the changing external environment. The degree to which an organisation has put in place such systems and structures is a measure of the maturity of its e-government capabilities.

4.1.6 Leadership & Management

Leadership and management are key to any organisational undertaking, but different views exist as to the meaning of each term and the relationship between them. There are those who consider leadership to be one of the four management tasks, namely: planning, organising, leading and controlling (Mintzberg, 1975; Smit & de J Cronje, 1992). There are others who believe that the concepts of leadership and management are different but complementary.

Kouzes and Posner (1987) underscore the symbiotic relationship between leadership and management by using such terms as turbulence, conflict, innovation, and change to describe leadership situations, and the terms stability, harmony, maintenance, and constancy to describe management situations. They conclude that both leaders and managers are needed, as they are essential for making social systems work.

In making a distinction between leadership and management, Kotter (1996) argues that leadership is about "coping with change," while management is about "coping with complexity." He explains that leaders cope with change by setting direction, and aligning and motivating people, while managers cope with complexity by planning and budgeting, organising and staffing, and controlling and solving problems.

To the extent that e-government is about building a new age government, it requires a proper combination of leadership and management -- the former to champion the transformation process, and the latter to keep the wheels of government rolling. This, however, must be accomplished in such a manner as to maximise the benefits of their complementarity, by ensuring that the organisation is not "over-managed and under-led," as is typically the case according to Kotter (1996). A number of factors can be used to find out the extent and effectiveness of organisational leadership and management for e-government. These include: e-government vision, mission and strategy; political and administrative "championship"; composition of e-government initiatives; location of direction, coordination and oversight for e-government initiatives; strategic partnerships and collaborations; and organisational planning and budgeting systems.

4.2 Capability Maturity Levels

We have noted that e-government maturity in a given government organisation is defined by its location on the growth scale on each capability factor. As growth is a continuous process, it has been partitioned into contiguous stages that we refer to here as levels of maturity. Most of the assessment models reviewed in the literature have defined levels of readiness or maturity. These ranged from three to six levels. The APEC (2000) defined three levels of readiness, while CSPP (1998) defined four progressive stages. The KPMG (2000) E-Government Capacity Check defined five levels of e-government maturity.

For this study, we have selected six e-government capability maturity levels: business-as-usual; on-line information services; on-line interactivity; on-line transactional services; service integration; and organisational transformation. These are defined as follows:

4.2.1 Business-As-Usual Level

A government organisation in this stage goes about its business in more or less the same way it has always done over the years. It displays no awareness of the expanding impact and challenges of the new ICT applications on government in particular and society in general. It does not consider these to be relevant or important to it. It does not view ICT as a strategic resource, and maintains conventional applications to provide support services. The ICT application portfolio of such organisations comprises mainly lower-end operational applications, the majority of which are for capturing financial transactions and maintaining resulting financial records.

Any reforms that the government may be undertaking are viewed exclusively as institutional and organisational adjustment processes -- processes that have nothing to do with either the new public management paradigms or any other new developments that seek to re-invent or re-engineer government systems and processes.

4.2.2 On-line Information Services ('Publishing') Level

The on-line information services level, also known as the "publishing" level, entails the establishment and maintenance of an organisational presence in the global cyber space. This comes through an appropriate website to which various pieces of information on the organisation are posted. Initially, the content of the website is predominantly about the structure of the organisation and those who occupy political and administrative leadership positions. Later, more information, such as annual reports and other publications relating to the activities of the organization, are posted to the website. Also included at this point are events and the activities of the leadership of the organisation.

4.2.3 On-line Interactivity Level

This level expands the capabilities of on-line presence to include forward and backward communications between the government agency and its stakeholders, be they customers, suppliers, citizens or other communities of interest. At the lowest end of this level, the government makes various application forms for the range of services it provides available and accessible on-line. Such forms can be downloaded, completed and then submitted using various modes, including hand-delivery, postal services, or faxing. Later levels of interactivity provide for on-line completion and submission of applications forms, and for requests for specific services from government, especially those relating to how to accomplish specific tasks, and provision of appropriate responses. Additional tools are added at this level to improve service. These may include databases that allow for posting of inquiries and conducting advanced searches to obtain real-time responses.

4.2.4 On-line Transactional Services Level

This level expands further the capabilities of the previous level to include conclusion of business deals electronically. A government organisation at this level of electronic maturity has developed its website to the point where its clients are able to carry out complete transactions on-line. Clients are thus able to identify a service or a range of services that they require, apply for them, make necessary payments for such services where applicable, and obtain service or services, where possible. Services such as renewal of business or road licences can be delivered electronically in the manner discussed here. These transactions are conducted on-line from a suitable access point, which could be a public service kiosk, an office or a home computer. Fully web-enabled service is added to make a business process such as tax and fee collections -- or purchase order

submission, or electronic payment -- interactive and automated. This level of technology requires business process analysis and re-engineering to make it reliable and secure for the Internet environment.

4.2.5 Service Integration Level

This integration level creates bridges between the various electronic government applications in the various government organizations, so that they work together as a single, government-wide system. It eliminates the functional and departmentalised manner in which the government operates internally and externally. It creates one-stop shops and single-window access to such services, or government portals built around customer needs and priorities. This stage ensures that public services are built around "life events," and not around government structures, as is traditionally the case. While the traditional government structures may remain intact, they become invisible as they increasingly recede into the background, while the e-services take the front stage as the interface between the government and its clients. Fully integrated interactions and transactions between multiple organisations, applications and databases, both internally and externally, are enabled at this level. Functions include ordering, delivery, accounting, and reporting. While Level 3 (On-Line Transactional Services Level) applications are focused on individual transactions, applications at this level (Level 4) focus on automating and integrating the multiple re-engineered business processes that support the goals and mission of the applications.

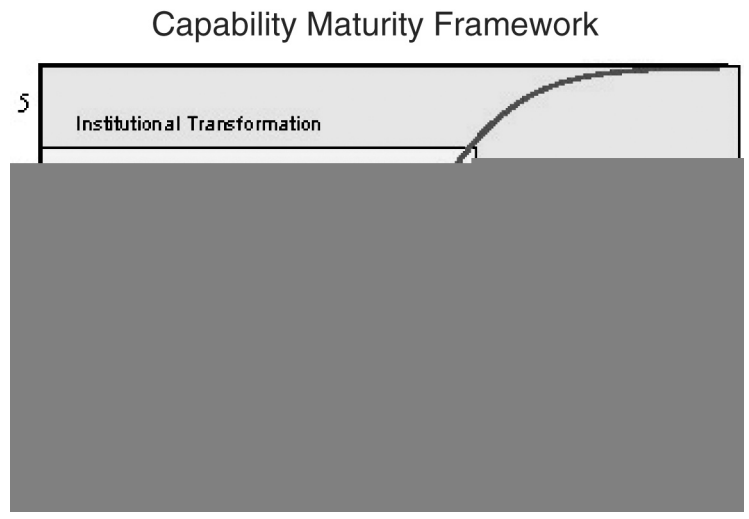
4.2.6 Organisational Transformation Level

This level presents the final stage in the development of e-government applications, when a total overhaul of traditional government organisational structures takes place and is replaced with new architectures that take full advantage of the power of ICT. The fact that all service delivery mechanisms have been fully integrated and streamlined so that they reflect the needs and aspirations of the customers, rather than the agencies responsible for their delivery, renders most traditional government structures dysfunctional and irrelevant. Furthermore, the work processes and systems that have given rise to seamless integration of service delivery on a government-wide basis provide a pointer to the kind of integration that may be required. Although the extent of the required transformation may not be fully understood in practical terms, since no government has yet reached this stage, there are indications that new age governments will adopt organisational forms that are less hierarchical and more "networked," less command-and-control and more enabling and empowering -- more information- and knowledge-driven than is presently the case.

4.3 Capability Maturity Function (CMF)

This study defines a capability maturity function (CMF) as a composite function that takes the data collected on the variables associated with each capability factor and returns values corresponding to the maturity of the organisation in that capability factor. It is considered a composite function on two counts. First, the variables corresponding to each capability factor may in themselves be functions of other lower-level independent variables. Secondly, the value obtained by direct manipulation of the variables corresponding to each capability factor must first be subject to transformation that aligns the variables to a standard learning or logistic curve. Finally, the value obtained from the learning curve is converted to a contiguous value corresponding to the maturity level of the organisation for the capability factor.

The use of a learning curve is necessary to depict the actual situation in organisations. Being a growth process, capability maturity is subject to characteristics similar to growth. The capabilities



of an organisation experience slower growth at the beginning due to inertia arising from resistance to change and other cultural factors. As time goes by, the organisation gradually builds more knowledge, competence and confidence in the changes introduced, and its capabilities experience a period of accelerating growth, peaking somewhere in the middle. Beyond this point, the growth rate decelerates due to increasing saturation. The diagram depicts the resulting trajectory and maturity levels.

The adoption of equal intervals for maturity levels means that these can be expressed as capability maturity indices (CMI).

5. Conclusion

This paper has developed a comprehensive framework for assessing the maturity of government capabilities for e-government. It specifically proposes an e-government capability maturity assessment framework based on:

- Six capability factors (development and business agenda, ICT application portfolio, ICT infrastructure development, human and intellectual capital, governance and institutional infrastructure, and leadership and management);

- Six levels of maturity (business as usual, on-line information services, on-line interactivity, on-line transactional services, service integration, and organisational transformation), and

- A mapping function that traces the logistic trajectory of growth curves.

The electronic capability maturity assessment framework proposed here provides for both quantitative and qualitative assessment of government institutional capabilities for e-government. By locating the maturity of relevant capabilities, quantitative assessments provide pointers to areas of the institutional environment that need further qualitative analysis to provide better understanding and knowledge. The framework also provides a more refined set of institutional capability factors relevant to an electronic government environment than is found in the current set of e-readiness assessment tools. The statistical tools to be used to translate data obtained into a contiguous set of

maturity levels have standard algorithms that can be used to automate the analysis. The next step is to implement the new framework in a real world setting, a challenge that the author is taking up in the next stage of a longer research project.

References

Accenture (2002) *eGovernment leadership – realizing the vision*, http://www.accenture.com/xd/xd.asp?it=enWeb&xd=industries%5Cgovernment%5Cgove_welcome.xml, retrieved 2 December 2003.

APEC – Asia-Pacific Economic Cooperation (2000) *The APEC e-commerce readiness assessment guide*, APEC, http://www.ncapec.org/docs/Readiness_Guide%205_0.doc, retrieved 2 December 2003.

Caldow, J (2001) *Seven e-government leadership milestones*, Institute of Electronic Government, IBM Corporation, http://www-1.ibm.com/industries/government/ieg/pdf/Seven_E-Gov_Milestones.pdf, retrieved December 2003.

Carrow, JC (2001) 'Five keys to e-government', *Inter@ctive Week*, Vol 8, No 2, 15 January, 86-88.

Castells, M (1996) *The information age: Economy, society and culture, Vol I: The Rise of the network society*, Blackwell, Oxford.

Chengyu, X (2002) 'E-government in China, present and future', Paper for the international seminar 'E-administration for the benefit of citizens', 21–22 January, Paris, France, http://www.univ-paris1.fr/droit-internet-2002/pdf/en/Xiong.pdf, retrieved December 2003.

CID – Centre for International Development (2000) *Readiness for the networked world: Guide for developing countries*, Information Technologies Group, CID, Harvard University, http://cyber.law.harvard.edu/readinessguide/thegudie.html, retrieved 2 December 2003.

Cook, ME (2000) *What citizens want from e-government: Current practice research*, Centre for Technology in Government, University at Albany/SUNY, Albany, NY, http://www.netcaucus.org/books/egov2001/pdf/citizen.pdf, retrieved 2 December 2003.

CSPP – Computer Systems Policy Project (1998) *The CSPP guide to global electronic commerce readiness*, http://www-1.ibm.com/industries/government/doc/content/resource/technical/277132109.html, retrieved 2 December 2003.

Drucker P (1969) *The Age of discontinuity: Guidelines to our changing society*, Heinemann, London.

Drucker, P (1988) 'The Coming of the new organization', *Harvard Business Review*, Vol 66, No 1, January- February, Harvard University, Boston, MA.

Gibson, CF & Nolan, RL (1974). 'Managing the four stages of EDP growth', *Harvard Business Review*, Vol 52, No 1, January-February, 76-88.

Greiner, LE (1972) 'Evolution and revolution as organizations grow, *Harvard Business Review*, Vol 50, July/August, Harvard University, Boston, MA.

Heeks, R (ed.) (1999) *Reinventing government in the information age: International practice in IT-enabled public sector reform*, Routledge, London.

Heeks, R (2001a) *Understanding e-Governance for development*, Working paper No 11, I-Government Working Paper Series, Institute for Development Policy and Management, University of Manchester, http://idpm.man.ac.uk/publications/wp/igov/igov_wp11.shtml, retrieved December 2003.

Heeks, R (2001b) Building e-governance for development: A Framework for national and donor action, Working paper No 12, I-Government Working Paper Series, Institute for Development Policy and Management, University of Manchester, http://idpm.man.ac.uk/publications/wp/igov/igov_wp12.shtml, retrieved December 2003.

Holmes, D (2001) *eGov: e-Business strategies for government*, Nicholas Bealey Publishing, London.

Humphrey, WS & Sweet, WL (1987) *A Method for assessing the software engineering of capability of contractors*, Software Engineering Institute (SEI) Technical Report, Carnegie Mellon University, Pittsburgh, PA, CMU/SEI-87-TR-023.

Humphrey, WS (1987) *Characterizing the software process: A Maturity framework*, Software Engineering Institute, (SEI) Technical Report, Carnegie Mellon University, Pittsburgh, PA, CMU/SEI-87-TR-O11, ADA 182895, June.

Kotter, JP (1996) *Leading change*, Harvard Business School Press, Harvard University, Boston, MA.

Kouzes, JM & Posner, BZ (1987) *The leadership challenge: How to get extraordinary things done in organizations*, Jossey-Bass, San Francisco.

KPMG (2000) *E-government capacity check: Lessons learned report*, KPMG and the Enhanced Management Framework Division, Chief Information Officer Branch, Treasury Board Secretariat, Government of Canada, http://www.cio-dpi.gc.ca/emf-cag/gcc-ec/report-bilan_e.pdf, retrieved 2 December 2003.

Limerick, D & Cunnington, B (1993) *Managing the new organization: A Blueprint for networks and strategic alliances*, Jossey-Bass, San Francisco.

Lovelock, P & Ure, J (2002) *E-Government in China*, Telecommunications Research Project, University of Hong Kong, http://www.trp.hku.hk/publications/e_gov_china.pdf, retrieved December 2003.

Melody, WH (2002) 'The Triumph and tragedy of human capital: Foundation resource for building network knowledge economies', *The Southern African Journal of Information and Communication*, Issue No 3, 1-9, LINK Centre, Graduate School of Public and Development Management, University of the Witwatersrand, Johannesburg.

Mintzberg, H (1975) 'The Manager's job: Folklore and fact', *Harvard Business Review*, July-August, Harvard University, Boston, MA.

Nolan, RL (1979) 'Managing the crisis in data processing', *Harvard Business Review*, March-April, 115-126.

Nolan, RL & Croson, DC (1995) *Creative destruction: A Six-stage processing for transforming the organization*, Harvard Business School Press, Boston, MA.

Okot-Uma, RW (2000) *Electronic governance: Re-Inventing good governance*, Commonwealth Secretariat, London, http://www1.worldbank.org/publicsector/egov/Okot-Uma.pdf, retrieved December 2003.

Okpaku Sr., JO (ed.) (2003) *Information and communication technologies for African development: An Assessment of progress and challenges ahead*, UN ICT Task Force Series 2, Third Press, New York.

Osborne, D & Gaebler, T (1992) *Reinventing government: How the entrepreneurial spirit is transforming the public sector*, Addison-Wesley, Reading, MA.

Riley, TB, (2001) *Electronic governance and electronic democracy: Living and working in the connected world, Vol 2*, Commonwealth Centre for Electronic Governance, http://www.electronicgov.net/pubs/research_papers/eged/contents.shtml, retrieved 10 June 2002.

SERC – Software Engineering Research Centre (2002) *The IT service Capability Maturity Model (CMM)*, SERC, Division of Mathematics and Computer Science Department, Faculty of Science, Vrije Universiteit, Amsterdam, http://www.bita-center.com/bitalib/itservice-cmm/itscmm-presentation.pdf, retrieved December 2003.

Smit, PJ & de J Cronje, GJ (1992) *Management principles: A Contemporary edition for Africa*, Juta, Cape Town.

UNDP – UN Development Programme (1997) *Reconceptualizing governance*, Discussion Paper 1, January. UN Management Development and Governance Division, New York,

WITSA - World Information Technology and Services Alliance (2000), *International survey of e-commerce*, WITSA, http://www.witsa.org/papers/EComSurv.pdf, retrieved 3 December 2003.