

# Chapter 37

## Authentication Mechanisms for E-Voting

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### ABSTRACT

*The e-government paradigm became an essential path for governments to reach citizens and businesses and to improve service and public performance. One of the important tools used in political and administrative venues is e-voting, where ICT tools are used to facilitate the process of voting for electing representatives and making decisions. The integrity and image of such applications won't be maintained unless strict measures on security and authenticity are applied. This chapter explores the e-voting process, reviews the authentication techniques and methods that are used in this process and proposed in the literature, and demonstrates few cases of applying e-voting systems from different countries in the world. Conclusions and proposed future work are stated at the end of the chapter.*

### INTRODUCTION

E-government is more than a phenomenon; it is a paradigm that guides the new governance process. Most countries in the world are embracing e-government initiatives based on confirmed benefits and essential requirements of the new millennium. As one of the main elements in the free democratic world, voting is a key enabler in e-government initiative, not only for the primary

reason of citizens' election of their representatives, but to enable quick and reliable feedback from citizens to the government, and evaluating the value of the offered services. E-voting can be an excellent supporting tool for election, decision making, consultation, and participation initiatives.

This chapter reviews e-voting concepts, methods and authentication techniques and tools used to ensure performing a creditable voting process. Once governments are willing to adopt electronic

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channels for their governance activities, they are entering a new era with new tools that range from simple information systems to more complicated Web 2.0 tools that open doors for all stakeholders to benefit from the power of reaching citizens and fostering a decision making process that activates a more participatory picture.

E-voting is becoming an integral part of any modern election system, where it became the most popular application in this area. E-voting depends on technology in more than one layer to create a very interactive and effective election process from the time of adding and verifying participants, to the last stage of calculating results and winners. All this should be implemented in reliable, correct, secure and fast manner. E-voting can also utilize new hardware, software and network technologies and add convenience to the process by allowing citizens to cast their votes from their homes and using the Internet.

This wide continuum of applications adds more complications to the voting system, where the crucial issues are the following: make sure that voters are from legitimate citizens; can vote and vote once and can do this in a flawless quick pace. Currently, this authentication process utilizes several tools, methods and even technologies to guarantee the legitimacy of elections. This chapter reviews e-voting in general and focuses on authentication methods that are applicable to the e-voting system. The chapter is divided into three sections. Following is a brief description of each section.

The following section reviews e-government concepts and focuses on e-voting domain. It reviews e-voting process in general, its definition, and the general related concepts. Next, authentication methods and techniques are reviewed and described based on a specific typology. Finally, cases from the world related to e-voting systems are explored and analyzed. Conclusions and research recommendations are stated at the end.

## **E-VOTING SYSTEMS**

Electronic government is defined as using Information and Communication Technology (ICT) to enhance government's operations, provide suitable services to citizens, and improve citizens' participation (World Bank, 2007; Yanqing, 2010; Abu-Shanab, 2012). Mason (2011) emphasized the notion of citizen's participation in democratic life, while others related e-government to the provision of information and knowledge to make suitable decisions in political life (Lee, Chang & Berry, 2011). In their pursuit toward improved accountability to citizens (Carter & Belanger, 2004), and improved public service quality (Irani, Al-Sebie & Elliman, 2006), governments try to implement new technologies in all aspects of their operations. E-voting is one of the essential applications especially in the election process.

E-voting is the most researched topic in the area of e-government, although it is not devoted to political cause only. Voting is a needed process in administrative areas, where a decision is needed based on some alternatives. Examples of such applications are used in group decision support systems (GDSS) and policy/agenda setting initiatives. E-voting is defined as using ICT to conduct voting (Buchsbaum, 2005). E-voting, as a democratic activity, includes the voter, the registration authority and a tallying authority, where an electronic system is used to cast votes (Kumar & Walia, 2011a). Research indicated that even with traditional voting systems, using information systems to count votes is considered an e-voting application (Remmert, 2004).

It is important to realize the benefits gained from using electronic systems in the voting process; e-voting offers convenience to the election process, accuracy and accountability of results (Buchsbaum, 2005), time and cost savings (Saveourvotes.org, 2008), increased public participation through open systems and Web 2.0 tools (Bouras,

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