

## THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES AS TOOLS FOR INSTITUTIONAL TRANSFORMATION IN ARMENIA

*Audrey N. Selian, Fletcher School of Law & Diplomacy, Tufts University;  
Turpanjian Center for Policy Analysis, American University of Armenia;  
National Center for Digital Government, Harvard University*

**Abstract:** *This paper analyzes the role of information and communication technology (ICT) in government in the Republic of Armenia (RA). This examination is based on broad theoretical research, as well as on qualitative information gathered over a six-month period of interviewing key Information Technology (IT) government employees, as well as of individuals working within and on the periphery of Armenia's burgeoning technology sector. The mini-case featured in this work is the RA's Ministry of Health. The purpose of this research is to formulate a means to assess which the feasibility of e-government, not only in terms of deploying its physical infrastructure, but also in terms of looking at its relevance given the current political climate and the nature of the democratization process in the country. Main topics addressed will include an examination of the role of technology as an institutional "transformer" given the intangible constraints of a Soviet legacy, the problems inherent in the use of IT in a donor-based economy, and the challenges of confronting the administrative infrastructure's status quo in Armenia.*

JEL Classification: O33, O19, O14.

Keywords: Information and Communication Technology (ICT), IT, institutions, transformation, governance, Armenia.

*The dream that a new technology might liberate man from both the tyranny of nature and the fruits of his own folly is as old as Western civilization (Westin, 1971).*

## **I. INTRODUCTION**

As a landlocked country isolated in many ways from the global economy, which lacks a substantial industrial base, Armenia stands to gain tremendously from the use of information technology. The country is still adapting and recovering from major events of the last fifteen years, and efforts are underway to uncover the right configuration of aid, technology, and policy that will be conducive to sustainable development. In its May 2003 “Armenia 2020” strategy paper, McKinsey & Co. formulated a number of recommendations based on an assessment of the software and IT services sector in Armenia, as well as upon a range of success factors from various case studies, including from India, Israel and Ireland. One of the key recommendations focused on the role of government as a leader in fulfilling ‘information society’ objectives, mainly as a lead user and facilitator of IT services in the public sector.

The advancement of Armenia’s IT sector is touted as one among a handful of solutions available to address the development ills of the country. Various organizations have been conceived to facilitate both public and private sector IT advancement in Armenia, including the an IT Development Support Council, the Enterprise Incubator Foundation, and SiliconArmenia.com. The educational curricula in technical fields of the state universities has improved. In addition, a number of e-government initiatives have emerged from across the spectrum of donors that operate in the country – TACIS, USAID, CDA, DFID, etc. – as well as from some NGOs in the community.

The extent to which these efforts transform the institutions of governance in Armenia is not something to be taken for granted. This paper will consist of an analysis of the current use of information and communication technology (ICT) in one of the principle ministries of the executive branch of the Armenian government: the Ministry of Health. This will be used as an example, a sampling of a larger comparative study that was completed across twenty institutions in the three branches of government.

### **A. Research Methodology**

This paper is grounded in the theoretical foundations of the concepts of political development and political culture, tying the manifestations of institutional development in Armenia into its broader socio-political context. It is based on pieces of qualitative information gathered over a six-month period of methodical interviewing key IT government employees and individuals working both within and on the periphery of Armenia’s burgeoning technology sector.

The bulk of the qualitative analysis here comes from over 70 interviews of employees in the Armenian government institutions, albeit with heavy emphasis on the executive branch. These institutions include a broad range of government ministries, as well as the Parliament, the Constitutional Court, the Central Bank, and two Commissions. Information was gathered in a grouping of field notes, and what began as a series of informal discussions was merged into a more formal template for analyzing the ICT capacity of institutions. The framework used to structure the research and gather data sets out four types of institutional capacity: financial, human, organizational, and technological.

Gathering qualitative information through interviewing is only effective if there is a strict framework of categories and definitions to organize data. Often, interviewing and surveying are the only way to gather data, as there is frequently a dearth of updated documentation in developing country governmental structures plagued by insufficient resources. Few governmental organizations in Armenia without explicit previous experience in ICT development appear to have strategic plans outlining their institutional objectives, particularly as they relate to improving the levels of transparency. The complex interplay between the components of institutional ICT capacity requires drawing conclusions, often about the same issues, through a number of different analytical perspectives.

The data formulates a means by which the feasibility of e-government efforts can be assessed, not only in terms of deploying its physical infrastructure, but also in terms of looking at its relevance given the current political climate in the country. Digital government, also known as electronic or e-government, is the use of ICTs by government to deliver information and services to its constituents. In spite of the considerable literature on the subject, there is little agreement on what constitutes good measures for digital government or what should be measured for assessment (Carbo and Williams, 2004). Due to space constraints, this paper will not examine in detail every Armenian Ministry or government institution; rather, it will take a broad overview of Armenia's ICT capacity, and focus on the Ministry of Health as a case study.

Topics addressed in this paper include: the role of technology as an institutional "transformer" given the intangible constraints of a Soviet legacy; the problems inherent to the use of IT in a donor-based economy; and the challenges of confronting the administrative infrastructure's *status quo* in Armenia. Armenia's current administrative infrastructure is indeed a critical barrier – along with its dire telecommunications (*i.e.*, ArmenTel) predicament – to the facilitation of enhanced levels of political participation and to political development. Our research addresses whether IT could possibly solve the endemic problems of governance in Armenia.

Two general points govern the use technology within governmental institutions. One is based on the organic growth and internal usage of technology (*i.e.*, technology as endoskeleton), including the existence of information systems, servers and networks, as well as databases and applications. The other refers to the external usage of technology (*i.e.*, technology as exoskeleton) in public diplomacy and a public relations tool as the primary means by which a given institution projects information about itself to its citizenry and peers in government. The most superficial manifestation of this type of ICT is the internet site, while the deepest measure of technology commitment in such organization is the existence of an explicitly designated IT budget, staff, and developed institutional capacity.

## **B. Key Findings**

Our research's key findings indicate that the persistent selection of the low-hanging fruit, in terms of providing technical and financial assistance to government institutions, may perpetuate cycles of ineffective ICT absorption. The real challenges tend to lie in the human and organizational capacity aspects of these institutions. To avoid project replication, greater communication and coordination between donors, ministries, and civil society organizations is necessary. This is also true for projects undertaken between

government institutions and local/municipal ones. Moreover, the executive, legislative, and judicial branches of government must cooperate to tackle the challenges of digitization and automation, and an active body must undertake the task of educating and training at every level of public sector administration. This active body already exists in the form of the IT Development Support Council but the Council is neither sufficiently empowered to issue directives or mandates, nor possessed of the capacity to do so by default.

The case of the Ministry of Health specifically demonstrates that “ICT and development” projects should be less about websites and more about the interactions that characterize sustainable development efforts. Local ownership of projects that are intended to enhance functionality and service delivery is vital. Each public sector institution must confront its unique challenges in developing its potential in terms of human, organizational, technical, and financial capacity. Donors may kick-start the process, but organizational and administrative maturity and true “ICT readiness” must grow organically. The innovativeness of individuals working at the Ministry of Health with limited resources but strong vision shows us that there is potential for mutually beneficial relationships that are longer-lasting and more sustainable than alternatives requiring extensive external influence. The provision of medical information is a case in point. There is neither sufficient use, nor leveraging of the local market – either in terms of tapping human capital, or in terms of employing local resources - when it comes to identifying and developing ICT-related solutions for government and society. The politics of the donor world should not function to the detriment of the galvanization of local human/social capital in Armenia.

### **C. Theoretical Foundations of Technology Impact in Political Systems**

Understanding the dynamic of non-western polities requires an approach that transcends falsely intuitive analytical frameworks based on western experience alone. It also requires a capacity to account for traits and trends that are embedded deeply within specific cultural and historical contexts. Accordingly, the view of technology as a neutral force in a polity is not unquestioned; cultural and historical context can play a role in polarizing its effects. Langdon Winner (1986), for one, was not satisfied with the idea of neutrality, arguing that technology can be inherently political. Winner asserts that this is true in part because there are some technologies that are particularly linked to a particular social or political system (Winner, 1986).<sup>67</sup>

Before embarking on a study of ICT capacity of institutions in a political system, it is important to outline a few conceptual areas that govern and affect the role of new technologies in government. These include the relationship of technology to power in political systems, the process of political development, and the phenomena of political culture. Each of these gives us a sense of how can influence, and what technology can accomplish, in society: “[Through the use of ICTs]... information about social reality could ... be made so rich and detailed, policy options could be so clearly defined, the

---

<sup>67</sup> A technology like a nuclear power plant, with the high risk involved in plant failure leading to a highly centralized method of producing power and the need for security to protect from theft and sabotage, is an inherently authoritarian technology. This does not mean that a nuclear power plant cannot work in a democracy; just that it concentrates power in a few. Similarly, the distributed, interlinked nature of the electrical distribution system is far more democratic in nature. The other way in which technology can be political is in its creation. Langdon believes that “[m]ost changes in the content of everyday life brought on by technology can be recognized as versions of earlier patterns.” There are, however, technologies that are fundamentally new and affect broader patterns”.

probable outcomes of alternative measures could be so accurately predicted, and the feedback mechanisms from society would be so effective that man could at last bring his full intelligence to bear on resolving the central problems of society” (Westin,1971).

#### **D. Power in Political Systems**

The region of the Caucasus (and Armenia, in particular) faces challenges ranging from an overall deficit of democracy and the predominance of “strongmen over statesmen,”<sup>68</sup> to the dysfunctions wrought by small clan-based ruling elites functioning in a dominant executive, a weak parliament, and a dependent judiciary (Giragosian, 2003).

Rosenau and Singh (2002) study traditional notions of instrumental, structural and meta-power in political systems. They argue that IT is a key enabler for formerly disadvantaged groups to play a role in politics and reconstitute their identities. Instrumental power focuses on the capacity or capability of power holders to effect particular outcomes. Thus, ICTs are viewed as a force that enhances these capabilities. This was one of the first ways in which political scientists and policy makers examined the relationship between IT and power in politics. ICTs enhance the capabilities of traditional global actors like states and firms, while also empowering other actors (including transnational social movements or terrorist groups) (Rosenau and Singh, 2002). Early public policy literature examining the impact of technology on power revolved around notions of instrumental power. The way technologies empower less privileged groups is especially important in recognizing the promise of technology in instrumental contexts. The spread of democracy in Russia was tied in crucial ways to the proliferation of information networks and accessibility of information for individuals and groups (Rosenau, 2002).

Structural power deals with capabilities in a political system and technology’s ability to affect the rules and institutions that govern outcomes. By definition, structural power is concerned with the constraints and limitations of particular activities with given institutions. Rosenau and Singh (2002) note the reciprocal relationship between technology and structure. Technology influences the structures of security or economic affairs; moreover, existing structures or institutions shape the technologies themselves. The case of technology shaping structures is made foremost in radical scholarship; those of the Marxian strain posit that so-called ‘forces of production’ (including technology) are essential in the unfolding of history, shaping social relations (as between capitalists and workers). The dialectical relationship is held in place by the superstructure, including the state that ‘exists to guarantee the production of these social (including economic) relations as a whole’. In the same way, Winner (1977) believes that technologies are structures whose conditions demand the restructuring of their environments. Those who see existing structures as constraining the use of information technology propose a slightly different notion of structural power. Structure determines technology’s potential, instead of vice-versa. Rosenau (2002) believes that technology is neutral but that its use is shaped by the environment in which it finds itself. There are indeed contexts in which technology and structures, or political-economic institutions, adapt to each other.

The concept of meta-power refers to how networks reconfigure, constitute, or reconstitute identities, interests and institutions. Keohane and Nye (1988) point out the ascendance of soft power and, thus, come close to delineating a notion of meta power. They see the power

---

of persuasion (rather than force) as a new salient feature of politics when information networks proliferate. Their conception is particularly salient for those in the business of public diplomacy, which is essentially the realm of public relations in government. Some theorists see technology as merely playing a catalytic role in accelerating or reinforcing existent or developing processes. Thus, the emergence of government websites, for example, can serve merely to reinforce the relevance or legitimacy of institutions that are intent on conveying a particular image to a particular audience; the element of control implicit in the application of technology to the process of content development means that institutions can “be” what they say they are.

According to Rosenau (2002), power is ultimately about capabilities, identities, and interests. Governance involves authority, concerted action, and the resultant institutions, and ICT networks themselves are governance networks. ICT networks allow for diffused forms of authority to emerge, for concerted action to take place, and for institutional creation or reinforcement. Scholarship and popular opinion deems IT less hierarchical and more plural and democratic. Nevertheless, it is critical to avoid making assumptions of this sort that can allow for a deterministic ICT paradigm to supercede the reality of partaking in technology projects in transition countries.

### **E. Political Development**

According to Almond and Powell (1966), the study of political systems necessitates analysis of the capabilities and functions of institutions within them. In broad terms, political systems can be assessed in terms of the relationship between their functions and structures, and, in many ways, it is technology that determines the interface between these. Certainly, ICTs’ use in politics affects both how government institutions convey information about their objectives and purpose, how they make themselves accessible and interactive to their constituents. Thus, the relationship between structure and function in government institutions is a critical one.

The term “political development” is endowed with a particularly deterministic undertone in the post-communist/development context. This is not unlike the majority of ICT projects undertaken in the developing world; the expectations of technology as an objectively positive transformer of institutions are clear. To “develop”, particularly in conjunction with the deployment of IT, means to create and simulate the structures and appearance of neo-liberal institutions as they exist in the West. Needless to say, this is a highly interactive, dynamic and complex process in which outcomes are not certain.

Political development is a byproduct of the extent to which the international community permeates a country’s institutions, the way domestic society evolves alongside civil society, and, of course, the way political elites pursue and fulfill their interests. The development process has some critical catalysts: impulses for change in the magnitude (and content) of inputs (*i.e.*, challenges, requests for information) into a political system. Such impulses can emerge, theoretically speaking, as a result of a growing lack of capacity in a system to cope with confrontation to incumbent powers. A decline in the magnitude or content of the flow of inputs into a political system may result in negative or regressive “development”. A political system’s capabilities may decline or be overloaded, roles and structures may atrophy, and the culture in question may regress to a more traditional pattern of orientation. Many would agree that the lack of transparency and clarity in political organizations and the increasing entrenchment of private interests in the Armenian public

sector reflect just this type of regression. Moreover, when ICT projects are implemented on top of a flawed institutional *status quo* (where elite modernization exists but a vast majority of the population is marginalized), outcomes can be less than optimal. This is a finding that is confirmed by the case of Armenia.

Almond and Powell (1966) identify several types of challenges to a political system. One is the problem of penetration and integration associated with state-building. The second is that of loyalty and commitment (possibly manifested by the extent of general trust in government). The third is that of participation in government decision-making. The final problem is unequal distribution of income, wealthy and opportunity (Almond and Powell, 1966). All of these problems feature prominently in Armenia's political system, and, in some ways, ICTs are being used as a superficial balm to soothe these problematic areas. The proliferation of internet sites, online communities, and the objectives of portal creation are in large part aimed at addressing issues of political participation and political trust.

A common theme in the democratization of "transition" states of the former Soviet Union (with the exception of Georgia, in which there has been significant U.S. involvement) is that such outright challenges are relatively latent, though unrest is high and general standards of living are still low. In Armenia, such challenges surfaced briefly in spring 2004 before being brutally repressed, without allowing time enough for there to be ripple effects in the fabric of governmental institutions. Formal opposition yet exists, but the more dangerous informal opposition forces characterized by people demonstrating in the streets is gone – replaced now with general apathy of the citizenry, mingled with mistrust and fear.<sup>69</sup> The "neo-nomenklatura" working in government institutions are very concerned about conveying a particular image about the state of affairs in Armenia; there is a concerted, collective effort to portray a cosmetically, *i.e.* technologically, enhanced version of government and state. In most cases, this is merely to ensure that donor funding streams continue to flow in what is without question a donor-driven economy.

## **F. Political Culture**

In conjunction to delving into the meaning and process of political development, it is essential to examine the concept of political culture. According to Almond and Powell (1966), political culture is the pattern of individual attitudes and orientations toward politics among the members of a political system; the subjective realm that underlies and gives meaning to political action (Almond and Powell, 1966). Such orientations include cognitive, affective and evaluative categories. Each category is based on varying levels of individuals' understanding, knowledge, feelings, or judgment of political objects and events. Since a political system is made up of the sum of its parts and institutions are comprised of the individuals that work within them, these perceptions with political culture matter. Political culture is likely to support certain general political goals and procedures, and to reject others (Almond and Powell, 1966). To a large extent, the supply and demand of political trust in society is also a determinant of its political culture: are political opponents viewed with suspicion? Does political interaction and discussion take place, what is the level of civility and institutionalization of political interaction?

---

<sup>69</sup> A poll conducted in the summer of 2002 revealed that less than 15 percent of the population read (government-controlled) newspapers on a daily basis and reported that 48 percent did not read newspapers at all. A September 2002 survey that found a mere 1.5 percent of the Armenian population trust the country's print media, compared with 80 percent five-six years ago (Giragosian and Balci, 2003).

Armenia's formal political culture is characterized by a President that holds enormous power (despite lack of specific reference thereof in the Constitution), a Prime Minister that has no specific mechanism of recourse with regard to presidential decisions, redundant responsibilities, as well as a lack of accountability and 'checks' between branches (Mkrtchian, 2001). Armenia's informal political culture, exemplified by its nepotistic tendencies, its non-standardized work habits, its general disregard for transparency and the free flow of public information, and a paradoxical conduciveness to the emergence of individual innovators within its structures, is difficult to gauge without the experience of immersion.

## **II. THE CONCEPTS OF E-GOVERNMENT AND BUREAUCRACY**

Approaches to implementing e-government work in developing countries generally tend to be broad and top-down. While a top-down approach in a transitioning country may be necessary in terms of guiding strategy and political will, it is not as useful when one gets to the nuts and bolts of looking at how e-government can actually be realized. Donor organizations undertake most e-governance projects, and few projects in Armenia tend to comprise any organic movement toward ICT and/or automation. Website-content developers are not working with process engineers and Chiefs of Staff to determine how best to limit the average citizen's time spent on countless administrative merry-go-rounds. There exists a simplistic assumption that websites will be constructed, citizens will use those websites, processes will potentially be automated, technology will work its magic, and a country will somehow become more democratic. Of course, the reality of internet penetration, teledensity, and general proclivity of the population to seek public information in Armenia is nowhere near where it must be to justify e-government initiatives.

The idea that ICTs could increase and enhance direct democracy (Barber, 1984) is an overly simplistic one when put into the context of non-western, transitioning political systems. Our research revealed no consistent definition or understanding of e-government. E-government, for the purpose of this paper and as mentioned above, is defined as the use of information and communication technologies to provide access to government information and delivery of public services to constituents through the automation of bureaucracy.

According to Jane Fountain (2001) of Harvard University, "... information technologies and organizational/institutional arrangements are connected reciprocally. Both function in this framework as dependent and independent variables. Each one has causal effects on the other. Institutions and organizations shape the enactment of information technology. Technology, in turn, may reshape organizations and institutions to better conform to its logic. In contrast, institutions generate rules and requirements to which actors and organizations must conform if they are to receive support and be deemed legitimate in their authorizing environment. Organizational environments reward effectiveness, efficiency, and control over production. Institutional environments reward normative requirements for appropriateness and legitimacy and, in some cases, conformity to procedure, presentation, symbols, and rhetoric."

According to Weber's (1947) theory of bureaucracy, a new type of organization, leadership and bureaucracy was derived from a "rational" framework in the second half of the 19th century. Leaders in these political systems were recognized and obeyed for subscribing to values of logic, efficiency and reason; such organizations functioned on the basis of

legitimately derived laws, rules and regulations. Weber identified three key features of bureaucratic organizations: a formal and unambiguous hierarchical structure of power and authority; an elaborate, rationally derived and systematic division of labor; and a set of general, formal, explicit, exhaustive and largely stable rules that were impersonally applied in decision-making (Jain, 2004). All decisions and communications are recorded in permanent files, there is a clear separation of personal from official property, and a high level of meritocracy (as opposed to nepotism) applied to hiring personnel. Despite the clearly negative connotation of this terminology when used in present day, it is apparent that the characteristics attributed to it as a concept are desirable. For those familiar with Armenia's political system, it is clear that the structures in place are pre-bureaucratic and in the laden context of a traditional society.

It is difficult for a specialized bureaucracy to operate effectively in a traditional society (Almond and Powell, 1966). In such societies, custom governs political conduct and, more specifically, the patterns of behavior engrained in well-established social networks. Individuals are treated (and behave) according to ascribed status, not according to particular merits and needs relevant to a particular political domain. To impose the rules of Weberian bureaucracy as we know on such cultures is to undermine persistent traditional norms. Even if ICTs could enhance the functionality (and hence interactivity) of websites, therefore, the fact remains that citizens seeking information about how best to accomplish a public sector administrative task will not send email or check an internet site. They will make use of an internal contact, if they can, to find the most effective and expeditious way to accomplish their goal.

The issue of how e-government and bureaucracy impact one another is undetermined and lacking in clarity. IT emerges as a tool for reforming bureaucracy, and, paradoxically, e-government failure may be explained as a consequence of bureaucracy (Jain, 2004). Researchers like Lazer (2005) use various lenses to study e-government. Stakeholder approaches, network theory, and diffusion of innovations phenomena are all a means of understanding under what conditions ICTs can improve the functioning of government (Jain; Lazer, Katz, Arrow, and Contractor). Armenia's case serves as an example through which the validity of both of these emergent themes can be examined.

### **III. INTRODUCING AN ICT ASSESSMENT TOOL**

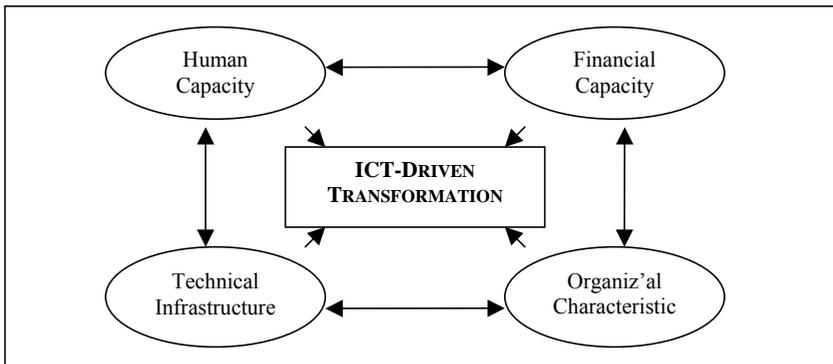
By virtue of the fact that the most challenging problems in many transition countries relate to social-service delivery and poverty, it is necessary to examine the capacity of government to serve its citizenry. The countries of the post-Communist world lack clear and consistent patterns of market-oriented regulation, liberal political cultures, and advanced existing telecommunication infrastructure as signaled by teledensity measures and internet penetration, and consistent "access" levels. They are not candidates for generalization either way. The most of idiosyncratic factors that "customize" the concept of political effectiveness to their nation states and color their otherwise generic adaptations of "democratic" structures are the key to understanding how to formulate and implement policy.

This analysis treats a core set of institutional characteristics as necessary to the process of political development or maturation in Armenia's political system on which technology usage will be contingent. These characteristics include human capacity, organizational culture, technical infrastructure, and a financial resource base. These four components,

shown in Figure 1, comprise the structural and cultural characteristics existent in a country's political system. Each of these pillars of institutional "capacity" are an effective indicator of the extent to which ICTs can be applied and absorbed to achieve the 'official' donor objectives of greater efficiency and transparency. Without them, it is not possible to gauge any change in the "regulative, distributive, symbolic or responsive capabilities" of Armenia's political system (Almond & Powell, 1966).

The tools used to manage information flow in a public sector institution, particularly related to the executive branch of government, have a material impact on that institution's ability to articulate and, eventually, to meet its objectives. Since the public service plays (at least theoretically) a key role in public sector institutions, it is critical to observe whether the use of technology can manage information flow. The possibility of an institution's absorbing new information technology, such that they can be real enablers of change, is contingent upon several interwoven key components related to organization, infrastructure, and leadership. Some are structural, while others are more dynamic and variable, like budgetary and human resource issues.

Figure 5.1. The 4 Pillars of ICT Driven Institutional Transformation

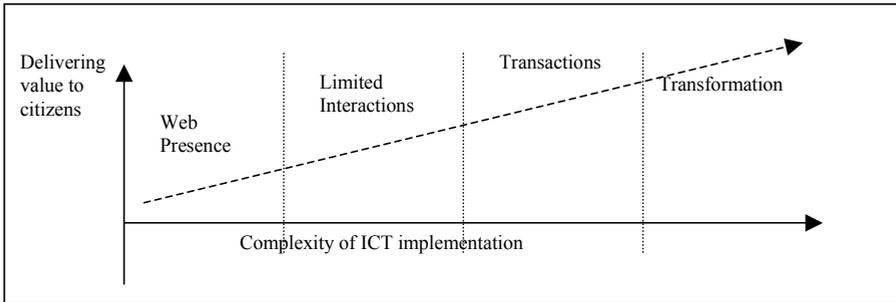


Our assessment's areas of inquiry address each fundamental component in turn and relate it to a government organization's capacity to adopt and use ICTs. The inquiry is based on a set of assumptions about how an institution can use IT effectively, insofar as the characteristics of technology as an objective, positive transformer can be understood. For example, it would be a valuable outcome if the determination of one component of ICT development turns out to be a catalytic one for the other components. In other words, it is a goal of this type of research to determine whether the main barrier to successful ICT implementation is a financial one as opposed to a technical one.

Based on a summary review of ICT for development projects, it is evident that the invisible threads of determinism wrapped around the various technology-related aid programs that donors organize are real. While donor efforts to promote democracy and free-market values in transitioning countries are largely well-intentioned, and the approach based on 'cause-and-effect' expectations about IT is flawed. Indeed, there is a degree of latent determinism even in the terminology and stated missions of those involved in gifting computers, networks, and servers to the developing world. In conjunction with this, of course, is a normative component that derives from academic literature characterizing ICTs as inherently positive social transformers. The process of implementing ICT work as a function of the value delivered to citizens reconfirms this conceptualization, as shown in

Figure 5.2, which the World Bank presented to a group of Armenian IT and e-Government experts in October 2004. From web presence, to the facilitation of interactions, to the eventual transformation of institutions to an "ideal" exemplified by optimal levels of political participation, ICTs are considered as tools for facilitating 'progress' along a continuum of institutional change.

Figure 5.2. ICT and Service Delivery



As ICT implementation progresses, the complexity of the types of transactions the use of technology facilitates gauges its utility to the citizenry. Our analysis attempts to clarify the features that will render the deployment of a technology program either a success or failure in these terms. Due to the fundamentally qualitative and subjective nature of the analysis, it is important to start out with a basic understanding of the interplay of decisive factors in a conceptual framework, as well as to articulate the means by which to assess optimal and sub-optimal outcomes. To this end, Figure 5.3 lays out some basic scenarios.

Figure 5.3. Characteristics of ICT Scenarios

	Sub-Optimal	Optimal
<b>Human Capacity</b>	Late Adopter Culture	Innovator Culture
<b>Technical Infrastructure</b>	Donor Driven & Marginal	Organic Growth & Mission Critical
<b>Financial Capacity</b>	Deference to External "Push" factors/ Aid	Commitment/ Active Resource Allocation
<b>Organizational Characteristics</b>	Opaque, No Feedback Mechanism	Commitment/Transparent & Accountable

**IV. DESIGN OF THE ICT ASSESSMENT TOOL**

Through a process of ongoing refinement and customization, it is necessary to assign varying levels of importance to the sub-components under each capacity heading depicted in Figure 5.1, if one hopes to make the results of such research operational and useful. Our analysis weighs and measures each sub-component (organizational, human, financial, and technical) on a seven-point Likert scale, which is subsequently summed up and normalized to a range of 0-10 (0 meaning "no evidence", and 10 meaning "very strong evidence" of each given phenomena). As aforementioned, various elements in each category are weighted more heavily relative to others. Hence, the totals for each capacity area comprise more than the simple summations of numbers above them; they are weighted and

normalized to a scale of ten. Numbers highlighted in yellow throughout the scorecard-values indicate categories with potentially unclear responses that were given the “benefit of the doubt.” This tool’s total (or perfect) score is 40, which defines an optimally functioning institution with optimal ICT capacity in a highly developed state.

For the organizational component, for example, the extent to which IT work is institutionalized and mission-critical is weighted more heavily than whether the organization manages websites or galvanizes the citizenry. Given that there is little discernible demand for public information in Armenia and that the majority of households acquire their public information from television,<sup>70</sup> ICT’s capacity from an organizational perspective lies in the structure of IT development, its drivers, and how it is executed rather than on how many hits each government website receives. Certainly, the extent to which efforts are donor-driven is also critical and is weighted (along with the presence of back-office automation) more heavily than other questions.

The analysis’ financial capacity component is concentrated most heavily on the pivotal point of whether an institution has an explicit IT budget. Institutional commitment, external advisory influence, and planning may be in place, but none of this is significant if there is no budget to support real IT development. The extent to which sustainability and transfer of ownership is evident, as well as whether the government provides a modicum of financial capacity when there is no active donor, is also taken into account and weighted more heavily than other factors, such as the nature of external donor support and the extent of budget tracking and execution (which is often redundant in the face of nonexistent budgets).

The analysis emphasizes as its technical capacity component the extent of PC penetration and the development of local, organic solutions using open-source software applications. The presence of a local network, the status of software licenses, and the nature of the client interface (which presumably indicates a sophisticated back-office) are all also weighted more heavily than the amalgam of usual questions about the nature and criticality of internet connectivity. The end result is a weighted, normalized score of between 1 and 10 indicating the extent to which each institution is able from a technical standpoint to effectively absorb and integrate ICT solutions.

The human capacity component is derived from a number of measures, the most heavily weighted of which reflects the extent to which innovators are present in the institution. Innovation and good leadership appear to be the most critical elements of success across the range of Ministries examined in this paper. Also weighted more significantly is the extent to which salaries exceed the low average of US\$50 per month and if there is adequate (or any) IT support. The analysis also accounts for other important factors, such as technical and/or regulatory backgrounds, career paths, employee turnover, etc.

If nothing else, the analysis shows the danger of assessing ICT capacity based purely on front-end technology in the form of web interfaces of governmental institutions. Such information mischaracterizes the capacity of the institutions simply by virtue of their website status, easily overlooking the key factors (*i.e.*, transactional capacity) that can determine the real success of digital government initiatives.

---

<sup>70</sup> This information is based on a survey conducted by the author between September and December of 2004 of 400 households in Kapan, Gyumri and Yerevan.

**V. THE SAMPLE CASE: ICT STATUS OF THE MINISTRY OF HEALTH**

*Address:* Government Building 3, Republic Square, Yerevan, Tel.58-24-13

*Website:* <http://www.arminhealth.am>

*Number of Employees:* Approximately 100-120

*Percentage of Computer Usage:* 75-80 percent

According to its official description, Armenia's Ministry of Health is a republican body of executive authority, which elaborates and implements the policies of the Republic of Armenia Government in the healthcare sector.

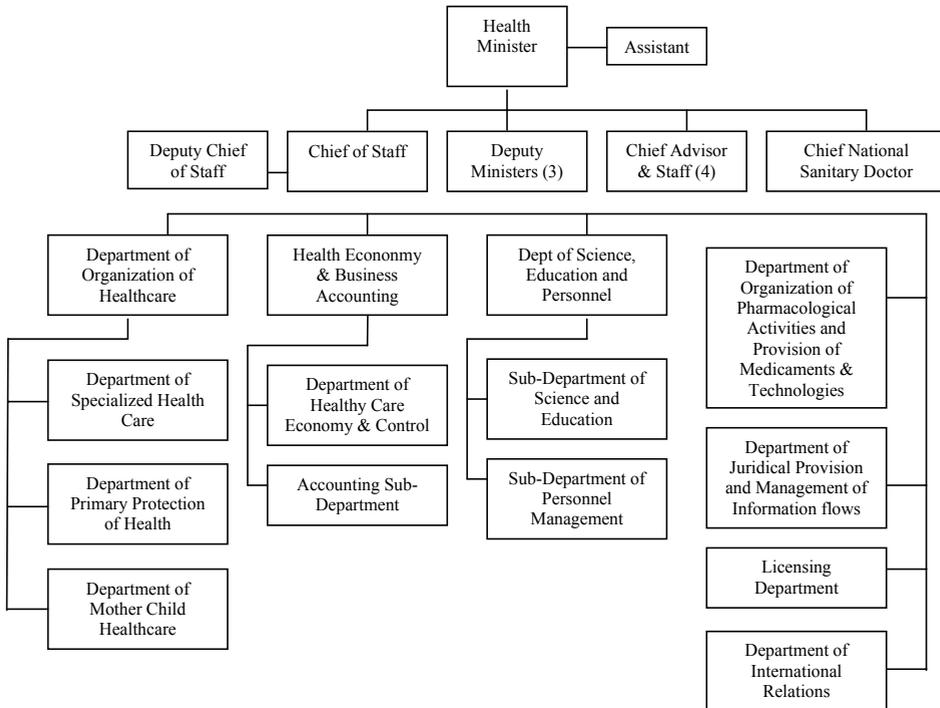
Publicly available information includes: statistics obtained through a National Database (including statistics regarding population, characteristics of population health, resources for health care, maternal and child health); legal Information (Law on Drugs, Law on Reproductive Health and Rights); programs and Action Plans (National Environmental Health Action Plan of Armenia (NEHAP), including a program on tuberculosis/malaria control in Armenia; the Armenian-American ophthalmology program; family medicine in the Primary Health Care section; National Response to HIV/AIDS in Armenia; and programs and strategies to improve child health and development; and programs and strategies to improve reproductive health).

There is also information available on international cooperation programs, as well as key features like webmail capabilities and English/Armenian language options. The Ministry of Health's website, relative to others sites, has been developed with the help and collaboration of the World Health Organization in Geneva, Switzerland.

Each department of the Ministry of Health generally has a Head of Department, a Deputy Head of Department and/or various Heads of Sub-Departments, a Chief Specialist, a Leading Specialist and/or a Primary Specialist, and a Secretary. The Licensing Department, the International Relations Department, the Department of Juridical Provision and Management, and the Department of Organization of Pharmacological Activities and Provision of Medicaments and Technologies are smaller than their counterparts in the organizational structure of the Ministry.

There are three main layers to the Health Information System Assessment, including the associated ministries (the Ministry of Health, the National Statistical Service, and the Ministry of Social Welfare), municipal centers, and medical facilities in the regions. Although it is not immediately explicit on the Ministry's organizational chart, an Information Department exists as part of the Judicial Provision and Management of Information Flows Department and was created approximately two years ago, having been previously split into three separate information- and/or technology-related centers. The Minister of Health decided to centralize the work of the Ministry's information and communication infrastructure in 2001 and work with the World Health Organization on an "ICT implementation" project.

Figure 5.4. Organizational Structure of Ministry of Health



As a result, the Ministry of Health has a moderately advanced information and communication technology infrastructure, supported in part by their own servers and, in part, by the services of MedInfo, a private health information systems provider created in 2001 that works primarily with the Ministry of Health. One of the results of the project is the Ministry website, which by Armenian Ministry standards, is well-developed and navigable.

MedInfo works with the Hygiene Agency, and supports the SANIBIT database, which is an information bank housing 87 types of disease indicators. Their work is devoted to health-related data processing, system design, and the provision of support to the technical projects of the Health Ministry and related units. Prior to the creation of MedInfo, from 1996-2000, a Health Information Analytical Center existed. Its service was generally incompetent and the lack of adequate financial resources to maintain the department internally rendered it ineffective. After 2001, work toward a functioning social security system began, along with development of the NEMRUT system and the National Information System (under the auspices of the Ministry of Transport and Communication). Since MedInfo was “privatized” into the Information Analytical Center one year ago, IT service has improved in quality and appears to be more answerable and responsive to Ministry technology needs.

The primary challenge of the Ministry of Health’s ICT environment appears to be related to facilities and education and/or IT training. The last major training initiative occurred approximately three years ago, and there are still issues surrounding the fact that some of the reporting forms used to collect information date back to the former Soviet system. There is considerable duplication of effort in the procedures associated with reporting and

recording data. The Ministry has difficulty interacting with comparable institutions for the purpose of leveraging information or looking at benchmarks or best practices.

It is also difficult to provide information to the citizenry, in large part because the key target audience of the Ministry is the people. Citizens, when they contact this ministry, must write official letters; emails are not part of its communication norms. ICT infrastructure, from an organizational perspective, is seen as an enabler not necessarily for standardizing the presentation of public information (an area in which they have already made some organic progress), but as an opportunity for comparing national data with international data sets. ICTs are seen to facilitate collaboration and to prevent the duplication of effort.

### **A. Human Component**

There are between 100 and 120 employees in the Ministry of Health, of whom 80 percent have PCs. Seven people work for the in-house information division, which is dedicated to the collection and analysis of data; two technical workers whose focus is network maintenance/systems) are imported from MedInfo, and there are three additional statisticians who work on reports and methodology. The Ministry itself does not employ technical specialists necessary for system design. While MedInfo's work is indispensable to the Ministry's function, the use of new technologies appears to be moderately "mission-critical" to its operations.

The MedInfo group that supports the Ministry's technical needs (from the standpoint of equipment maintenance, upgrades, accessories, etc.) is composed of twelve people, including engineers, programmers and network administrators. Some of these work part-time. They typically have low employee turnover and a consistent, high level of training for the employees.

There is a considerable amount of individual initiative that goes unrecorded, even on the official Ministry websites. An interview with the Armenian equivalent of the American Surgeon General yielded tremendously interesting facts about the development of public information materials (CDs, brochures, etc.). This is part of a broader pattern of fragmented, decentralized development of information materials that is typical in most Armenian Ministries and organizations.

### **B. Financial Component**

There is no separate budget designated for an Information Technology development in the Ministry of Health. Resources are allocated in general aggregated departmental budgets and are utilized on an "as-needed" basis.

According to MedInfo, the total money allocated to health care in the national budget has grown each year, from AMD 18 billion (US\$36 million) in 2003, AMD 24 billion (US\$48 million) in 2004, and AMD 34 billion (US\$68 million) slated for 2005. MedInfo works with the Ministry of Finance, as well as UNICEF, USAID and the World Bank to develop an immunization program. Interestingly, the interview with MedInfo yielded an idea that is seldom articulated in Armenia: that government funding for such programs is at an order of magnitude above the collective funding pool brought together by donor organizations and that more of it comes from the state than from outside. It is not possible to discern the

extent to which this is true without transparency in the sources of the government's general budget, information that is not publicly available. In any case, such statements are in stark contrast to the culture of donor dependence that appears to be present in the majority of government Armenia's Ministries.

### **C. Technical Component**

MedInfo has created a local area network (LAN) and established an internet connection via satellite internet. As is the case with most Ministries, financial limitations are the main problem associated with maintaining consistent internet connectivity. Their "knowledge management" systems are comprised mostly of local file servers, which reside at the Ministry in conjunction with a number of print servers. The Ministry's internal "knowledge" network is equipped with search functionality. Webmail use is common. There is a functioning framework to connect with information systems in the Marzes, three of which currently have IT facilities. These regional centers contribute to the aggregation of updated information about mortality, diagnoses, etc. for international classification of diseases.

In terms of physical infrastructure at the Ministry, there are in place both three (Acer) servers (Mail, File/Print, Web) and a number of computers with varying levels of processor capacity. There are: one Pentium IV computer, four Pentium III's, fourteen Pentium II's, eighteen Pentium I's, seven old Celeron processors, and 33 Celeron IIk; in total, just under 80 machines. The Ministry has eight copy machines (five of which must be upgraded) and 44 printers, half of which are in acceptable shape. Across the board, approximately 50 percent of this equipment must be upgraded.

There is an optical line for the provision of internet and network connectivity that should be physically ready for the Ministry in a couple of months but which will be more expensive than the connectivity that MedInfo currently provides. ArmenTel's telecommunication monopoly features prominently here as everywhere else; they have a downlink of one Mb and a radio modem uplink of 128 Kbps.

### **D. Work with Donors**

Armenia's Ministry of Health collaborates with the World Bank, the World Health Organization (WHO), and USAID to develop an information program aimed at creating a computerized system of reporting. Over the last twenty years, they have gathered information for a National Database and have plans to add analyses that eventually will be publicly available online. Data is collected on an ongoing basis from 600 facilities, creating the "Health System of Armenia" in conjunction with the National Statistical Service. Death and birth certificates are also issued. There have been known to be significant discrepancies between figures stated in the medical and the state systems – in large part because people who move or emigrate rarely report their change of status. For this reason, the integrity of the constantly updated health systems database is more likely to be accurate, according to the Director of Information Services.

MedInfo has worked with the WHO on data presentation systems to aggregate national indicators of various kinds (social, demographic, health) through until the end of the year. It also works with PADCO in a social transition program financed by various information centers and an electronic network (GHIS).

## **VI. APPLYING THE ICT ASSESSMENT TOOL**

Figure 5.5, below, presents the main results of this analysis, which allows for a comparative view on qualitatively derived information within and across government institutions. The Ministry of Health's total score, 19.17, places it quite squarely in the middle of its counterparts in terms of average achievements of ICT capacity across the four categories of analysis. It is important to place this analysis in context. As one of fifteen executive branch ministries, the relative strengths of the Ministry of Health lies in technical and organizational areas of IT equipment and application and in the innovation from human capital. Its greatest challenge lies in the financial realm. The spillover effects of ICT capacity evident in this Ministry are few, if any, considering the total lack of inter-Ministry coordination and communication in government. It is fairly common for government employees to know little if nothing about their counterparts, despite information provided by their official websites.

## **VII. CONCLUSIONS ABOUT THE ICT CLIMATE**

The purpose of this type of "inventory" analysis is to lay a foundation upon which future e-government work in Armenia can be undertaken. Without a means of clearly identifying and deconstructing problem areas, there is little hope of addressing and presenting solutions for them. This paper represents one small step in contributing to a solution for these challenges.

The climate for the use of ICTs in Armenia is still generally sub-optimal. Our case study of the Ministry of Health demonstrates this sup-optimal climate, though the Ministry of Health still performs better than some of its institutional counterparts. This may be attributed to the development of its information systems by an external, private entity that benefits from reasonable remuneration, in stark contrast to the vast majority of Ministries, in which IT departments are in-house and yet peripheral (at best). The Ministry of Health has found a way to forge ties with a spin-off IT department that clearly proves to be more efficient as an entity external to itself. The private entity is not subject to the budgetary oversights of other organizations, and must deliver – and expect in return – professional service with professionalism from its contractors. This appears to work well with MedInfo. The externalization of the IT center forces directs attention within the organization to the priority of communication infrastructure. Needless to say, the fact that the Ministry of Health's work is especially information-driven certainly helps. The main beneficiaries of what IT-enabled infrastructure exists of the Ministry are those for whom access to statistics about diseases, immunizations, health records, etc. are useful. Beyond usefulness to health researchers and other international and civil society organizations, centralized and accessible information about health is vital to the functioning of local/municipal level health organizations; it is critical for the continued relevance of practitioners' knowledge in the field. Armenia's health system is far from adequate; however, material improvements could at least achieve institutional transparency at the executive level. Recent international emphasis on the benefits of tele-medicine capabilities and the rise of e-health solutions for global development agendas provides further incentive for the continued prioritization of ICTs in the Ministry of Health.

Figure 5.5. ICT Capacity Assessment Tool

<b>Organizational Components</b>		Scale 1-7
1	Transparency: If yes	6
a	General propensity to divulge information	x
b	Evidence of PR + IT depts. work together? If yes	x
c	Does Chief of Staff facilitate ICT work? If yes	x
d	Organizational chart available? If yes	x
2	Target audience for ICT projects: who do they benefit? If society (1)	4
3	Digitizing info for galvanizing citizenry (via interactivity): If yes (1)	1
4	Digitizing info for back office automation: If yes (1)	4
5	Efforts donor driven, simply for absorbing funding? If no (1)	2
6	Does the institution manage websites? If yes (1)	4
7	Do they use local networks and maintain DBs for back office automation? If yes (1)	6
8	Is IT work of individuals or institutionalized? Do they report to senior management? If institutionalized and yes (1)	6
9	If IT dept. is centralized/inhouse(.5), if de-centralized/outourced (1)	6
10	Is IT mission critical for high percentage of total functions? If yes (1)	4
<b>Total</b>		<b>5.42</b>
<b>Financial Components</b>		
1	Is there indication of institutional commitment?	5
2	Is there an explicit IT budget? If yes	1
3	Is there evidence of external support?	4
4	Extent and involvement of external support	5
4a	If financial? Yes	x
4b	If design? Yes	x
4c	If technical? Yes	x
4d	If organizational, strategic? Yes	x
5	Evidence for sustainability & transfer ownership? If yes	5
6	Are upgrades of equipment planned? If yes	1
7	Is there budget tracking? If yes	1
8	Is the budget executed through the year? If yes	1
9	If no budget, where does resource come from? If government	4
10	How does IT interact with other factors of organization? If ubiquitous	4
<b>Total</b>		<b>2.58</b>
<b>Technical Components</b>		
1	How many computer/relative to total staff? If > 80 percent	4
2	Is security a priority? If yes	6
3	If MS Windows (default) (0), If OS presence	4
3a	Do they do application development in house?	x
4	Software licenses? For each user? If yes	1
5	Web-based, client-server, terminal? If any	5
6	Is there local network? If yes	5
7	Status Internet connectivity (low- 0, medium -.5, high-1)	4
8	How critical is Internet to work? If M or H	4
9	How many servers service network? If > 2	6
10	Level of upgrade necessary is low, If yes	4
10a	Is there defunct equipment, unused equipment?	x
<b>Total</b>		<b>5.33</b>
<b>Human Components</b>		
1	How many total IT staff supporting Ministry? If > 2 or 3	5
2	Does human capacity management feed back into planning?	1
3	Is there adequate ICT support?	4
4	If IT center: external (1), if internal (.5)	6
5	Salaries: If > average US\$50	6
6	If background is technical, and regulated	1
7	Career path? If yes	1
8	Employee turnover: If low	4
9	Presence of innovators: If yes	5
10	Leadership: If subjective assessment is good (Yes =1)	5
<b>Total</b>		<b>5.83</b>
<b>Grand Total out of possible 40</b>		<b>19.17</b>

**LIKERT SCALE:**  
**1-7**  
 1= No evidence  
 2  
 3  
 4= Some evidence  
 5  
 6  
 7= Strong evidence

An overview of the inventory-analysis results across many government institutions, interesting patterns emerge. The topmost legislative and judicial branch institutions in the country, including Parliament, the Ministry of Justice, and the Constitutional Court, are all generally more ICT-capable than their executive branch counterparts. Within the executive branch, those institutions with important roles in the determination of fiscal, monetary, trade or labor policies are considerably better supported in terms of ICT capacity than those institutions with a role in social programs, such as health, education, environment, and culture. Executive branch institutions include the prime minister's office and Ministries associated with areas of critical infrastructure (i.e., transport, energy). Those institutions that are mandated to serve the people are not adequately equipped to do so from an ICT point of view.

One of the conclusions to be drawn from this is that, by and large, there is either little understanding of the necessity of a unified and coherent strategy when it comes to the use of ICTs in Armenia, or that there is an intentional lack of ICT-induced transparency due to perceived costs of interactivity. Such costs may not necessarily be derived in monetary terms. Across the board, there is inconsistent provision of public information, reflected by a lack of uniformity not only in the simple fonts used on government websites, but in these institutions core organizational structures. There is neither a standard, nor a measure, applied to assess Ministry's service vis-à-vis its constituents. Among the most notable strides taken in the past year has been the creation of a simple information center (as part of a public sector reform project) by PricewaterhouseCoopers. Several Ministries make use of this public information center, which is located in the reception area of the Government Building #3 in Yerevan, home to about half of the Ministries in Armenia. For the first time, informational brochures for citizens coming with queries and requests are available.

While little of the existing ICT infrastructure raises serious problems of interoperability and the organizational arena is ripe for process and/or strategy innovation, there is still very little foundation for creating a culture of IT-savvy government workers in Armenia. The difficulty lies in a work ethic heavily influenced by the communist experience and the work patterns of a generation of workers and civil servants who are generally resistant to organizational change, particularly in government. There is also a general dearth of incentives for change, on one level exemplified by a distinct lack of demand on the part of citizenry for access to information. People are simply not in the habit of asserting their rights to public information, whether that information is printed on paper or available in digital format. In addition, precedents for the protection of monopolies of digitized public information have been set; the Ministry of Justice and the IRTEK case is a shining example of such a problem.<sup>71</sup> E-Governance is still a long way off, therefore, because citizens in Armenia in general do not see themselves as the beneficiaries of public information provision.

---

<sup>71</sup> According to several insider sources active in the "IT" sector of Armenia, the case of IRTEK is a landmark to the monopoly of public information and top-down control. This scandal arose in the wake of an EU TACIS project initiated in 2003, providing over one million euros intended for the digitization of information pertaining to the laws of Armenia. The project was undermined by the Deputy Minister of Justice of the RA, who chose to protect his own agenda in the production of CD-ROMs with that same legal information, and upon which was created a private company called IRTEK ([www.irtek.am](http://www.irtek.am)). Many users of this system have described it as primitive and unsophisticated; nevertheless, its monopoly in providing legal information in digitized format has been fought over in court, and won. This may not say as much about IRTEK as it does about the rule of law in Armenia.

Often, there is perceived to be a “buy-in” on the part of various departments or organizations for the simple purpose of securing grant money and acquiring the new hardware or equipment. This outcome has been manifested countless times in various ministries, and the result is that one finds a tremendously high degree of fragmentation in the IT “market” for government work, not only in terms of policies and standards, but also, more specifically, on the level of non-standardized fonts, non-interoperable machinery, etc. Furthermore, there are no guarantees that the IT equipment in question will ever be used to its full capacity or that it be directed toward the purpose of effectively delivering services to the citizenry.

The issues of sustainability and ownership in this country are critical; there is a strong tendency for projects to dissolve or disappear completely after funding runs out, in part because ownership and commitment by Armenian figureheads and organizations is not always successfully assumed. One interviewee’s take on the adage that “information is power” was that “...the lack of information is *also* power...” Armenia’s Ministries may exemplify this truism in many ways. Moving toward institutional transparency does not necessarily serve the purpose of those who do not suffer the institutional *status quo*. Will the efforts of governments to push for the modernization of networks and for new ICTs serve to undermine mechanisms of governance and control whilst in ‘transition’? This notion addresses what Fountain (2001) terms the “perversity of incentives for institutional transformation.”

The extent to which e-government projects could facilitate political participation is a social phenomenon that must manifest itself in the physical realm before it can extend to the virtual realm. In other words, the social reality of a political culture characterized by “unpleasant” interactions with all levels of public administration, as is the case in Armenia, can easily transcend the objectives of any IT efforts to provide the opposite. To provide online functionality that typifies an advanced polity is to present a solution thirty steps ahead of society. The technology itself can “leapfrog” various steps and standards, but should not be geared to leaping over public perceptions of “what could work here” and “what could never work here.” Every society has its own answer to the question of effective ICT adoption, and in the case of transitioning countries, workable solutions are often hybrid; combinations of automation and social networking.

There is little apparent understanding as to where the main impact of ICTs will be, and this is manifested by an obvious collective misunderstanding as to what e-government should accomplish. While this research is not meant to serve as a discouragement to those donor organizations spearheading efforts to develop the ICT sector and to follow through on the afore-mentioned recommendation of the McKinsey report, it is intended to shed light on the problems of developing automated processes that merely cover up (or compound) existing administrative/operational problems. The development of ICTs in government – to support both back-end and front-end systems – should come not only from the united front of a coordinated and coherent donor stream, but in conjunction with genuine efforts to promote organic (as opposed to transplanted) growth strategies. Anything less will result in a continued flow of ineffective funding that misses the mark in terms of meeting the objectives of true institutional transformation, which in large part – and with few exceptions – describes the *status quo* in Armenia today.

**REFERENCES**

Almond, Gabriel and G. Bingham Powell Jr., 1966. *Comparative Politics: A Developmental Approach*, Little, Brown.

Toni Carbo and James G. Williams, 2004. "Some Determinants of User Perceptions of Information Quality on the World Wide Web," *Electronic Journal of e-Government*, Vol. 2, No. 2, pp. 94-105.

Fountain, Jane, 2001. *Building the Virtual State: Information Technology and Institutional Change*, Brookings Institutions Press.

Giragosian, Richard, 2003. "Problems of Governance: the Caucasus," Center for Slavic, Eurasian and East European Studies, Conference on Contemporary Security Challenges in Eurasia (April), Chapel Hill.

Giragosian, Richard and Tania M. Balci, 2003. "Draft Report on the Status of Economic and Political Transformation: The Republic of Armenia (1998–2002)," Bertelsmann Foundation.

Jain, Aby, 2004. "Using the lens of Max Weber's Theory of Bureaucracy to examine E-Government Research," Proceedings of the 37th Hawaii International Conference on System Sciences.

Mkrtchian, Nerses, 2001. "The Governance System in Armenia," United Nations Development Program.

Rosenau, James N. and J.P. Singh, 2002. *Information Technologies and Global Politics: The Changing Scope of Power and Governance*, State University of New York Press.

Weber, Max, 1947. *The Theory of Social and Economic Organization*, Henderson and Parsons, trs., New York.

Westin, Alan F. ed., 1971. *Information Technology in a Democracy*, Harvard University Press.

Winner, Langdon, 1986. *The Whale and the Reactor: A Search for Limits in an Age of High Technology*, University of Chicago Press.

Winner, Langdon, 1977. *Autonomous Technology*, MIT Press.