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# ADVANCES IN DIGITAL GOVERNMENT

*Technology, Human Factors, and Policy*

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# **ADVANCES IN DIGITAL GOVERNMENT**

*Technology, Human Factors, and Policy*

*edited by*

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# **Preface**

## **Motivation**

In February 2001, *IEEE Computer* magazine published a collection of articles on digital government that we had edited. The issue was a success for the digital government community; however, in the process of preparing the issue, we received more important contributions than could be accommodated. That motivated us to edit an extended collection of articles, including full articles on the research that was presented in *Computer*. This volume is the result.

## **Objectives**

The primary objective of this edited volume is to present a collection of in-depth articles that addresses a representative cross-section of the matrix of issues involved in implementing digital government systems. Specifically, the articles presented in this book constitute a survey of both the technical and policy dimensions related to the design, planning and deployment of digital government systems. The research and development projects within the technical dimension represent a wide array of governmental functions, including the provisioning of health and human services, management of energy information, multi-agency integration, and criminal justice applications. The technical issues dealt with in these projects include database and ontology integration, distributed architectures, scalability, and security and privacy. Human factors research presented here emphasizes compliance with access standards for the disabled. The policy articles contained in this volume cover both conceptual models for developing

digital government systems as well as real management experiences and results in deploying them.

A corresponding objective of this volume is to present digital government issues from the perspectives of different communities and societies. The hope is that through geographic and social diversity, this collection of articles will illuminate a wider array of policy and social perspectives than might otherwise be made available to the reader. This should expose practitioners to new and useful ways of thinking about digital government and the values and assumptions that those outside of their societal sphere bring to this area of research. Collectively, the articles presented here represent projects and issues from North America, Europe and North Africa; and they present results that impact on urban and rural communities; people who have disabilities; and, in general, a broad spectrum of citizens and government officials.

### **The Contributions in this Volume**

The articles in this volume represent a broad cross-section of topic domains in digital government research. They also address many dimensions of digital government research, including: national versus local contexts, developed versus developing nations, broad software substrates versus specific application domains, policymaking, collaborative design and development processes, citizens' attitudes toward digital government, and the requirements for providing services to disabled and elderly populations.

We begin in, chapter 1, with an introduction, which includes a history of digital government; a survey of major technical, human factors and policy concepts and issues involved in the development and operation of digital government systems; and linkages to the research of the contributors to this volume. This collection is organized into four groups: foundation systems, specific application domains, policy issues, and case studies.

#### *Foundation Systems*

The first group of articles in this volume focuses on systems designed to implement broad aspects of government.

In chapter 2, Bouguettaya, Ouzzani, Medjahed, and Elmagarmid present a Web-based system that is designed to support the performance of cooperative tasks between different government agencies whose data have different structure and semantics, and to which different rules and processes are applied. Examples of these types of cooperative tasks abound within social services, where citizens are often required to interact with multiple agencies to attain a goal. Their system, called *WebDG*, takes an ontology-

based approach to managing interactions between diverse databases that may exist across multiple agencies involved in a cooperative task.

In chapter 3, Batini, Cappadozzi, Mecella, and Talamo present an overview of the Italian government-wide Nationwide Public Administration Network and the corresponding Nationwide Cooperative Information System. These systems were mandated by the Italian Parliament in 1993 in the creation of the Authority for Information Technology in the Public Administration (AIPA) and are intended to increase the overall effectiveness and efficiency of the ministries that comprise the Italian government, particularly in the context of inter-ministry actions.

In chapter 4, Atluri, Chun, Holowczak, and Adam discuss their research on inter-agency workflow and decentralized workflow management. The goal of their work is to eliminate the submission of redundant requests to multiple government entities in the process of attaining a complex goal, such as the establishment of a business. Their approach is designed to allow customization and automatic execution of workflows.

In chapter 5, Ambite, Arens, Bourne, Feiner, Gravano, Hatzivassiloglou, Hovy, Klavans, Philpot, Ramachandran, Ross, Sandhaus, Sarioz, Schmidt, Shahabi, Singla, Temiyabutr, Whitman and Zamand describe their research on the integration and access of statistical data across government agencies. Their *Digital Government Research Center (DGRC)* system performs the mapping of ontologies across organizations, multi-database access planning and automated terminology analysis. The DGRC provides a Web-based query input interface that is designed to bridge the gap between general query mechanisms appropriate for experts and mechanisms that allow non-experts to be productive.

In chapter 6, Golubchik presents her research on scalable data collection over the Internet. This work is motivated by the fact that government organizations are now allowing citizens to file forms electronically. Scalability of such services is of particular concern when there are deadlines for citizens to upload their data (e.g. a tax filing deadline). Golubchik's framework, called *Bistro*, is designed to provide scalable data collection over the Internet both with and without deadlines.

In chapter 7, Joshi, Ghafoor, Aref, and Spafford present an overview of the challenges in providing security and privacy in digital government. They focus in particular on the difficulties that multiple heterogeneous security regimes pose in this context. They present various solutions to providing security in a multi-domain digital government environment and focus in particular on the role-based access control (RBAC) model.

*Special Domains*

The second group of articles in this volume focuses on research and development of systems that implement governmental functions within focused domains.

In chapter 8, Macintosh, Malina and Farrell discuss the design and evaluation of a Web-based system they have implemented to support the most representative of the functions of a democratic government: participatory decision-making by voting. Their system, called *e-petitioner*, enables citizens of Scotland to create, view, discuss, sign, and submit petitions to the Scottish parliament.

In chapter 9, Han, Kunz and Law discuss their on-line system for testing the compliance of building and facilities designs with the Americans with Disabilities Act. They use a hybrid approach to evaluate designs from both compliance and usability perspectives. Their Web-based prototype system replaces the traditional compliance and permit approval process with one that is semi-automated.

In chapter 10, Hauck, Chau, and Chen discuss their research in knowledge management within the domain of law enforcement. Their *COPLINK* Project is a collaboration between the Tucson, Arizona USA police department and the Artificial Intelligence Lab at the University of Arizona. The project has developed the *COPLINK Connect Database* application, which facilitates information sharing within and between law enforcement agencies; Detect Criminal Intelligence Analysis application, which is designed to analyze collections of intelligence data and identify important relationships (e.g. between a crime suspect and some other object or concept); and, a collaboration framework for law enforcement agencies.

In chapter 11, Karr, Lee, Sanil, Hernandez, Karimi, and Litwin describe a prototype system they have developed for disseminating statistical data while protecting confidentiality of organizations or individuals referenced in the data. Protecting the confidentiality of data collected by governments has long been a major concern. Their system employs geographical aggregation and Bayesian statistical analysis methods of the aggregated methods to preserve confidentiality.

In chapter 12, Zhang, Zhu, and Mark discuss their research in the efficient content-based retrieval of images from very large distributed databases. The goal of their system, called *WebView*, is to improve access to the massive amounts of image data collected by various government agencies by augmenting existing systems. *WebView* uses a new approach called *keyblock*, which they show to be superior to several well-known approaches.

*Policy Issues*

The third group of articles in this volume focuses on policy issues in the development of digital government.

In chapter 13, Comedy examines the role of the federal government in the development of information technology, from encouraging research and development to policymaking. She looks in particular at the work of the President's Information Technology Advisory Committee in supporting the transformation of society and government through innovations in information technology.

In chapter 14, Fletcher discusses the role of policymaking in the evolution of digital government. She focuses in particular on the policies that have addressed requirements for high availability and "understandability" of government information. This has resulted in the adoption of the portal model of information access -- most prominently in the FirstGov Web portal -- as a means of providing highly available, single points of entry into broad collections of government information.

In chapter 15, Strover discusses the results of a survey of citizens' attitudes toward digital government. This survey consisted of interviews of over 1,000 randomly sampled respondents across Texas, including a special random sample of rural counties. The results showed that while citizens value the potential benefits of digital government, they are concerned about a number of issues, including Internet access, privacy and the quality of services offered.

In chapter 16, Dawes and Pardo examine critical success and failure factors for collaborative design, development, and deployment of digital government systems. These factors were identified through in-depth examinations of 18 collaborative digital government projects across the state of New York.

*Case Studies*

The articles in the fourth and final group present case studies of digital government policy and systems development. Collectively, the articles address the development of digital government in the context of both developed and developing nations and at the town level (i.e. the creation of a digital city).

In chapter 17, Roy examines the evolution of digital government in the Canadian context. He discusses key policy documents that have established the foundation for Canada's digital government plans. He also presents the views of a cross section of senior Canadian government officials on the development of digital government. The views discussed address issues of



system and organizational capacities, cultures of innovation and technological adoption, competencies, drivers and inhibitors of the evolution of digital government, and design principles.

In chapter 18, Boudriga and Benabdallah discuss the Tunisian government's planning model for developing digital government. The major facets of the model address: the definition of the objectives for their digital government, the upgrading of their telecommunications infrastructure to accommodate, the modification of the Tunisian legal system to accommodate new concepts brought about by on-line services, and the digital divide that exists within their country. Their article presents a workflow for these tasks, which might serve as a template for other developing nations.

In chapter 19, Pacheco da Rocha discusses the development of a digital city in the mid-sized Portuguese town of Aveiro. The primary goals of the Aveiro Digital Town project are economic and social development. Particular emphasis is given by Pacheco da Rocha to requirements that must be addressed within digital governments to meet the needs of disabled and elderly populations.

*WILLIAM J. MCIVER, JR. and AHMED K. ELMAGARMID*