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Anne-Marie Oostveen

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A Social Informatics Perspective on the Design and Implications of Large-Scale e-Government Systems

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Anne-Marie Oostveen

In herinnering aan
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Introduction

Since a decade many countries have launched e-government initiatives. This online provision of both information and services is seen as a necessary step to modernize administrative processes. The intended effect of e-government technology is to make government more efficient. Citizens are expected to access information and services faster, in a more personalized manner and cheaper than before. The new technologies may enable politicians and public administration to serve the citizens better and would allow citizens to keep closer tabs on the performance and actions of their government. In addition to a better service provision, it is predicted that e-government technology will empower democracy as it will gradually close the distance between the citizen and the legislator. With a wide range of technology-based approaches and new techniques government is hoping to attract those people who are not yet involved with the more conventional methods of citizen participation in governance. But moving government online is a complex challenge. Administrative, social, legal, political and cultural forces all need to be managed in order to make a successful transition.

This dissertation analyses the design and effects of two e-government applications from a Social Informatics perspective. The FASME (Facilitating Administrative Services for Mobile Europeans) project aimed at developing a prototype of a system that supports Europeans in solving administrative problems when they move to another European country. The goal of the TRUEVOTE project was to design and implement an e-voting system based on digital signatures and Public Key Infrastructure (PKI). The system allowed citizens to cast a ballot from home, work, or abroad on any computer hooked up to the internet. In researching new technologies we need to be critical about the possibilities and limitations that sophisticated information and communication technologies (ICTs) provide. This critical thinking also means that we need to examine ICTs from perspectives that do not automatically and 'implicitly' adopt the goals and beliefs of the groups that commission, design or implement specific applications and systems (Kling et al. 2000).

One of the questions we asked in both cases was: How are these large-scale systems developed and how can users participate in their design? As our study aimed to seek insightful opinions from the users, a combination of methods – focus groups, interviews, testing the systems, questionnaires, etcetera – were applied. We are interested to understand how methods of user involvement can be adopted to the context of large-scale e-government development. We investigated whether the current methods for user requirements engineering and evaluation are sufficiently suited to the characteristics of e-government development. In addition, this thesis explores what the intended and unintended consequences of e-government technologies and their applications are. We look at the effects of these complex systems, and the conditions

under which they are implemented. Furthermore, we ask whether we can investigate unexpected second-order effects at an early phase of designing a new system[1].

In Chapter 1 we discuss various theories and perspectives for theorizing about the relationships between technology and society. We will explain why we have chosen the Social Informatics approach to study large-scale e-government innovations. Chapter 1 also sets out the research questions which the dissertation seeks to answer. Chapter 2 provides an introduction to the two case studies on which this thesis is based: the FASME and the TRUEVOTE case. Chapter 3 gives an overview of the multiple research methods we have applied in the FASME and TRUEVOTE projects.

Chapter 4, '*From Small Scale to Large Scale User Participation: A Case Study of Participatory Design in e-Government Systems*', is the first empirical chapter of this thesis and outlines the kind of participatory design issues that arise in complex and large-scale network technology projects. The case study suggests how to organise user involvement in very complex systems.

Chapter 5, '*Linking Databases and Linking Cultures: The Complexity of Concepts in International e-Government*', concentrates on the social and cultural implications of the cross-national coupling of administrative systems. Administrative systems classify people into categories that are based on political and cultural values. These values differ between countries, which is a serious constraint for fast introductions of e-government systems: not so much technical interoperability but socio-cultural interoperability is the problem.

Chapter 6, '*Internet Voting Technologies and Civic Participation: the Users' Perspective*', discusses the opinions of the users of electronic voting technologies, as this is crucial for the shaping and acceptance of the technology. It also results in a set of questions with respect to electronic voting that guided the second case study.

Chapter 7, *'Social Experiments with E-voting: a Social Informatics Approach'* studies the design, uses and consequences of the TRUEVOTE electronic voting system from a Social Informatics perspective, taking into account the system's interactions with institutional and cultural contexts. This emphasis on the contextuality of the technology gives us the opportunity to look at a broad range of issues like: political struggles within the participating organisations, logistics, legislation, privacy and digital divide.

Chapter 8, '*Security as Belief. User's Perceptions on the Security of Electronic Voting Systems'*, addresses the opinions of the users involved in the testing of the TRUEVOTE electronic voting system, in particular concerning issues like security, verifiability and trust.

[1] This dissertation is based on empirical work that was carried out in the two large-scale and complex e-government projects FASME and TRUEVOTE. Most of the chapters have already been published in peer reviewed academic journals. Therefore, some repetition is unavoidable and the reader will find that certain parts of the texts overlap.

Chapter 9, '*The Effects of Voting Technologies on Voting Behaviour: Issues of Trust and Social Identity*', is the final empirical chapter of this thesis and presents an explorative study of the effects of voting technologies on the turnout and outcome of ballots. We conducted a preliminary test of two hypotheses about how trust and social identity mediate the effects of voting technologies – through their *social* dimensions – on voting behaviour. The field experiment gave us the opportunity to investigate whether e-voting influences the articulation of political preferences and opinions by citizens, and how this effect is mediated by sociological and social psychological variables.

Finally, Chapter 10 summarizes the main arguments, lists the main conclusions, and compares our results to other research. It ends with some, in our view, crucial questions for further research in e-government technology: that is on the relation between the use of e-democracy applications and the public trust in government.

1
Theorizing the Relationship Between Technology and Society

1.1 INTRODUCTION

There is a lot of speculation about the social changes that might arise when new applications like electronic government systems are to become widespread (Kling, 2000). Questions about the consequences of new technologies are often posed in a very black and white manner. For instance: Will e-voting increase voter turnout? People expect a straightforward 'yes-or-no' answer. However, life is not that simple, and usually there are no clear-cut answers. Therefore, the social changes that might occur because of the implementation of new and complex information and communication technologies (ICTs) need to be analytically and empirically researched.

Many different perspectives and theories are used to examine the relationship between technology and society. In this chapter we will discuss the most well-known approaches that try to clarify how far technology does, or does not, condition social change. Can the social changes associated with the use of new ICTs have been caused by information technology? Are they developing as a largely independent force? Or should the changes be viewed as more fundamentally determined by other, non-technological, social forces?

We start our examination of the relationship between technology and society by explaining 'technological determinism', which is according to Chandler (1995) "still the most popular and influential theory of the relationship between technology and society". Technological determinism suggests that technology is the driving force for social and cultural change (Humphreys, 2004). And, with every new cycle of technological innovation, we are flooded with studies from a technological deterministic perspective (Monge & Contractor, 2003).

We then continue with a theory which views technology as a social phenomenon shaped by the society producing it. In the past 25 years the focus has begun to shift from a technological deterministic perspective towards this 'social constructivism' perspective. Technology is not defined solely as an object or tool, but also encompasses human knowledge and technique, and the forms of social relations within which these are used (MacKenzie and Wajcman, 1985). Scholars working in the field of Science and Technology Studies (STS) are concerned with the way organisational, political, economic and cultural factors influence the process of technological innovation and change. To understand technology development and use, STS researchers consider both social and technical aspects as mutually constructive; as they are against substituting one form of determinism with another (Horton and Davenport, 2005). STS is not a unified body of theoretical approaches. Bijker, Hughes and Pinch (1987) identify three

main theories within STS: the Social Construction of Technology (SCOT), the Systems Theory, and the Actor-Network Theory (ANT). We will explain the social constructivist theory in section 1.3 and will describe the main critiques that it has received over the years.

In section 1.4, we will introduce the Social Informatics perspective that we have chosen as the theoretical framework for our research. To understand the impact of ICT on society, we have to find a way to analyze the interactions between a technology and its broader context, a framework that neither understates nor overstates the relative autonomy of society and technology from each other. A broad problem-oriented research approach like Social Informatics aims at capturing such complex interdependencies. Although at first sight, Social Informatics looks quite similar to the Social Constructivist approach, it differs in a number of important aspects. These differences will be discussed.

From a Social Informatics approach it ensues that we place great emphasis on the involvement of users in the design, development and use of technological innovations. In section 1.5 we will explain why it is important to involve users in the design of large-scale e-government systems, and how this can best be done by using a mixed–method approach.

Finally, in section 1.6 we will introduce the four specific research questions that ensue from our theoretical framework.

1.2 TECHNOLOGICAL DETERMINISM

Technological determinism is a technology-led theory of social change that looks at technology as the prime (if not sole) mover in history. Determinism can be described as the notion that something is so powerful that it is beyond human control. Technological determinists say things like: “You can’t stop progress” and “You can’t turn back the clock”. They see the development of technology as autonomous. According to Chandler (1995) the term was first coined by the American sociologist and economist Veblen, who lived from 1857 till 1929. Yet, the idea of technological determinism can already be seen in Karl Marx’s remark that: “the hand mill gives you society with the feudal lord; the steam mill society with the industrial capitalist” (Marx, 1847, quoted by Mody, 2004). Chandler (1995) describes the theory like this: “Whatever the specific technological ‘revolution’ may be, technological determinists present it as a dramatic and ‘inevitable’ driving force, the ‘impact’ of which will ‘lead to’ deep and ‘far-reaching’ ‘effects’ or ‘consequences’”. Technological determinists assume that technological change is an independent factor that impacts on society from outside of society (MacKenzie and Wajcman, 1999).

Within the technological deterministic theory, different views can be found ranging from ‘strong’ (also called ‘hard’) to ‘weak’ (or ‘soft’) determinism. Strong technological determinism is the stance of those who insist that information technology will radically transform society and our ways of thinking. Weak technological determinism presents technology as a key factor which may facilitate changes in society and behaviour (Chandler, 1996). Many users of ICT have a rather strong deterministic

view; they tend to view information and communication technology as a totally autonomous entity with a will of its own. “Rather than as a product of society and an integral part of it, technology is presented as an independent, self-controlling, self-determining, self-generating, self-propelling, self-perpetuating and self-expanding force. It is seen as out of human control, changing under its own momentum and ‘blindly’ shaping society” (Chandler, 1995). Technological determinism actually has two different meanings (Van den Besselaar 1998), and proponents of this approach (often implicitly) adhere to both. Firstly, technological *development* has an autonomous logic and is not influenced by social and economic factors. Therefore the design of new technologies is an independent factor which is beyond human control. Secondly, the *effects* of technology have an autonomous logic. In this case technological determinism is a technology-led theory of social change in which it is assumed that changes in technology cause changes in society.

1.2.1 The technological deterministic perspective on the development of technology

A popular belief is that technology is neutral, that it is designed and developed separate from politics, economics, and power. According to this view technology is construed as an independent factor in social change, something presumed to be ‘outside’ society (MacKenzie and Wajcman, 1999). Technological determinists believe that technology develops by its own laws and that it realizes its own potential whereby it is only limited by the material resources available. Therefore it must be regarded as autonomous. “The activity of technologists is construed as independent of society; technologists are thought to apply the discoveries of science, turning them into techniques and devices that then impinge upon society” (Woolgar, 1991: 30). Technological determinists argue that technological development is unstoppable and that no-one can be blamed for the way it progresses. Pacey (1983) states that when technology fails or when it has negative consequences, it is not due to the technology itself, but to the improper use of it by "politicians, the military, big business, and others". An example of this perspective is the often heard statement that ‘guns do not kill people, but people kill people’ and that it is ‘up to us how we use them’. In other words, technology is only good or bad dependent upon how we choose to use it. In his “Four Arguments for the Elimination of Television”, Jerry Mander states that most Americans will argue that technology is neutral. According to this perspective: “[there is] nothing intrinsic in the technology itself or the circumstances of its *emergence* which can predetermine its use, its control or its effects upon individual human lives or the social and political forms around us” (Mander, 1978). But even if one accepts this point of view, technologies do have *affordances*. Affordances refer to the perceived and actual properties of an object, which determine how an object could possibly be used (Gibson, 1977). People determine what operations are permitted, in part constrained by affordances, in part guided by constraints (Norman, 1998). Therefore, guns are not neutral, even if one does not need to use them for killing people. Lelia Green rightfully points out that: “such a perspective ignores the development of the whole military-industrial complex, and the incentive to create weapons that can kill at a distance” (Green, 2001: 3). She continues by saying: “Guns can be good in some situations, bad in others, but this doesn’t make them ‘neutral’” (ibid: 13).

1.2.2 The technological deterministic perspective on the effects of technology

The implementation of new technologies can have either negative effects (dystopian view), or bring positive changes and progress (utopian view), but either way, according to the technological deterministic view they will radically transform society. In its pessimistic form technology is seen as an autonomous entity that will bring dramatic and disastrous changes to society. In literature, examples of a dystopian view on technology can be found in Aldous Huxley's *Brave New World* and George Orwell's *1984*. In academia, Neil Postman is a well-known example of a scholar who subscribes to a pessimistic view on the relation of technology to culture. In his book 'Technopoly' he comments on technology, how we relate to it, how it changes us and the world we live in. Postman describes technology as a 'dangerous enemy' that 'intrudes' into a culture 'changing everything', while destroying 'the vital sources of our humanity' (Postman, 1993). A new change is assumed to be the consequence of technological change.

Negative views of technology's impact on culture and society are not uncommon, but articles and books written by the majority of computer experts and 'futurists' support the utopian form of technological determinism. Technical experts tend to view social change in technical terms and generally hold the view that adoption of new information technology is the central cause of current socio-cultural change. They presume that what happens in society is generally determined by the nature of technology, and they usually believe in technology as a positive social force. They argue that technical progress leads to social and cultural change and increases opportunities. One of most famous technological deterministic futurists with a utopian view is Marshall McLuhan, known for his statement "the medium is the message". McLuhan seems to be supporting the position that human society is helpless and must succumb to the technical forces. In an interview with Playboy Magazine in 1969, McLuhan states: "We must understand that a totally new society is coming into being, one that rejects all our old values, conditioned responses, attitudes and institutions". He continues by optimistically showing his faith in progress: "The computer thus holds out the promise of a technologically engendered state of universal understanding and unity, a state of absorption in the logos that could knit mankind into one family and create perpetuity of collective harmony and peace" (McLuhan, 1969: 72). Another, more recent, example of a scholar taking the utopian perspective is Nicholas Negroponte, the founding director of the Massachusetts Institute of Technology's Media Lab: "Like a force of nature, the digital age cannot be denied or stopped. It has four very powerful qualities that will result in its ultimate triumph: decentralizing, globalizing, harmonizing, and empowering." (Negroponte, 1995).

The belief in ICT and technology in general as the ultimate solution to existing problems (progress ideology), has led many governments to embrace it and make it a top priority for modernization. This faith in emerging ICTs demonstrates that the instigators of e-government also have a utopian deterministic view. Governments have an important role in technology development. Castells shows that the state can be, and has been in history, a leading force of technological innovation (Castells, 1996).

As we shall see in section 1.3, Science and Technology Studies (STS) scholars have formulated a lot of criticism on the technological deterministic perspective. However,

Mody points out that: “To be sure, outside of technology studies circles, determinist talk is still alive and well. Popular representations of technology, as well as policy statements by proponents and opponents of particular artefacts and systems, paint technologies as possessing autonomy, as developing along ineluctable pathways, and as being the core around which society is structured and measured” (Mody, 2004). This is also the opinion of Wyatt who points out that “technological determinism lives!” She describes how technological determinism still persists where analysts try to make sense of the introduction of technology in various social settings. It also persists in theoretical and abstract accounts of the relationship between the social and the technical, in the responses of policy makers and politicians, and in the reactions we all experience when confronted with new machines (Wyatt 1998: 137).

1.3 SOCIAL CONSTRUCTIVISM

In the previous section we learned that technological determinism is the theory according to which a developing technology will have social consequences for people to foresee and live with (Dahlbom and Mathiassen, 1993: 196). In this perspective society is shaped by technology. However, does it make sense to hold technology responsible for the social changes that have been documented throughout history? According to Manuel Castells it doesn’t: “Of course technology does not determine society” (Castells, 1996: 5). Technologies are produced and used in particular social contexts, and the processes of technological change are intrinsically social rather than simply being driven by a technical logic. Yet, Castells does not imply the primacy of the social over the technical: “Neither does society script the course of technological change, since many factors including individual inventiveness and entrepreneurialism, intervene in the process of scientific discovery, technological innovation, and social applications, so that the final outcome depends on a complex pattern of interaction” (ibid.: 5). This perspective is called social constructivism. Social constructivists argue that technology does not determine human action, but that human action shapes technology. Just as with technological determinism there are two levels on which the relationship between technology and society can be discussed when one uses a social constructivist approach; the *development* of technology and the *effects* of technology. Firstly, the development of technology is a social process and does not take place in isolation of society. Secondly, the effects of technology are socially conditioned. The effects depend on how people use the technology. In the following sections we will further describe these two levels within social constructivism.

1.3.1 The social constructivist perspective on the development of technology

Social constructivist theory states that technological development is a social process. According to this view it is impossible to separate values, biases, and politics from technology. The social position and perspective of its creators are written into a technology. These parameters affect how questions and problems are defined and shape how technologies are designed as a solution. But Woolgar (1991) describes that the process of designing new technologies is also based on assumptions about the character and abilities of the users. This is called *configuring the users.* According to Oudshoorn et al. (2004), engineers, and other actors involved in the design process, configure the user and the context of use as an integrated part of the entire process of technological

development. The designers define “the preferences, motives, tastes, and competencies of potential users and inscribe these views into the technical design of the new product” (Oudshoorn et al. 2004: 32). This can lead to technological artefacts that have incorporated barriers against specific groups of users. In other words, potential users who do not fit the technology as designed are simply prohibited from using it. “If the user representations incorporated into the artefact fail to match the actual users, it is very likely that the technology will fail” (ibid: 32). Therefore, it matters who designs technology. It matters who uses technology. And, it matters when and why both groups do. Technology is socially shaped. It is a construct of society.

Understanding that technology is socially constructed changes the conception of systems development. In the past 50 years people have had very little to say in the development and design of computer technology. They were ignorant of the options available. The computer professionals have not given much thought to the social consequences of their technology. Dahlbom and Mathiassen (1993) argue that the adoption of social constructivism leads to a more democratic attitude toward the design of technology. Instead of designing *for* or *with* the users, the users are now responsible for the design themselves. In the view of Dahlbom and Mathiassen technological determinists have to accept responsibility as technology experts for changing the lives of people, while social constructivists share that responsibility with everyone who is involved in the design and use of technology. Social constructivists will be interested in engaging the users in the design process. They will not only engage the immediate users, but all those who may be affected by the new system. It is essential to recognize that supporting a different theory has far-reaching practical consequences for the development and design of new technologies.

However, as society is a differentiated system itself, different social actors have unequal roles in and influence on the social construction of technology. Green notes that technology is developed as a result of choices made by influential power brokers representing certain social elites, such as the armed forces, bureaucracy and corporate power (Green, 2001: 9). This means that technology represents “the priorities of the elites who sponsor its development, rather than representing the society as a whole” (ibid, 10). Therefore, biases not only arise from the way in which tools and technologies are used, but are already embodied in particular technologies. “Wrapped in the blanket of technological development and processes are gender, social, political, cultural, and economic factors, and power relations; all designed to influence the conception, design and use of technology” (Davey, 1995). As Green puts it: “To argue that any technology is neutral is to ignore the social and cultural circumstances in which that technology was developed, and the policy and regulatory regimes under which that technology is deployed. Neither technology nor culture is neutral – both reflect people and society, the power of different social groups and the outcomes of competing priorities” (Green, 2001: 5). In her research on the introduction of new ICTs in Uganda, Litho (2005) emphasizes the fact that technologies embody gender differences. She notices the limited participation of women in designing development projects. “Although all social groups matter in the development of a technology, development practice tends to only consult men and ignore women and as a result, technology that is introduced for development is inappropriate to the needs, priorities and circumstances of women” (Litho, 2005: 6). The patriarchal structures underlying Uganda’s culture exclude women as a relevant social group in the development of new technologies, resulting in ICT

facilities which do not work effectively. Wajcman argues that: "Technologies result from a series of specific decisions made by particular groups of people in particular places at particular times for their own purposes. As such, technologies bear the imprint of the people and social context in which they are developed. [...] Technological change is a process subject to the struggles for control by different groups. As such, the outcomes depend primarily on the distribution of power and resources within society" (Wajcman, 1991: 22-23). She suggests that the male dominance of technology secures itself by the active exclusion of women. As a result, women's contributions have been minimal and so too, has their influence. Litho's research confirms that notions of gender aspects, social relations and power structures are imbedded in technology development and design. In its creation technology is not neutral, as some would argue.

1.3.2 The social constructivist perspective on the effects of technology

So far we have focused on the *development* of technology in determining whether technology is socially constructed or not. Besides the conception and the design of technology, the *use* of new technologies is also essential. Social constructivism also states that technology does not determine the effects. So technology in *this* respect is seen as being neutral. Social constructivist theories suggest that technology is shaped by different influences as part of its development and then reshaped in use (Bijker and Law, 1994). The effects depend on how people actually use technology. This is called *appropriation*. Swan and Clark (1992) point out that: "previous research on the use of innovations has tended to highlight the situation in which the user adopts the innovation as defined by suppliers". Interestingly though, a series of case studies show that certain users introduce pivotal modifications that reshape the original innovations (ibid. 113). The same technology might be used in different ways by different people, leading to different outcomes, or as Law and Bijker state: "the notion that any object, institution or process may mean different things to different people" (Law and Bijker, 1992: 298). This means that a technology will not only be adapted by different users, but it will also be interpreted in different ways. Therefore, there is no linear path between the design of a technology, its use and its impacts. Hence, it is difficult to predict what the effects of a certain technology will be because of two reasons. Firstly, there is often a disparity between the intentions of those designing and implementing ICTs and their actual use. And secondly, the same technology can have many different effects.

There are many technologies of which it can be said - by persons who hold to an 'instrumental theory of technology' - that their effect on society is determined by the way we use it. Something like a video camera, for instance, is not bad on its own. Nowadays cameras are used in many cities to track our every movement once we step outside our front door. This CCTV surveillance technology can be perceived as invading our personal privacy. On the other hand, if the London Metropolitan police releases CCTV images of four men they are urgently trying to trace in connection with failed bomb attacks on the underground, the CCTV camera's are used to track down terrorists, and in that way serve to protect innocent citizens.

There are a growing number of scholars who realize that there is, as Castells calls it, a 'dialectical interaction' between society and technology. Technology can never be a value-free, a-political, pure creation because it is made by humans and used by humans. Both the development and the use of technologies occur in society - not in a vacuum.

The role of a certain technology will be determined by the social context into which it is introduced, in other words: context matters.

	***Development* of Technology**	***Effects* of Technology**
Technological Determinism	- Technology is autonomous - Technology is designed and developed separate from political, economical, cultural influence or power. - Technology = neutral	- Technology causes social and cultural changes. - This inherent transformation of society can be positive (utopian) or negative (dystopian). - People will just have to accept the effects of technologies, they are unstoppable and uncontrollable.
Social Constructivism	- Technological development is a social process and does not take place independent of society. - Designers try to configure the users in the design, but the same technology can have different effects .	- Technology does not determine social and cultural effects, the effects are socially conditioned. - The effects depend on how people use (appropriate) the technology. - Technology = neutral

Table 1.1 Technological Determinism versus Social Constructivism

1.3.3 Theories of Social Constructivism

Science and Technology Studies (STS) provide an analytical framework to observe and describe the construction of the socio-technical. Although there are differences between STS approaches, Bijker et al. (2001) point out that there are important commonalities which bind them together: "Authors have been concerned with moving away from the individual inventor (or "genius") as the central explanatory concept, from technological determinism, and from making distinctions among technical, social, economic, and political aspects of technological development. The last point has been aptly summarized by using the metaphor of the "seamless web" of society and technology" (Bijker, Hughes and Pinch, 2001: 3). Besides pointing out those three trends, they also identify different approaches within STS.

The Social Construction of Technology Approach

One of these approaches is the Social Construction of Technology (SCOT) which was formulated in the mid 1980's by Pinch and Bijker (1984) in their well-known article "The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Science of Technology Might Benefit Each Other". Pinch and Bijker proposed the SCOT approach as a method for analyzing the history of technologies (Humphreys, 2004). According to Pinch and Bijker technology and its characteristics is a product of the social, political, economic and cultural environment in which it is situated. The

developmental process of a technological artefact is multi-directional and non-linear, as illustrated by the development of the bicycle. A variety of designs of bicycles and of interpretations of their function ('meaning') compete, until one becomes dominant. There are four related components to the conceptual framework of SCOT: relevant social groups, interpretive flexibility, closure mechanism/stabilization and technological frame.

Technology development is a process in which multiple groups negotiate over the design of an artefact. These different social groups each have a specific interpretation of the artefact and will see and construct quite different objects (Klein and Kleinman, 2002). Relevant social groups interpret and redefine the artefact as they adapt it to their purposes and apply their understandings of what it is (Lamb, 1996). Pinch and Bijker (1987) define relevant social groups as "all members of a certain group who share the same set of meanings attached to a specific artefact". Different groups (designers, developers, users, but also opponents) will not only define the problem differently but also the success or failure of the design. This means that there is not just one possible way, one best way, of designing an artefact. A relevant social group can be an organisation, institution, or (un)organised groups of individuals, and can be very heterogeneous. "ICT design reflects an ongoing discourse among developers and between developers, people who will use the ICTs, and other stakeholders" (Kling et al., 2000: 120). Conflicting technical requirements exist for different social groups. Pinch and Bijker apply two methods to identify the relevant social groups: the snowball method (in which one source of information leads to another source of information), and the method where researchers must "follow the actors" (Bijker, 1994). Klein and Kleinman (2002: 30) describe the notion of 'social relevant groups': "Technology development is a process in which multiple groups, each embodying a specific interpretation of an artefact, negotiate over its design, with different social groups seeing and constructing quite different objects".

New technologies have interpretative flexibility. Whether artefacts work or don't work depends on who uses them and how they use them (Lamb, 1996). Interpretative flexibility is the way in which different social groups involved with a technology understand the technology. The idea of interpretive flexibility suggests that "technology design is an open process that can produce different outcomes depending on the social circumstances of development" (Klein and Kleinman, 2002: 29). There is not just flexibility in how people think or interpret artefacts but there is also flexibility in how artefacts are designed. Artefacts are the product of inter-group negotiations.

When one meaning of one specific social group becomes dominant, the interpretive flexibility diminishes. This stabilization of an artefact over a period of time is what Pinch and Bijker call 'closure'. There are two kinds of closure: rhetorical closure and closure by redefinition of the problem. With *rhetorical closure* the key point is whether the relevant social groups see or perceive the problem as being solved. A declaration is made that no further problems exist and that no additional design is necessary. *Closure by redefinition of the problem* occurs when unresolved problems are redefined so that they no longer pose problems to social groups. Humphreys (2004) notes that: "Bijker considers closure 'almost an irreversible' process. He argues that once something has been closed it is hard to think back to the way it was before being closed".

Pinch and Bijker define closure as the point at which relevant social groups consider their problem with the artefact solved. Stabilization is the process through which one artefact becomes the prototypical design for a particular technology. This stabilization depends on many factors, economic and political, and the ability of the innovators to engage other actors in the production, promotion and use. Pinch and Bijker observe that stabilization occurs at different points for different social groups.

Another important concept in SCOT is the 'technological frame' which refers to the socio-cultural and political context of a social group shaping its norms and values, and influencing the meaning given to an artefact (Pinch and Bijker). Members of a relevant social group share the same meaning of an artefact and are united by a common technological frame, which structures their actions (Bijker, 1995). A technological frame is formed whenever interaction around an artefact begins and it includes elements such as goals, key problems, problem-solving strategies, and requirements to be met by solutions, tacit knowledge, user's practice and exemplary artefacts (Bijker, 2001). Cornford and Klecun-Dabrowska (2003) explain: "Actors with low inclusion in the resulting technological frame – in the interactions around attribution of the meanings to a technical artefact or its construction – then have little ability to change the artefact, rather they have to 'take it' or 'leave it'. The degree of an inclusion of an actor in a technological frame indicates to what extent the actor's interactions (thinking and behaviour) are structured through that frame".

The SCOT theory is criticised on a number of points. A frequent criticism is that it focuses on relevant social groups, without attending to power asymmetry between these groups. Technology design is an open process that can produce different outcomes depending on the social circumstances of development. Artefacts and systems are the product of inter-group negotiations (Klein and Kleinman, 2002); however, it is known that not all social groups will have equal access and power to influence technological innovations (Winner, 1980; Douglas, 1990; Russell and Williams, 2002). Class, race, gender education and ethnicity may be important factors in the evolution of technology (Winner, 1980). The choice of relevant social groups is subjective and depends upon the researcher (Winner, 1993), and the biases through the subjective choices of the researcher can thus lead to an oversimplified understanding of technology and society (Winner, 1980; Douglas, 1990; Rosen, 1993; Russell and Williams, 2002; Clayton, 2002). As we saw, Pinch and Bijker point out the importance of relevant social groups in the development of technology in their Social Construction of Technology (SCOT) theory. But implicitly, Pinch and Bijker's SCOT theory assumes that groups are equal and that all relevant social groups are present in the design process. This assumption fails to adequately attend to power asymmetry between groups. Some groups may be effectively prevented from participating in the design process at all (Klein and Kleinman, 2002; Williams and Edge, 1996; Wyatt 1998). Although in later years Bijker argued for a semiotic conception of power whereby power is embedded and mediated by artefacts as well as by social groups, this semiotic approach has still been unable to incorporate invisible actors and social groups (Oudshoorn & Pinch, 2003: 4).

A second critique of the SCOT approach relates to the limited attention which is paid to the effects of technologies after they have been designed and developed. In 1993,

Langdon Winner published an influential critique of SCOT entitled "Upon Opening the Black Box and Finding it Empty: Social Constructivism and the Philosophy of Technology." According to Winner, SCOT explains how technologies arise, but ignores the effects of the technology after the fact. Woolgar and Grint state that the most significant influence of social construction occurs during design and development: “The argument is that a multitude of design possibilities are narrowed down through a process of social construction, wherein the dominant interests and social groups hold sway” (Woolgar & Grint, 1991: 369). What this means is that after the design and development phase, the chosen technology becomes a stabilized artifact. In other words, the construction is said to be social as well as technical, but only up to the point of stabilization. After that there is little disagreement about what the technology can do and this is more or less similar to the technological deterministic approach.

A third critique of SCOT lies in the absence of normative questions. Hamlett (2003) observes that: “it is only a small step from asserting that technologies are socially constructed (or that technology and society are mutually and reciprocally constructed) to asking more normative questions: How should technologies be constructed? Which ‘relevant social groups’ ought to be included in the process?” These normative questions are not asked within SCOT.

The Actor-Network Theory

Another approach within the Social Constructivist theory is the actor-network theory (ANT) developed by scholars including Bruno Latour, Michel Callon and John Law from the study of science and technology. The actor-network approach resulted as a critique to SCOT. It criticises SCOT for neglecting the valid aspect of technological determinism by ignoring the influence of technology upon social relations (Strum and Latour, 1999). ANT looks at technology and society as ‘mutually constitutive’ (MacKenzie and Wajcman, 1999: 23). As Callon points out: “The actor network is reducible neither to an actor alone nor to a network. Like networks it is composed of a series of heterogeneous elements, animate and inanimate, that have been linked to one another for a certain period” (Callon, 2001: 93). The actor-network theory declares that the world is full of hybrid entities containing both human and non-human elements (people, social groups, artefacts, devices and entities), and was developed to analyse situations where separations of these elements is difficult (Tatnall and Gilding, 1999). The actor-network theory claims that any actor, whether person, object, or organisation is equally important to a social network. Removal of certain actors will result in significant break-downs in social order, because societal order is an effect caused by the smooth running of an actor network. Callon explains this by using the example of the introduction of an electric car (VEL) in France: “Each element is part of a chain that guarantees the proper functioning of the object. It can be compared to a black box that contains a network of black boxes that depend on one another both for their proper functioning as individuals and for the proper functioning of the whole. What would the battery be without hydrogen? What would become of consumers without their VELs?” (Callon, 2001).

ANT refuses to a priori distinguish between small and big networks and there is therefore no distinction between the micro, meso and macro level. Actor-network theory is concerned with tracing the transformation of heterogeneous networks. “It explores the

ways that the networks of relations are composed, how they emerge and come into being, how they are constructed and maintained, how they compete with other networks, and how they are made more durable over time" (Tatnall and Gilding, 1999).

According to ANT, there are three overlapping stages of the constitution of technology networks. The first stage is called *inscription* and it refers to the ways in which technology embodies the beliefs, practices, and relations etc. of the society it emerges from. The second stage is *translation*, when the actor-network is actually created, and when actors other than the primary actor become involved. A powerful actor is able to translate another's interests to his own. This is the stage when negotiation takes place. Michel Callon defined four moments of translation. The first one is 'problematisation'. What is the problem that needs to be solved? Who are the relevant actors? Delegates need to be identified that will represent groups of actors. During problematisation, the primary actor tries to establish itself as an obligatory passage point between the other actors and the network, so that it becomes indispensable. The second moment of translation is 'interessement'. This entails getting the actors interested and negotiating the terms of their involvement. The primary actor works to convince the other actors that the roles he/she has defined them are acceptable. The third moment of translation is 'enrolment' when the actors accept the roles that have been defined for them during interessement. Finally, there is the moment of 'mobilisation of allies'. Here the question is asked whether the delegate actors in the network do adequately represent the masses. If so, enrolment becomes active support. The final stage of the constitution of technology networks is called *framing*. As the key issues and debates are resolved within a network, technologies can become stabilised over time.

An important critique on the ANT approach is that it takes the artefact or the technologist as its point of departure instead of looking at networks from the consumers' point of view (Oudshoorn & Pinch, 2003: 5). Other social constructivist approaches have tried to place more emphasis on the users. The feminist approach for instance reflects such a shift in the conceptualisation of users from passive recipients to active participants. In the feminist studies the question "who is the user" is very important, since the act of identifying specific individuals or groups as users actually shapes the development and use of technologies (ibid, 2003). The more recent social constructivist studies show that gender, age, socio-economic and ethnic differences among users may all be relevant. Because of the different characteristics of the users, they will all have a different position in relation to a specific technology (Kline, 2003; Laegran, 2003; van Oost, 2003).

A second criticism of the ANT approach is the exclusive attention it gives to experts and producers. Because the ANT approach does not make a distinction between the micro and macro level, it al becomes the same thing. The focus is on a central actor, who wants to realise an actor-world. This focusing on one actor turns the ANT studies into micro studies, or a "one-man-show". According to the feminist perspective "this 'executive approach' pays less attention to non-standard positions, including women's voices" (Oudshoorn & Pinch, 2003: 7). In relation to this, ANT has also been criticised for its lack of distinction between people and objects and the fact that it seems to suggest that all actors are equal within the network. Like the SCOT theory it does not take into account pre-existing structures such as power. Because the ANT approach, as

well as the other theories of social constructivism, tend to ignore the political biases that can underlie the spectrum of choices for relevant actors, they are seen as being amoral and apolitical (Winner, 1993).

A third criticism on the actor-network theory addresses its relative disinterest in the external context. The trajectory of a project is analysed in terms of the interactions between the chosen actors and external contexts are not assigned an important role in the interpretation.

Finally, ANT has been criticised for the fact that it does not reflect newer technologies (ICTs) and their everyday practices. However, in the last decade a number of papers (for example Tatnall and Gilding, 1999) investigate how ANT might be used in studying technological projects.

The Systems Theory

An important critique on both the SCOT and ANT approaches is the fact that both deal mostly with small-scale systems and consumer products. The systems theory by Hughes partly solves this problem. In the early 1980s Thomas P. Hughes and others criticised the history of technology for a focus upon artefacts (the bicycle, the light bulb, the car, the telephone, the computer) at the expense of the larger 'systems' of which these are part. As a reaction to this shortcoming, historian Hughes attracts attention to network technologies and uses large technological systems (not artefacts) as his unit of analysis to explain the relationship between technology and society. "Technological systems contain messy, complex, problem-solving components. They are both constructed and society shaping. Among the components in technological systems are physical artefacts, such as turbo generators, transformers, and transmission lines in electric light and power systems. Technological systems also include organisations, such as manufacturing firms, utility companies, and investment banks, and they incorporate components usually labelled as scientific, such as books, articles, and university teaching and research programs. Legislative artefacts, such as regulatory laws, can also be part technological systems. Because they are socially constructed and adapted in order to function in systems, natural resources, such as coal mines, also qualify as system artefacts" (Hughes, 1987, 2001: 51). In his description of the growth and the organisation of the electricity industry, Hughes points out the importance of technologies as well as money, politics, people and legal institutions. John Law notes: "the technical was indeed important – the creation, for instance, of the incandescent light bulb, or the calculations necessary to determine the optimal local and later regional voltages for transmitting and distributing electricity. But the technical was always and also juxtaposed – or better, inextricably mixed up – with political deals with city halls (for instance to win battles against gas suppliers), with legal arrangements about the location of supply cables and generating stations, and economic calculations about how far (and at what voltages) it was profitable to transmit power before losses became unsustainable" (Law, 2003).

It is important to focus on large technical systems when researching the relationship between technology and society because technological systems grow over time, and become more complex and interconnected. Networks of artefacts, organisations and people are required to maintain and operate the technological systems. Large technical

systems might best be described as “multi-actor systems – whether in the sense of groups assuming certain roles within organisations viewed as enveloping LTS or in the sense of inter-organisational networks” (Joerges, 1999). Joerges (1999) observes that these large systems (for example the telephone system, electricity generation, and railroad system) are often equated with the large corporate organisations and monopolistic utilities which develop and operate them.

Hughes notes that “technological systems solve problems or fulfil goals using whatever means are available and appropriate; the problems have to do mostly with reordering the physical world in ways considered useful or desirable, at least by those designing or employing a technological system”. Large technological systems seem to evolve in accordance with a loosely defined pattern. The history of evolving systems can be presented in the following phases: invention, development, innovation, transfer, and growth, competition, and consolidation. These developmental stages are not simply sequential, they overlap and backtrack. Hughes shows that various factors, not only technological and economic ones, but also social, organisational and political ones, play a different role in each of these stages. Hughes’ central point of attention is the required form of management and coordination that technological systems require. Each phase is thought to need a different type of manager to keep all the components involved in the development of a technological system connected with each other.

As systems mature they acquire style and momentum (also called dynamic inertia). In Hughes theory of momentum, it is explained that when a technology is young, deliberate control over its use and scope is possible and enacted by society. However, when a technology matures, and becomes increasingly embedded in the society where it was created, its own deterministic force takes hold. In other words, Hughes says that the relationship between technology and society always starts with a social determinism model, but evolves into a technological deterministic form over time when its use becomes more prevalent and important.

Although Hughes’s theory does include the study of large systems (unlike SCOT and ANT), some problems still remain in this approach. The systems theory is similar to the aforementioned approaches in that it does not pay a lot of attention to the users. Moreover, it pays very little attention to newer technologies (ICTs) and their everyday practices.

In summary there has been a lot of criticism on the theory of social constructivism. As Oudshoorn and Pinch (2003) show, the theory has evolved in recent years and its developers themselves have frequently revised or extended elements of it. For instance, there is clearly more focus on the users in the recent studies undertaken by social constructivists. However, the basic concepts of social constructivism have remained relatively stable. Therefore, we need an alternative approach to the theory of social constructivism to overcome its limitations. In our research we have chosen to use the Social Informatics approach instead of the more practiced STS theories to investigate the social consequences of large e-government systems.

1.4 SOCIAL INFORMATICS

An alternative way to investigate the roles of ICTs in a systematic, empirically grounded, and theoretically informed way is to use the Social Informatics (SI) approach[1]. 'Social Informatics' is defined as "the interdisciplinary study of the design, uses and consequences of ICTs that takes into account their interaction with institutional and cultural context" (Kling et al., 2000). The aim of SI is not only to enlarge academic understanding of ICTs, but also to inform public policy debates and professional practice.

The Social Informatics approach helps to address some of the limitations of the Social Constructivism theory. Nevertheless, Social Informatics uses a lot of the same notions, concepts and definitions as the above mentioned theory of Social Constructivism. For instance, Social Informatics research shows how technological determinism is based on an analytical failure, and SI research is therefore based on the concept that ICT is socially shaped (Kling, 2000: 219). In the following paragraphs we will describe six of the main differences between Social Constructivism and Social Informatics.

Social Informatics versus Social Constructivism

Although the Social Informatics approach borrows a lot from SCOT, ANT and the Systems Theory, it also tries to address most of their shortcomings. Unlike the other described approaches, Social Informatics is deeply concerned with the context in which each new technology appears (Kling, 2000). The main idea behind Social Informatics research is that ICTs do not exist in social or technological isolation (Kling et al., 2000). "One key idea of social informatics research is that the social context of information technology development and use plays a significant role in influencing the ways in which people use information and technologies, and thus affects the consequences of the technology for work, organisations and other social relationships. Social context does not refer to some abstract cloud that hovers above people and information technology; it refers to a specific matrix of social relationships" (Kling, 2000: 225). Contextual analysis looks at the larger framework of which technology development is a part. It focuses on the economic, technological, social, cultural and organisational conditions. It investigates the relations between systems development on the one hand, and decision making, power structures, legislation, learning effects, organisational aspects, media influence on the other. However, it takes careful analysis to specify appropriately what "the context" means for a particular situation (Kling, 1987).

Second, Social Informatics focuses on both macro- and micro-levels of analysis. This differs from Social Constructivism which concentrates more on micro-studies. Robbin (2005) draws attention to Kling's core sociological concepts of: "context, social situation, embeddedness, identity, role, and authority (power); the influence of history on thought and action; the dynamics, contingencies, fluidity, and uncertainty of the outcomes of social relations; social relations as a negotiated order that assumes

[1] One may also describe the difference between the two perspectives in terms of the *New Production of Knowledge* (Gibbons et al., 1994): social constructivism belongs to traditional mode-1 academic research, while social informatics belongs to the mode-2 fields, in which the production of knowledge generally is interdisciplinary and embedded in application contexts. We do not pursue this discussion further in this thesis.

cooperation but also acknowledges conflict over goals; and the individual as a reflexive social actor with "interests" who acted strategically".

Thirdly, Social Informatics is related to 'design oriented research' and 'constructive technology assessment' (Van den Besselaar and Rip, 1987; Deay Ouwens et al, 1987; Rip et al., 1995; Van den Besselaar, 1996; Schot and Rip, 1997). It is concerned with addressing ICTs and their impact when significant opportunities to shape these network-enabled activities still exist (Kling, 2000). This is in contrast to the social constructionist theories which all have the tendency to look at technology development from a historical viewpoint. This means that decisions, problems, mistakes and trajectories are explained and reflected upon with hindsight. Social Informatics researchers on the other hand can participate from the start of a technological project, making it possible to use their insights to influence the design and implementation of new applications and systems.

A fourth difference between the Social Informatics and Social Constructivism approach is effectively captured in the following quote by Kling:

> *"One of the fascinating and important sociological questions surrounding computerization is the extent to which the use of computer-based systems really transforms any part of the social order – and if so, how? Answers to this question rest heavily on the way computer-based systems are* consumed *– not just produced or disseminated. This question differs from the central focus of the sociology of technology on the conditions that produce differing technologies and the character of technological alternatives (e.g. Bijker, Hughes, and Pinch, 1987). In my view, it is a fundamental question, since social studies of technology gain their public value by shedding light on the consequences of social groups using various technologies. Moreover, if we want technologists to take the social consequences of their designs into account, some group should be producing reliable studies to help inform their actions"* (Kling, 1991: 342-343).

Instead of solely investigating new technologies during their design and development phase, it is important to also examine what happens to the relationship between technology and society after this phase, when the technologies are consumed. In other words, one should not assume that technologies become stabilized artefacts after their design. The design process is not finished after implementation.[2] Although the social constructivist theory does pay attention to the appropriation of technology by users, it only does so for a limited time. McLaughlin and Skinner (2000) also noted that the discussion of the social construction of ICTs has focused largely on the design process and has paid little attention to the shaping of the developed ICTs after they are adopted. It is only a recent development that "there is a growing interest in what happens when and after a technology is introduced […]" (ibid. 413). Social informaticians stress that attention should be paid not only to the early design process, but also to the actual use

[2] This is an issue also discussed in innovation theory, where it is emphasized that the innovation process continues during the diffusion phase (Rosenberg 1982). Sometimes the concept of innofusion is used in this context (Williams et al., 2005)

of the technology innovation over a longer period of time. This kind of research is more fundamental than 'configuring' or 'tailoring' a system to individual users' needs prior to implementation. In other words, there should be more focus on the way that users interact with new technologies and reshape them in medium- and long-term use, and how this interaction can inform systems development.

A fifth important difference between Social Constructivists and researchers in the field of Social Informatics is that the latter see more value in problem-driven (rather than theory-driven) research. In this respect, social informatics is characterized by the problems being examined rather than by the theories or methods used in a research study (Kling et al., 2000). Sawyer puts it like this: "[…] social informatics is problem-oriented. This work is defined by its interest in particular issues and problems with computerization and not by its adherence to certain theories or particular methods" (2005). The problem-driven approach gives researchers the opportunity to use more than just one rigid theory. Consequently, research in the SI field is multi-theoretical and interdisciplinary. The researchers not only rely on different theories, but also use a wide range of methodological approaches to study social aspects of ICT design, use and consequences. Examples of these methodologies include ethnographic studies of work practices, participatory design, social histories of information technology and action research. The research in this dissertation is also based on a multi-method strategy and applies different theories.

Finally, Social Informatics places a great emphasis on public debate. A critique on Social Constructivism is that they do not engage enough in practical nor in public debates. This allows the powerful, and those with vested interests to dominate public debate about technology, since the most powerful voices in debates about computerization are the designers, sellers, and government agencies directly involved (Kling, 1992). Kling criticizes Social Constructivism by saying that: "Sociologists of technology can do much to improve the quality of debate and discourse about the deployment of computerized systems and other potentially powerful technologies" (Kling, 1992: 351). It is important to get involved in public debates, because the debates about the social roles of technologies sometimes ignore relationships that are recognized as being very important by social analysts. Kling and Iacono (1990) point out that computer-based technologies are potentially transformative. Computerization can raise questions about social choices and value conflicts which the participants do not always seem to understand very well, and the contribution of scholars is to articulate these social choices (Kling, 1991: 344). Therefore, social scientists have the responsibility not only to study the use and social consequences of technological developments, but also to talk about them and not stay 'needlessly mute' (Kling, 1992: 354).

Social Informatics as a critique of techno-oriented approaches

Even though the actual name of the approach is relatively new, Social Informatics research has already been taking place throughout the 1970s and 1980s by studies that have been labelled as Social Impacts of Computing, studies of Computer Mediated Communication (CMC), and Computer Supported Cooperative Work (CSCW). Researchers changed their views during the 1970s from viewing ICT as having a direct impact (technological determinism) to the insight that the impacts of ICT are socially shaped. "In the standard (non-social informatics) accounts of ICT and social change, it

is common to hear information technologies characterized as tools, and questions are asked about their social impacts" (Kling, 2000: 219). The standard tool model underestimates the complexities and costs of computerization and overestimates the generalisability of applications from one setting or group of individuals to another. Figure 1.1 shows the differences between the standard models and the social informatics model in which computerized information systems are conceptualized as "socio-technical networks".

Standard (tool) models	Sociotechnical models
ICT is a tool.	ICT is a sociotechnical network.
A business model is sufficient.	An ecological view is also needed.
One-shot ICT implementations are made.	ICT implementations are an ongoing social process.
Technological effects are direct and immediate.	Technological effects are indirect and involve different time scales.
Politics are bad or irrelevant.	Politics are central and even enabling.
Incentives to change are unproblematic.	Incentives may require restructuring (and may be in conflict).
Relationships are easily reformed.	Relationships are complex, negotiated, multivalent (including trust).
Social effects of ICT are big but isolated and benign.	Potentially enormous social repercussions of ICT (not just quality of work life, but overall quality of life).
Contexts are simple (a few key terms or demographics).	Contexts are complex (matrixes of businesses, services, people, technology history, location, etc.).
Knowledge and expertise are easily made explicit.	Knowledge and expertise are inherently tacit/implicit.
ICT infrastructures are fully supportive.	Additional skill and work are needed to make ICT work.

Figure 1.1 Standard models versus socio-technical models (source Kling, 2000: 220)

From a Social informatics perspective, one wants to work out problems of stability, change, and transformation in society and its institutions that were induced by ICT adoption (Robbin, 2005). The focus is on questions such as "What kinds of impacts do computer-based information systems have upon public agencies and the polity?"; "What influences the adoption of new computer-based technologies?"; "How are particular computer-based technologies ordinarily introduced"; and "What are the social consequences of using computer based technologies?" (Kling, 1987 in Robbin, 2005). Social informatics also tries to correct traditional techno-centred theoretical approaches, which suggest that technology shapes organisational practices in a deterministic and uni-directional causal direction. Yet, observations and multiple theoretical perspectives show that technology adoption is a "problematic and complex, contingent process, one that is mediated by history, context, structure and agency, culture and meaning systems, symbolic and material interests and resources, and political and social processes" (Robbin, 2005). Unlike the techno-centred approaches of many computer professionals, Social Informatics theories are not based on a simplified conception of computing and social life, but explain socially complex technologies more adequately. Kling argues that the conventional theories "drew *a priori* boundaries around direct computer-based systems and immediate users, their work groups, or at formal organisational boundaries that often fail[ed] to capture important social relationships which influence[d] the development and use of computer-based systems" (Kling 1987, in Robbin 2005). Figure 1.2 summarizes the key issues Social Informatics studies focus on.

1. The context of ICT use directly affects their meanings and roles.
2. ICTs are not value neutral: their use creates winners and losers.
3. ICT use leads to multiple, and often paradoxical, effects.
4. ICT use has moral and ethical aspects and these have social consequences.
5. ICTs are configurable – they are actually collections of distinct components.
6. ICTs follow trajectories and these trajectories often favour the status quo.
7. ICTs co-evolve during design/development/use (before and after implementation)

Figure 1.2 Key Social Informatics Issues (source Kling et al. 2000: 117)

There are three basic orientations in Social Informatics (Kling et al., 2000). The first orientation is the normative one in which research aims to recommend alternatives for professionals who design, implement, use or make policy about information and communication technologies (Lamb and Sawyer, 2005). The goal of this type of research is to influence practice by providing empirical evidence. This empirical evidence is often based on participatory design research in which users are observed and asked about the ways they understand, use and adapt new systems. The second Social Informatics research orientation is analytical, which refers to studies that develop theories about ICTs in institutional and cultural contexts *or* to empirical studies that are organised to contribute to such theorizing. "This type of research seeks to contribute to a deeper understanding of how the evolution of information and communication technologies' uses in a particular setting can be generalized to other systems and other settings" (Lamb and Sawyer, 2005: 5). Finally, there is the critical orientation of Social Informatics research which encourages researchers to examine ICTs from multiple perspectives, such as from those of the various people who use them, as well as people who design, implement and maintain them. A critical approach to Social Informatics demands the work to be situated (contextual), empirical, and reflect social actor principles.

Computerization Movements

In the past 30 years there have been many major campaigns to computerize different aspects of our lives. Many new technologies were seen as key enabling elements of a utopian vision. These visions have been articulated by technologists and futurists rather than by social analysts (Kling, 1991: 354). Iacono and Kling (1996) ask themselves the question why the United States (or any other industrialised country) is rapidly computerizing. They point out that the two most common answers are, that first of all, computer-based technologies are efficient economic substitutes for labour or older technologies, and secondly, countries are shifting from a society where industrial activity dominated to one in which information processing dominates. However, the authors find that these answers ignore some of the broadly non-economic dimensions of computerization in industrialized countries. The adoption, acquisition, installation and operation of ICT systems are often far more socially charged. "Large expenditures on the latest equipment and systems are often out of proportion for the attained value, while social costs are typically ignored. What this suggests is that computerization has important social and cultural dimensions that are often neglected in discussions of the

rise of computer-based technologies and networking" (Iacono and Kling, 1996: 87). Governments often construct utopian tales about new technologies to render them socially meaningful and to mobilize large-scale support. Computer technologies are portrayed as the panacea for all social problems and the more negative results (displaced workers, loss of privacy, etc) are depicted as minor unavoidable consequences. Computerization is the process of developing, implementing and using computer systems for activities such as teaching, writing, designing houses, voting, etc. Kling and Iacono argue that computerization is part of a larger social context, which is "deeply embedded in social worlds that extend beyond the confines of particular organisation or setting" and "is driven by other and larger social processes" (Kling and Iacono, 1994).

This view resulted in the concept of *computerization movements*, which can be compared to other social movements. "Our main thesis is that computerization movements communicate key ideological beliefs about the favourable links between computerization and a preferred social order which helped to legitimate relatively high levels of computing investment for many potential adopters. These ideologies also set adopter's expectations about what they should use computing for and how they should organise access to it." (Kling and Iacono, 1994: 2). Groups formed around new computer technologies and formed social movements. New computerization movements will continue to emerge as new technologies are developed (Iacono and Kling, 1996). Computer-based social movements share the following ideological beliefs (Kling, 1991: 355):

- computer-based technologies are central for a reformed world.
- the improvement of computer-based technologies will help reform society
- no one loses from computerization.
- more computing is better than less, and there are no conceptual limits to the scope of appropriate computerization.
- perverse or undisciplined people are the main barriers to social reform through computing.

According to Davenport and Horton (2005) the concept of computerization movements is powerful: "It entails a long view and large scale approach to the study of technology while acknowledging that these are often based on cumulated micro studies; those who study computerization movements can thus explore how observations of the local and specific intersect with the de-contextualised high level versions of events." A computerization movement is a social movement that develops around one of the more core ICTs and depends on a socially constructed process of societal mobilization. Its key components include[3]:

- core technologies,
- organisational structures (computer movements organisations),
- a historical trajectory,

[3] For a further discussion see Hara and Rosenbaum (2005) who add a few additional distinctions: CM internal or external to organisations; market versus non-market driven; scope – affecting the whole population or a part of it; one technology or a set of related technologies; utopian versus dystopian (Negative effects of CMs can for instance be spamming, viruses, hacking or identity theft)

- strong technological action frames[4], an utopian ideology, and myths
- organised opposition (computerization counter movements),

The key components listed above show that e-government is an example of a computerization movement (Davenport and Horton, 2005; Hara and Rosenbaum, 2005). Large-scale applications for e-government require the interoperation of a range of ICTs. This makes it a CM with core ICTs that are bundled together and often appear to the person using them as a single application. An extended network of organisations works on developing and sustaining e-government structures, over the last decade. The ideology behind e-government is that it will have many positive impacts on society: 'modernizing government', making public services cheaper, faster, and more user-friendly. Finally, organised opposition can be found too, such as social movements for privacy protection, and movements against voting computers – who do not believe in the utopian narratives.[5]

As we have seen, the intended effect of e-government is to make government more efficient, user friendly, and transparent. Advocates of the e-government movement see great potential for this new form of governance. In "The World of E-Government", Curtin, Sommer and Vis-Sommer (2003) offer a technological deterministic and utopian view in which e-government will change the course of democracy for the better, making "grassroots democracy real democracy, instant democracy, for all citizens, everywhere". In the introductory chapter they speak enthusiastically of 'rapid betterment', 'explosions in freedom', 'great hope and good for all people', 'good for the future of this precious, troubled and endangered planet', and 'great possibilities and promises', emphasising that 'only good can come from this' (Curtin et al. 2003: 5). Whether the authors are accurate in their reflections on the positive outcome of widespread e-government is questionable. They make strong claims and from a Social Informatics perspective we know that many predictions about the social effects of specific ICT consequences have often been proven inaccurate because they are based on oversimplified conceptual models of specific kinds of ICTs or of the nature of the relationship between technology and social change (Kling et al: 2000). Furthermore, Social Informatics studies show that ICTs often have mixed effects. Sometimes the expected consequence happens, while in other cases ICT use seems to lead to effects that are opposite to those that were anticipated. Curtin et al. have also drawn attention to the fact that ICTs can have different effects, noting that: "The results of developments in e-government internationally, [...], are still mixed."(Curtin et al. 2003: 8). But the authors' use of the word *still* implies that one day the results won't be mixed anymore, and that there is one clear way forward: one ultimate e-government concept. We do not think that this is the case. Similar e-government applications will continue to have varied consequences in different settings as opposed to one fixed effect. Finding varied and even conflicting consequences is common in Social Informatics research.

[4] "Technological action frames are the composite understandings of a technology's function and use built up in the language about a technology" (Meyer, 2005). These action frames specify what is in the frame and what is out of the frame – one set of meanings rather than another is conveyed, or one story rather than another is told (Davenport and Horton, 2005).

[5] www.wijvertrouwenstemcomputersniet.nl, www.verifiedvoting.org, www.blackboxvoting.org

Computerization movements play a role in trying to persuade their audiences to accept an ideology that favours everybody adopting state-of-the-art computer equipment in specific social sectors. However, Iacono and Kling argue that CMs generally advance the interests of elite groups in society (among others) because of the relatively high costs of developing, using, and maintaining computer-based technologies. ICT-based systems and infrastructures increasingly segment (or 'splinter') society – adding another dimension to the digital divide (Graham & Marvin, 2001).

This leads to the 'counter-movement question' whether ICTs can also be used to advance the interests of the weaker groups in society (Iacono and Kling, 1996), or whether they will merely help to create larger digital divides? An important way to assure that not only upscale elite groups are associated with new technologies, is to 'democratize' the design, development and implementation of new technologies through the participation of all relevant social groups. Davenport and Horton (2005) note that although e-government in the UK promotes itself as process-oriented and customer-focused, it offers little scope for the direct participation of citizens in service design. The issue of participation of social groups in the design of technologies is therefore of utmost importance. This is addressed in the next section.

1.5 PARTICIPATORY DESIGN

User participation is often encouraged for three reasons: to ensure that user requirements are met, to gain user commitment, and to avoid user resistance (Cavaye, 1995; Silva and Breuleux, 1994). If user feedback is not sought throughout the design process, then a new system is unlikely to effectively handle overlooked exceptions, complexities and nuances. Therefore, non-expert citizens need to be brought into participatory contact with specialists, experts, and policy makers. It is often argued that excluding users from the design and development process is a major cause of system failures. "Most computer-based systems are installed with little public view of the social visions held by their designers, developers and implementers.[…] The rhetoric justifying these developments are often anchored in images of an 'information age'" (Kling 1991: 355). There is also little investigation into people's behaviour and needs. Many designers develop tacit scenarios of the ways that people will use systems that often differ from actual conditions and uses. Socio-technical and participative design approaches focus on involving users in the design process and on considering a wide range of social and technical alternatives to problems (Greenbaum and Kyng, 1991, Schuler and Namioka, 1993). The basis of the socio-technical theory is that human and organisational issues cannot be considered in isolation from the technology (Catterall et al, 1991:256). Systems designers with a socio-technical orientation do not simply consider these issues while working closed off from the users who will use a specific system. The designers want to discover the preferences of the people who are likely to use their systems by involving them as much as they can in the development process. This way they learn about the 'softer' issues, which encompass a variety of technical, organisational, social and human factors and their interactions (Kling, 1999). There are many tools and techniques available to involve end-users.

However, there has been some debate about the effects of user participation. For example, Lin and Shao (2000) note that getting users involved in the development

process may improve their attitudes toward the system and enhance the importance and relevance users perceive about the system. Yet, according to Cavaye (1995), empirical studies are not able to show consistently that there is a causal relationship between user participation and system success: research provides mixed results, which may result from inconsistent operationalisation of constructs (Cavaye, 1995). Similarly, Hwang and Thorn (1999) acknowledge that empirical studies keep producing controversial results. Using a meta-analysis, they calculated 41 effects from 25 studies. In their research, they distinguished between user participation and user involvement. User involvement is a need-based mental or psychological state of users toward a system and its development process. "The importance and personal relevance that users attach to a particular system, or to information systems in general, depending on the users' focus" (Barki & Hartwick, 1989). User participation is the observable behaviour of users during the development process of a system. Measuring the effect of *user involvement*, the researchers found that the psychological state of users had an undeniable positive impact on system success. This sense of belonging can result in a high rating of the system upon completion and more aggressive use of information technology to improve performance. "Users are likely to be happy if they identify with a system under development, even if they do not make tangible contributions". (Hwang and Thorn). Furthermore, they found that *user participation* is beneficial to system development - if users participate in the actual development process, they have a better chance to provide input and feedback to systems design.

In most e-government projects, not much emphasis is placed on the participation of end users. However, we are of the opinion that user engagement in e-government applications is of utmost importance because of the non-commercial nature of these systems. The fact of the matter is that there is a big difference between new technologies like DVD players, HDTV, or personal computers and innovations that are implemented by government. With the former, consumers have a certain power to influence the adoption, if not in the design process, then at least in their ability to refuse to buy and use the new products. "The final consumer may have little opportunity to engage upon the design and development of such artefacts (e.g. domestic goods) other than the 'veto power' to adopt or not" (Williams and Edge, 1996: 878). However, with e-government applications we speak about 'citizens' instead of 'consumers'. This is an important distinction. Citizens will have no other option than to use the systems that government implements (e-voting, ID card, etc.). Other viable options often do not exist. Consumers frequently use technology completely differently from the initial intention. People refuse it, or use it for other purposes then intended by the designers. With e-government people are more or less forced to use it as intended: they can't abandon the technology or reshape it to be used in new ways. Therefore, the role of the citizen is crucial and he/she should be involved in the design and implementation of these large-scale systems. This will enable the citizen to have the last veto to reject something like, for instance, e-voting, before it becomes a fait accompli. When users are not involved in the development of e-government systems, democracy might be in jeopardy.

Despite the general agreement that user participation is important, the role of users is in practice often fairly superficial.[6] An exception is the Participatory Design (PD) approach. PD originated in the Scandinavian nations in the late 1970 (Schuler and Namioka, 1993). Users are viewed as active collaborators in the design process rather than just 'passengers', and 'sources of information'. PD is a body of practice and theory that emphasizes direct, empowered, collaborative action by users, in concert with professionals. Through PD, users move out of roles such as observer, approver, 'knowledge repository', or 'component of the system', and into roles such as peer co-designer, design co-owner, expertise contributor, and self-advocate (Miller, 1993). Participatory design is therefore a useful approach not only to achieve high quality systems, but also to democratize technical change (Van den Besselaar, 1998). This ideological basis underpins the participatory design approach. Users participate by analyzing organisational requirements and planning appropriate social and technical structures to support both individual and organisational needs and interests.

Evaluating some fifteen early 'best practice' PD projects since the 1970s, Clement and Van den Besselaar (1993) concluded that under appropriate conditions, users are capable of participating actively and effectively in information systems development. The projects differed in many respects, but also had some common characteristics. One of the similarities was that most projects focused on small stand-alone applications of IT, indicating a low organisational complexity. "Since most projects have been relatively small, we do not yet have much experience on which to draw for participative approaches to develop large applications, integrating existing systems or creating technical and organisational infrastructures to support PC-based end-user computing" (ibid., 1993). This has not changed since, as recent studies of PD show.[7] In another article van den Besselaar notes that "participation in small-scale and micro-level technical development projects is relatively successful, whereas intervening in large-scale projects at company level or sectoral level generally is unsuccessful" (Van den Besselaar, 1998).

In smaller projects the groups of users involved are more specific than the users in large projects. In the latter, stakeholders and users form a far more heterogeneous population, often with diverging roles, opinions and interests. Large projects therefore require a different approach. Furthermore, small-scale projects focus mainly on *users* (as workers or consumers) and on *managers* neglecting more political and strategic issues involving *users* (as citizens) as well as *politicians*. In large-scale systems both dimensions are often simultaneously relevant and interacting: the political and normative, as well as the operational dimension.

[6] In fact, the two cases underlying this thesis are a good example of this. Although the role of the users was often discussed in the original project proposals of both the FASME, and the TRUEVOTE system, the technical design was actually already fixed before the fist user was involved.

[7] The more recent editions of the biannual Participatory Design Conference confirm this. E.g., Clement et al, 2004.

As e-government developments are usually large-scale projects with an incredible complexity, they cannot be approached in the same way as the smaller projects (often within one organisation) which advocate an active and direct involvement of users. Cross-border e-government is even more complex, with many different user categories from different countries. Because of their different nationalities, the users will have different cultural backgrounds, opinions, moral standards and values. These will all be reflected in their level of acceptance of the new technology and will also add to the complexity of their involvement. To enable citizens' participation in the design, development and use of new e-government system, there is a need for experimenting with new PD approaches and tools.

For effective PD, one needs critical reflection upon, and early warning of, the intended and unintended, expected and unexpected (negative) effects of particular technological developments: technology assessment (TA). TA is the systematic analysis of the anticipated impact of a particular technology in regard to its safety and effectiveness as well as its social, political, economic, and ethical consequences. The need for TA arose "from dissatisfaction with the fact that, up to that time, technological developments had automatically been seen as a blessing and had not been subjected to critical assessment" (Grin, van de Graaf and Hoppe 1997: 9) TA comprises two parts. The first is an analytical part of scientific analysis of the functioning and of the effects of the technology considered. This takes into consideration, in particular, potential long-term and unexpected side effects. The second part is the normative evaluation of the results of the analysis with regard to criteria, goals, and objectives. This includes the comparison to other alternatives (other technologies or non-implementation). It also means that the question needs to be asked whose values and preference should have primary importance.

In TA, the perspective of the parties affected have been given precedence, since the suppliers, sponsors and embedders were thought to already have enough influence (Grin, van de Graaf and Hoppe, 1997: 11). An important question within TA is whether it can influence development paths, and if so, how. Can TA research actually influence the designers of a technology? Can it influence the choices of companies when they bring technological innovations to the market and can it contribute to the choices that governments make when they formulate their technology policy? In the 1980s TA researchers came to the conclusion that their research often did not have the intended influence. This led to new interactive forms of TA (ibid.), and approaches such as Constructive TA (Van den Besselaar & Rip 1987; Deay Ouwens 1987; Rip et al 1995; Van den Besselaar 1996; Schot, Rip 1997). Because TA has evolved into a more interactive (participation) and constructive (design) approach, it relates well to the PD approaches. In this dissertation we will combine the two.

1.6 THE RESEARCH QUESTIONS

In this dissertation, we explore the social implications of e-government technologies, and the way users can influence the design, development and use of the large-scale public sector innovations.

Research Question 1

As we argued in this chapter, it is of great importance to engage future users in the design and development of new systems, especially when they are going to be introduced by government. This also entails enhancing the opportunities of ordinary, non-expert citizens to participate effectively and meaningfully in developing policy responses to identified problems (decision making about technology). However, deliberative involvement of users in large-scale and complex development of networked applications is fundamentally different from involving users in the design of small, stand-alone applications – and it is hardly practiced. Therefore our first research question is as follows:

> **Research Question 1:** *How can users participate in large-scale systems' design and development?*

Research Question 2

As we have already stated there is usually no simple, direct effect of information technologies and their consequences often depend on the context in which systems are developed, implemented and used (Kling, 2000). This leads to our second research question:

> **Research Question 2:** *What are the intended, unintended and second-order social effects of e-government (in particular e-voting systems) technologies and their applications?*

Of course, not all social effects of e-government technologies can be discussed in one thesis. Therefore we restrict ourselves to several important aspects, which were derived from the literature, and from the opinions of a variety of users.[8] Our first case describes the development of a system which is meant for international e-government. We focus on the specific problems that occur when building cross-border e-government applications. In the second case we study a set of intended and unintended consequences which occur when electronic voting technologies are implemented. For instance, we examine whether e-voting systems would enable an increase in voter turnout as is often predicted. We also study the possible (and generally neglected) effects of e-voting on voting behaviour, and on the risks related to moving the civic duty of voting from a public place to people's own private home. We investigate these and other contextual questions because they will help us to develop an analytical understanding of information technologies in social life. To avoid repetition, the more detailed research questions are formulated and answered in Chapters 4,5,6,7,8, and 9 – which can be read (and were published) as individual papers.

Research Question 3

One of the objectives of this study is to go beyond the foreseen first-order expectations that are usually identified by research into new technologies. The thesis identifies, explores and evaluates a range of second-order effects that occur when e-government technologies are implemented. Second-order effects are the unintended consequences of

[8] User input from focus groups guided us to concentrate on these particular questions throughout our research.

a new technology which often have a far more powerful impact on society than the more obvious first-order changes. Although it is inevitable that we learn about most of the second-order effects as they occur, we need an early glimpse of what those effects will be by paying more attention to the contextual factors when developing a new application. And, if one wants to influence design practice, one needs methods for studying socio-technical systems in an early phase. In our research we deployed small scale experiments. This brings us to our third research question:

> **Research question 3:** *Can we investigate second-order order effects at an early phase of designing a new system through small real life experiments?*

Research Question 4

After the work is done, it will be time to reflect on the question whether the analytical framework that we have adopted has proven its worth. One of the aims of this thesis is to develop and apply a conceptual framework for analysing large-scale ICT systems. Social Informatics provides the conceptual lens to scrutinize the development of e-government systems and their effects. This leads to our last research question:

> **Research question 4:** *Does a Social Informatics approach provide a useful framework for understanding the social implications of technical change?*

The next chapter describes the two cases on which our empirical research is based. Then we outline the research methods used in Chapter 3. Chapter 4 and 5 are based on the fist case of international e-government. In Chapter 4 we analyze how user participation was organised and what results were achieved for the designing process, and for the details of the design. In Chapter 5 we analyze one aspect in particular; the issue of technical and social interoperability in international e-government systems.

Chapters 6 to 9 cover the electronic voting case. Chapter 6 describes the set-up and results of the user participation in this case. The developed system was tested in a series of real life (field) experiments, and in Chapter 7 the experiments are described and analyzed. After this, we more specifically analyze two social issues. In Chapter 8 we study the problem of trust in the e-voting technology, while in Chapter 9 we investigate whether e-voting technology influences voting behaviour. In the Conclusions we place our findings in the context of the larger (but still small) body of research into the social dimension of e-government and e-democracy.

2
The Cases

2.1 INTRODUCTION

The research in this dissertation is based on two cases. Both cases deal with the design and development of large-scale e-government systems. In this chapter we will describe these two cases focusing on the background, motivation, and the objectives of the projects, and on the systems developed within these projects.

The first e-government system (FASME) aimed at developing a prototype that supports Europeans in solving administrative problems when they move to another European country. It is a good example of *international* e-government. In the second case an electronic voting system called TRUEVOTE was developed and tested. This e-voting system could be used for voting at polling stations as well as for remote voting from home or the workplace. Both projects involved a large number of different partners.

2.2 THE FASME CASE

2.2.1 Background and motivation

The concept of e-government stands for a large class of socio-technical changes in the public sector, deploying a broad set of ICT based innovations (e.g., Snellen & Van de Donk 2000; Schmid et al., 2001; Anttiroiko & Mälkiä, 2006). It serves a myriad of purposes and tries to fulfil many citizen and commercial needs. E-Government will have the ability to change our lives directly or indirectly. The challenge of e-government is twofold. First of all, electronic government promises fast and accurate transactions and delivery of information and services. Governments want to raise the standard of service for its customers (the public, businesses) by putting all feasible existing services online. The standard of these services can also be raised by identifying new opportunities for service innovation. Service innovation can come from integration of existing cross-agency related services, streamlining of existing processes and collaboration with private and other non-government organisations to invent new services (Siew Siew & Yin Leng, 2003: 29). Secondly, governments want to actively engage their citizens, establishing greater consultation and citizen participation. New technologies offer possibilities for citizens to interact with their local or national government on a level that has not been possible before ("e-engagement" or "e-democracy"). People can use the e-democracy technologies to register an opinion, participate in a survey or vote in an election.

The FASME case is an illustration of an e-government initiative in which governments try to provide fast transactions and easy delivery of information and services for European citizens. We focus particularly on the issues related to the international character of the application.

Five and a half million foreign citizens resident in EU member states are nationals of other member states (Salt, 2000). EU and EEA citizens in European member states have the right of free movement and are not subject to the same immigration rules as non-EU/EEA nationals. The largest numbers of the 5,457,068 EU nationals who lived in member states other than their own were to be found in Germany with over 1.8 million and France with over 1.3 million. The UK and Switzerland, although the latter is not an EEA country, followed with over 800,000 EU nationals and Belgium with over half a million (ibid.).

There has been a general trend towards greater harmonisation of migration policy across the EU. In part this has been achieved through intergovernmental treaties and agreements, in part by the actions of individual governments which have responded in similar fashion to emerging migration issues. The major finding from Salts study is that the single most important characteristic of the migration patterns and trends identified in the EU/EFTA states is their variability from country to country. It cannot be emphasised too strongly that Western Europe is a very heterogeneous migration region. Countries differ in matters of migrant origins and destinations, timing and migrant characteristics. Many of these differences are long-standing and they reflect the different migration histories and relationships of European states. Even though there is an enormous variability between individual member states in the numbers and characteristics of the foreign workforce, generalisations can be made that broadly transcend national differences. Generally, labour force numbers are rising. The last two decades of the 20th century were ones of increased migration in EU/EFTA states, most of which was from neighbouring regions.

The 5.5 million mobile Europeans have to deal with time-consuming administrative procedures, which differ between the various European countries. When moving to a new country, people often have to queue for hours to provide information, show their passports and submit forms. The complexity of government is a regular cause for complaint. The lack of standardization and information sharing forces citizens to supply personal information repeatedly while bouncing from one agency to another to get service. Another problem is that only a small part of government's information and service databases can be easily searched because no standardized classification of information and services exists. Information is usually organised by agency or service title and not by the needs of the citizens who seek answers or help (McGinnis, 2003: 53). Consequently, citizens sometimes need to visit several departments more than once to get a fairly straightforward service done. To facilitate the European citizens' mobility, many bureaucratic obstacles need to be removed.

2.2.2 The FASME project

The FASME (Facilitating Administrative Services for Mobile Europeans) project was run as part of the "Information Society Technology" research program of the European Commission. The main objective of this interdisciplinary project was the development of a prototype application to improve the user-friendliness of public administration procedures in European member states, so that moving within Europe would be easier in the future. The project proposal suggested the use of smart cards for the transport of personal documents in digital form to provide some improvements for the citizens.

“Citizens shall no longer have to carry personal documents in paper form with them in order to obtain certain administrative services. They shall not have to bother with finding out which documents are needed in a foreign country. They shall not have to bother with obtaining these documents from various authorities and delivering them to various other authorities. Instead they will be able to use a secure multi-application smart card” (Riedl, 2001). In the project registration procedures were analyzed for a new residence in seven European cities: Antwerp in Belgium, Belfast in Northern Ireland, Cologne in Germany, Grosseto in Italy, The Hague in the Netherlands, Naestved in Denmark and Newcastle-upon-Tyne in the United Kingdom. A pilot version of the FASME system was implemented and tested in Cologne, Grosseto and Newcastle.

Currently, mobile Europeans carry personal data on paper documents. Numerous documents must be provided by a European citizen to the local administrations. FASME developed an information technology application to streamline the provision of administrative services to migrating citizens, and to institutions and enterprises that are relevant for migrating citizens. FASME aimed to facilitate improved access to many administrative data, which has different formats in different countries. The system has translation capabilities, to translate the administrative information from the sending country into a format that is required in the receiving country. Obviously, the obstacles and constraints are many, considering the very different administrative traditions in the various EU countries. In the next section we will describe these different administrative procedures for registering a new address and re-registering a car – the application domains implemented in the prototype.

The pilot locations

The differences in administrative traditions can be illustrated by comparing two administrative processes for the three participating pilot locations Cologne, Grosseto and Newcastle – as was done in the requirements analysis of the project.

Figure 2.1 The three pilot cities Cologne, Grosseto and Newcastle.

The first application that was to be implemented on the FASME JavaCard was the actual change of address, i.e. the registration or de-registration of an address of an EU citizen within the EU member states. In Germany there is a general obligation to register in the case of moving into and out of a place of residence. This obligation applies to each person who moves in or out of a place of residence. Registration has to be carried out at the local registration office which forms part of the local government or municipal administration. The deadline for the registration is 8 days following the move into a place of residence. Deregistration is also to be carried out within 8 days after moving out of a place of residence. The following forms need to be submitted in the case of a registration by persons from the European Union (e.g. Italy or Great Britain) in Germany: a personal identity card and a tenancy contract (confirmation of the party providing residence). One has to sign a registration which can be obtained from the registration office and contains the resident's identity details. EU citizens do not need to submit confirmation of the deregistration of their former address in the case of changing their address to Germany.

In Italy the registration or deregistration of an address (Residenza) is carried out at the resident's registration office (Ufficio Anagrafe) of the police headquarters (Questura). The obligation to register with the police is, in general, to be carried out within 8 days at the place of residence. The obligation to register in Italy is carried out by completing an officially stipulated registration form, which can be obtained from the registration office. The data that is to be provided are the identity data of the registering persons and the family members. Furthermore, the following must be submitted to the Ufficio Anagrafe: personal identity card, proof of the party providing the residence (e.g. a tenancy contract), residence permit of the persons who are subject to the obligation to register, and confirmation of the deregistration from the country of origin (if there is an obligation to deregister in such countries, e.g. Germany). Most of the citizens' rights and obligations are derived from the status of registration at the registration office. For example, the right to vote, vehicle registration, the issue of a driving license, the allocation of a tax code, entries in the health care system; municipal services and public services such as access to public schools.

In the United Kingdom there is no obligation to register with the police. EU citizens register their residential address at the "Department of Health and Social Security" (DHSS) and are supplied with an insurance card within 3 to 4 weeks. The documents required to file an application for employees (insurance card) are a valid passport and the proof of independent or non-independent gainful employment. Citizens of EU countries and the other countries of the European Economic Area need not register a fixed place of abode irrespective of how long they reside in the United Kingdom. One may pursue gainful employment without a work permit immediately after arriving in the United Kingdom.

The second process that was modelled for the prototype was the registration or de-registration of private motor vehicles. In Germany the local authorities of the municipal and district administrations (road traffic licensing departments) provide information about which documents need to be submitted for the registration of a vehicle. These include, at least, the following documents: personal identity card, proof of the operating

licence, proof of the third-party liability insurance, and proof of the vehicle purchase and/or registration. The forms can be obtained from the road traffic licensing department.

In the case of changing one's address to Italy, vehicles must be re-registered within six months at the pertinent authority. If a person intends to register a motor vehicle from an EU member state, the following documents are required: a motor vehicle certificate, proof of insurance coverage, certificate pertaining to the place of residence. The M.C.T.C. registers the vehicle by issuing a motor vehicle number plate and a motor vehicle certificate. Citizens are further required to register vehicles with the motor vehicle registration authority (P.R.A). For this, one requires the motor vehicle registration certificate and a copy of the motor vehicle certificate. The foreign number plate, motor vehicle registration certificate and motor vehicle certificate are usually withdrawn by the M.C.T.C. and destroyed.

In the UK, the following preconditions need to be satisfied to re-register a motor vehicle with a British number plate: a British third-party liability insurance policy must have been taken out, vehicles which are older than 3 years must be equipped with a test certificate (MOT test), the road tax must be paid, former registration documents and other motor vehicle papers including the conformity certificate must be shown, and the owner must be in possession of a valid driving license. Following re-registration, the vehicle is equipped with a new number plate. The old foreign number plates and the motor vehicle registration certificate must be handed over to the embassy (personally or by post) which then deregisters the vehicle at the registration office in the respective country.

The above comparison of only two administrative processes between only three EU member states (Germany, Italy and The United Kingdom) demonstrates differences between the legislation of the member states within the European Union with regards to handling administrative procedures. The FASME prototype tried to propose a solution for the harmonisation of a smart card infrastructure.

The technical platform

The technical platform of FASME was a so-called JavaCard; a smart card based on the object-oriented programming language Java. A smart card is a plastic card, the size of a credit card, with a chip on it. The chip contains a microprocessor and some memory. The information on the card is kept in electronic form. There are different types of smart cards. The simplest one is the telephone card. This card is smart enough to prevent forgery, but it does not offer any protection when it is lost. Other smart cards have one password to suit one user or service. The smartest smart card can handle different applications and will use different passwords and authentication. This smart card is comparable to a small computer on which different programs run. The smart card is smart because it has control over who is allowed to use the card and in what way.

Figure 2.2 The FASME smart card

The information stored on the FASME card is protected with the use of biometric identification. Biometric technology is used to erect a barrier between personal data and unauthorized access. Technically speaking, the devices create electronic digital templates that are stored and are compared to "live" images, when required, to verify the identity of an individual. Instead of showing a birth certificate, producing a driver's licence or revealing one's family history, one can use features such as an iris, a voice, a signature, a fingerprint, a hand or a face to identify oneself[9]. A sensor will record the human characteristic presented by the user.

Figure 2.3 The fingerprint sensor

The sensor translates the human characteristic into a digital representation, which is called the *biometrical bit pattern*. The templates use algorithms to secure the record and

[9] The ultimate goal of the FASME project was to integrate a fingerprint sensor into the Java Card. The fingerprint is practically stable from birth to death and therefore the template does not have to be updated frequently.

protect it from disclosure. The biometric pattern cannot be reconstructed, decrypted or otherwise manipulated to reveal a person's identity to someone else or to be used forensically. Biometrics can thus be thought of as a very secure key, but one that cannot be passed on to someone else. However, the promise of biometrical identification as a method for secure identification is accompanied by concerns about privacy. The biometrical data may become a key to track a person's everyday activities. Also, the biometrical data may reveal much additional information about a person, such as health status or race. Another problem with the use of biometrics for identification of individuals and for authentication is that under certain conditions the system could fail. Environmental conditions such as temperature variations or the presence of dust can cause a failure; so can behavioural conditions such as stress and sweat. A rejection by the system of someone truly linked to the template is called a 'false rejection'. This will decrease user acceptance of such a system. An acceptance of someone who doesn't belong to the template used for comparison is called 'false acceptance', and could cause a security violation (Hes, Hooghiemstra and Borking, 1999).

By using the FASME card one can save, read or change personal data. In addition, the FASME card will use a processor, which can be programmed, thus it can be used for more than just a single function. Lips has drawn attention to the popularisation of the smart card within the public sector, noting that "Slowly, but to an increasing extent, multi-functional smart cards are coming into use in public service delivery. At the moment smart cards are used in combination with kiosks, ATM machines and banking networks, and more and more with PCs. There are examples of smart cards in policy areas such as health care, social security, education, and transportation" (Lips 1998: 335). The FASME project – that started in 2000 - was an example of this.

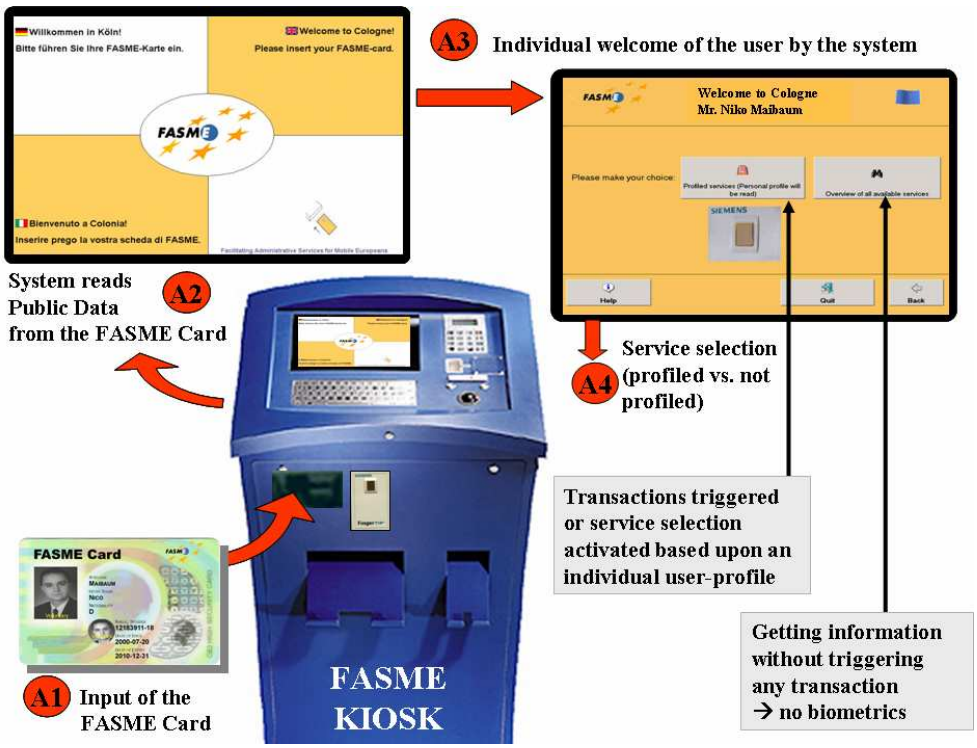

Figure 2.4 Using the FASME kiosk

The initial idea of FASME was to use the JavaCard to store documents on, which could be downloaded through the internet, using biometric (fingerprint) identification and authorization techniques. Later on the concept changed, turning the card solely into an identification tool to enable transfer of documents from one system to another. The ideal situation would be for mobile citizens to conduct most of their administrative tasks using the FASME JavaCard. Citizens would access governmental services at electronic kiosks with touch-screen interfaces. These electronic kiosks would then serve as contact points realizing a so-called one-stop government (Riedl, 2001).

How would this work in practice? The citizen will arrive, with his individual FASME card, at the kiosk in order to register. In this scenario, the citizen is authenticated by the interplay of the kiosk, the JavaCard, a trusted third party and himself (biometrics). Data is read from the card and confirmed through the kiosk. Personal data is provided by means of time-stamped and signed documents, through the JavaCard, upon the consent of the citizen (Auerbach, Chai, Cong and Riedl, 2001). The kiosk is the primary contact point for the citizen and has a multi-language capability. In the pilot system the kiosk supported three languages: English, German and Italian. The citizens can use the kiosk to perform administrative services that are offered on the kiosk. In the pilot system only two services (Citizen Registration/Change Address and Parking Permit/Car Registration) were implemented for each of the three cities, but in the future the range of services can be expanded. The kiosk also acts as a service station for all card-related activities. This way the citizens can view the contents of their card and update their personal profile. This profile is used to provide the citizen with a range of services and information that is tailored to their specific individual needs.

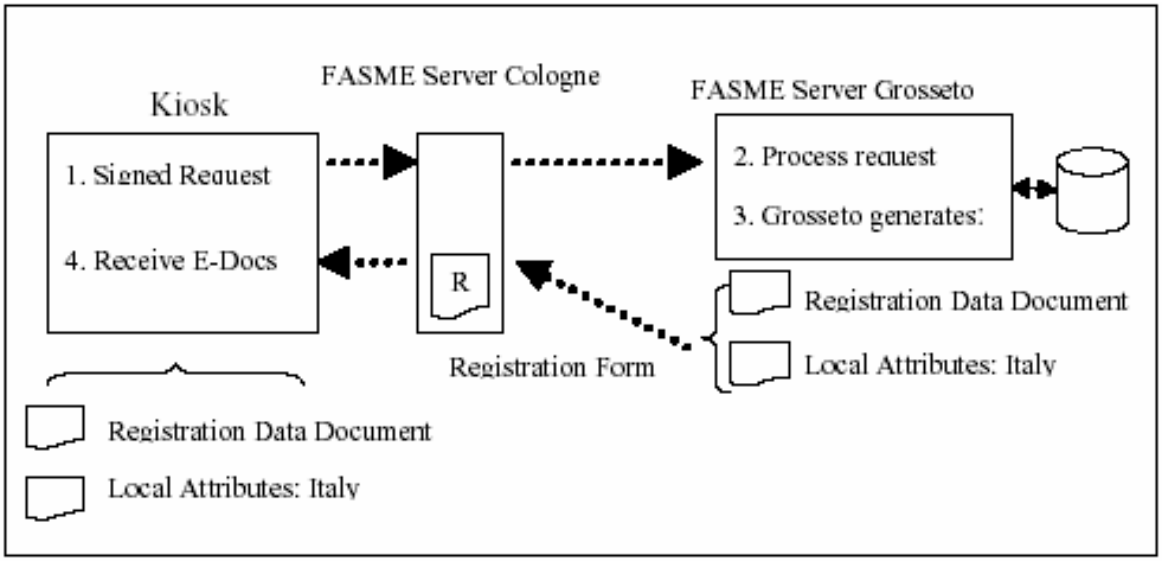

Figure 2.5 Generating the FASME documents and transferring them to the kiosk

Figure 2.5 gives an example of how the FASME documents are generated and transferred to the kiosk, in this case of someone who moves from Grosseto to Cologne. The digitally signed request for electronic documents is passed from the kiosk on to the

Cologne server, sent to Grosseto and processed by the FASME server in Grosseto. The FASME server in Grosseto generates all requested documents and passes them back to the server in Cologne.

The vision of the FASME project was that in the future a migrating citizen would only have to visit one civil office, where she could carry out all the necessary administrative tasks in less than half an hour. Such a task may comprise, for instance, the registration or cancellation of a residence, a driving license or a car. One could also think about registration with benefit programs, application for, and granting of, a work permit, ordering or cancellation of waste disposal services, dog license application or renewal, and many other tasks. However, one must be realistic about the complexity of, and the differences between, administrative procedures in the 25 European Union countries. These differences pose many technical, political, legal and cultural problems that need to be solved carefully.

2.3 THE TRUEVOTE CASE

2.3.1 Background and motivation

Recent elections worldwide, both local and general, have seen a gradual decline in overall percentage of the electorate exercising their right to vote. Only about half of all Americans who are eligible to vote in fact do so (Caltech/MIT, 2001). The problem of falling turnout is not exclusively American. The same trend is evident in most established democracies across all orders of election (Electoral Commission, 2002). In countries where voting is not compulsory, the levels of turnout at local, national and European elections are a real cause for concern. After all, turnout is the most obvious indication of political participation and electoral engagement. When people become increasingly disengaged from politics and the democratic system, one starts to question the legitimacy of the political system itself. As a result of the declining turnout at elections, politicians want to find ways to increase civic participation. Changes to reverse the decline in turnout include universal postal voting, an extension of the polling hours, and more modern methods of casting a vote such as the use of telephone, text messaging and internet-based voting. Electronic voting, in particular, is seen by politicians as the way forward to re-engage people in the political process.

Electronic voting (also called internet voting, online voting, or e-voting) is an election system that uses encryption to allow a voter to transmit his or her secure and secret ballot over the internet. Internet voting systems are being considered to replace or complement the older conventional voting systems. McGarth states: “In the first flush of internet fever, electronic voting was hailed as the miracle cure-all for democracy's ills. E-vangelists argued it would engage young people in the political process, invigorate democracy and bring voting methods up to speed with current technology” (McGarth, 2002). Indeed, in the very first articles written about internet voting it has often been argued that increasing the number of channels available to voters would significantly improve turnout levels. Researchers pointed out that there is a firm link between turnout rates and the ease of voting (Gosnell, 1930; Lijphart, 2001). Most proponents of electronic voting, therefore, argue that the adoption of electronic voting systems will increase voter participation, especially among youths. Politicians also seemed

convinced of the engaging powers of internet voting. Robin Cook, the leader of the British House of Commons, felt that electronic voting would attract the under-40s back to the democratic process (Guardian, 7 Jan 2002). Some academic literature however, appears to be more reluctant to claim that internet voting is a 'quick fix' to boost turnout figures. Critics of internet voting express concerns about security and the lack of equal access to the internet for all citizens i.e. digital divide (Phillips and von Spakovsky, 2001; Alvarez and Nagler, 2000). Nonetheless, the Directorate-General for the Information Society of the European Commission believes that electronic voting provides a means to increase citizen's participation and, therefore, supports a number of electronic voting projects like TRUEVOTE within the Information Society Technologies Programme (IST).

Electronic voting systems can be grouped into three general categories: poll site, kiosk, and remote voting. *Poll site electronic voting* refers to the casting of ballots at public sites where the voting platform is controlled by election officials. Poll site electronic voting involves the use of internet-connected appliances or personal computers (PC's) at traditional poll-sites. The appliances either replace or stand alongside traditional dedicated poll-site equipment. Poll-site electronic voting eliminates the questions raised over accessibility of the internet. In addition, the security required to verify the identity of voters remains as it is today — through authentication by a poll worker prior to gaining access to a polling booth. The advantage of electronic voting at poll-sites is that voters can cast their ballot at any polling place. The voter could choose from hundreds of polling places, including ones that may be closer to home, work, or school. This increases access by providing all voters more opportunities to vote. Currently, a registered voter can only vote at one poll-site. This can present a challenge for people who, for a variety of reasons - transportation, time constraints, health, etc - cannot get to that one site in time to vote. With electronic voting, the voter can vote at any poll-site.

The next 'logical' step in electronic voting is the expansion of online voting options by allowing election officials to take advantage of computers, internet connections and appliances at public places such as community centres, libraries, and business/computer centres. This is an excellent use of existing resources as well as another way to further increase access and improve voter turnout. Besides using existing computers, kiosks could be placed away from the official polling sites. *Kiosk voting* offers an intermediate step between poll site voting and remote voting. This model would be tamper-resistant and located in convenient places like supermarkets, train stations, post-offices, or schools. The voting platforms would still be under the control of election officials. The physical environment could be monitored by election officials, responsible lower-level clerks, or even camera's (IPI, 2001). The election officials or clerks would be present to ensure that privacy and security measures were in place. They would also restart the voting computers if/when necessary and call for help if needed. Voters would request electronic voting authorization in advance, bring that authorization to the polling place, and then use it to authenticate themselves to the voting computer just prior to actually voting (California Internet Voting Task Force, Appendix A, 2000).

Finally, there is the method of *remote electronic voting* (REV). Once voters start using internet terminals at polling stations, it's only a short step to using the same technology from home or work (Kantor, 1999). However, remote electronic voting (the casting of

votes from any computer connected to the internet) poses the most substantial security risks. Remote electronic voting refers to the casting of ballots at private sites where the voter or a third party controls the voting client. Sometimes the term internet voting is used synonymously with remote electronic voting. However, remote electronic voting is the preferred term for voting that takes place by electronic means from any location. This could include the use of the internet, but also text message, interactive digital TV, or even touch-tone telephone. The remote electronic voting method on which this thesis concentrates allows voters to cast their ballots from any PC connected to the internet from anywhere in the world. Remote electronic voting is simply an alternative to postal voting, which is already in use today. Just as poll-site electronic voting systems must be certified, so too must remote electronic voting systems. In addition, many countries will need to pass legislation to allow its use.

Besides making a distinction between the different voting sites (poll site, kiosk, or remote), electronic voting can also be distinguished by the nature of the election (public or private). *Public elections* are (general) elections for citizens' representatives in local, regional, national and supranational legislative bodies. These elections are subject to particular (national) laws and rules concerning criteria like ballot secrecy, fairness, verifiability, accuracy, transparency, etc. *Private elections* are defined as non-public elections, such as elections within unions, organisations or companies. These are not subject to such firm legal requirements as public elections. Election officials usually have more freedom in setting the election procedures rules for private elections than they do for public elections. Public voting systems - whether through traditional voting methods or electronic voting - are commonly expected to satisfy criteria like accuracy, secrecy, verifiability and integrity.

Public elections must comply with standards and legal tests that are generally more rigid and rigorous than for private elections. There are several key differences between public and private elections. Fundamentally, the legitimacy of democratic institutions depends upon the extent to which the will of the people is represented. As such, public elections tend to attract greater attention and face a higher likelihood of fraud and attack (IPI, 2001). Equality of access is an essential goal for public elections. Similarly, voter privacy and ballot secrecy have always been requirements for public elections. The logistical and procedural considerations of administering elections are more complex for public elections than for private elections. It is interesting to note is that the growth and frequent use of private elections online spurs interest in, and demands for, having online public elections in the years ahead. Private elections are also likely to stimulate advances in technology, and to provide experience in electronic voting that will be of benefit to public elections. The TRUEVOTE pilot system, our second case study, was developed for use both in public and private elections and could be used for voting at polling stations as well as for remote voting from home or the workplace.

2.3.2 The TRUEVOTE project

The TRUEVOTE project is, just like FASME, a project that was run as part of the "Information Society Technology" research program of the European Commission. In the project a voting protocol based on digital signatures and *Public Key Infrastructure* (PKI) was designed and implemented. The multi-disciplinary project was tested and

evaluated in five different locations, with 14 experiments and about 2300 registered voters.

The pilot locations

The locations where the e-voting application was tested differ quite substantially from each other. First of all, the demonstrator partners consisted of *two municipalities*. The first municipality is the London Borough of Newham, which is situated to the East of London and has a population of around 230,000 people. The experiment took place at the Carpenters Estate, an inner city housing estate (750 households) with a culturally and ethnically diverse population of about 1400 people. Ethnic minority groups make up almost 80% of the total estate population with more than 30 languages spoken, each by significant numbers of residents. The estate is amongst the most socially deprived areas in the UK. The Carpenters Estate is in Stratford Ward, which is ranked as number 206 in the Government's overall Index of Multiple Deprivation, putting it amongst the 2.45% of most deprived wards in the country. Over seventy percent of Carpenters Estate council tenants are receiving housing benefit on the grounds of low income and nearly half of all tenants receive Income Support. The second participating municipality is Orsay in France. Orsay is a town of 16.500 inhabitants, situated 25 km south-west of Paris (F); Orsay belongs to the green belt around Paris, with wide natural spaces and the landscaped area "Vallée de Chevreuse", which has become one of the most important and well-known areas for scientific research in Europe.

Secondly, a major division of *a large membership organisation* took part in the project. CGIL Lombardia (Italy), with more than 800.000 members, is the most widespread trade union in Lombardia and one of the biggest in Europe: it consists of fourteen regional and local structures, covering the territory with 100 provincial branches and more than 300 local offices. CGIL is mostly represented in medium- and large-sized enterprises in communication, public administration, transport, metallurgic and chemical factories. The trade union has developed a virtual network between all regional and local structures, in order to exchange information and knowledge on a regional basis, allowing all members to actively participate in union activities.

Thirdly, *two community networks* were involved as demonstrators. OYK (Learning Upper North Karelia) is a rural community network in the eastern forest periphery of Finland, consisting of three neighbouring municipalities with a total area of 4500 square kilometres and a population of about 20,000. OYK has 5078 registered users. 'The Learning Upper North Karelia' project gained quite a lot of publicity in Finland and also in other countries because of its success in creating a functioning model for "everyman's information society". The final demonstrator in the TRUEVOTE project was the digital city in Milan, Italy. The 'Rete Civica di Milano' is a community network known by its acronym, "RCM". The network was founded in September 1994 at the Civic Networking Laboratory of the Computer Science Department of the State University of Milan and has 15,000 registered members, 3500 of whom log on regularly (at least once every two weeks). The RCM is housed in the university and is supported by sponsors and by its members. It is designed to offer a free, effective, and easy-to-use on-line environment to the entire community. This network brings together private citizens, non-profit organisations, local government, and private companies, thus

guaranteeing the right of online citizenship to all. The Civic Network of Milan has an internet atmosphere that has the objective of promoting the communication, cooperation and distribution of services between members of the Milan local community and those interested in the Milan community. In the RCM, registered users can find information, news, arguments and services supplied by trade-union members, associations, public agencies, schools, professionals, private companies, etc. People can also add their own information on a variety of topics. Discussion in most of the conferences generally takes place in Italian but there is also one conference where most messages are in the Milanese dialect.

This variety of partners represents a solid basis for field experiments in different areas. Both the municipalities and the community networks are natural demonstrators for carrying out field experiments for *voting an opinion* within an e-democracy framework. CGIL is well-suited to *voting for people and voting an opinion* within membership organisations. Moreover, while the two community networks involve a population already quite familiar with ICT (although not necessarily very expert), Orsay involves a sort of European standard citizenry. The specific choice made in Newham to involve a segment of society characterized by a very heterogeneous and multicultural population reaches out to potentially excluded citizens and is consistent with the need to experiment with voting technologies for all.

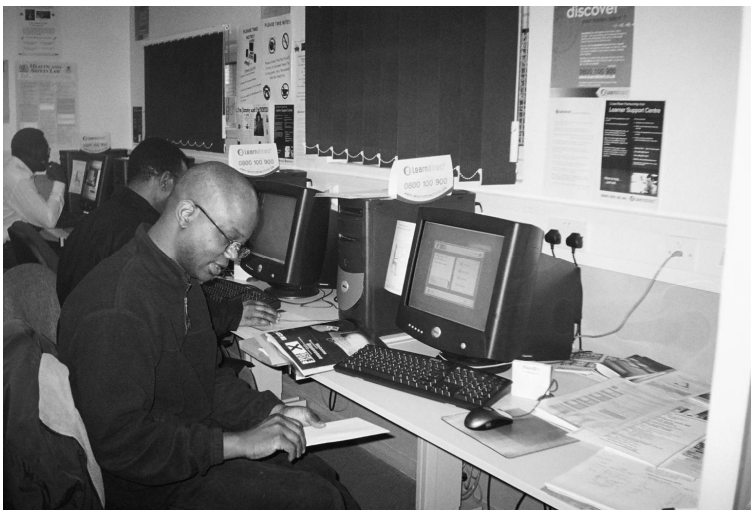

Figure 2.6 An end- user in Newham opening the envelope containing his PIN code

The topics (local, national and European) of the ballots were chosen in different ways by each demonstrator. In some cases (for example for Orsay) they were validated through a formal institutional process. In other cases (for instance RCM) they were negotiated with the local institutions interested in the demonstration (Municipality of Milan and Province Council of Milan). At CGIL the topics of the ballots were chosen in an autonomous way. The topics for the first and second ballot were different in each demonstration site. They were selected on the basis of their local meaningfulness and importance (common criteria to all the topics). This was due to the fact that the aim of

the demonstrations is to simulate a situation that could really occur. The last (European) ballot had the same topic for all of the demonstrators.

The technical platform

Let us now describe briefly the architecture of the TRUEVOTE system. The main characteristic of the system is that it relies on a Public Key Infrastructure for user authentication. Access to the system is limited by smart card based authentication. The voting system that is proposed by TRUEVOTE will enable members of a community to privately express their opinions on different subjects. Only previously authorised members will have the opportunity to express their opinion using the system. The TRUEVOTE system allows access from different voting sites, e.g. public voting stations (or kiosks) and home PC's. The project realises an internet based service that will provide all users, not only those who have direct access to the internet either at home or work, with a tool to cast a ballot. This can be done either by mean of software components that need to be installed on their own computers, or by making available voting kiosks in public administration offices, etc.

Most of the research in the field of electronic voting is oriented to the construction of protocols for political elections. The TRUEVOTE system will be able to manage different types of voting sessions, like referenda, elections, and opinion surveys. In order to accomplish this, the system must be flexible enough to allow all the possible combinations of voting types and locations. In general voting schemes can be grouped into two families: one based on Chaum's election scheme and one based on Cohen and Fisher's election scheme. A discussion of these two election schemes is beyond the scope of this dissertation. Suffice it to say that the TRUEVOTE scheme is based on techniques as proposed by Chaum, i.e. mail mixes to create anonymous channels and blind signatures to sign a message without seeing its content.

The TRUEVOTE system is a decentralised voting system where a set of components manage voter authentication, vote submission, vote collection and vote tallying. The components comprising the system are:

1) the Initiator,
2) the Voting Application,
3) the Election Centre (which comprises the Registrar, the Validator, the Forwarder and the Authenticator)
4) the Trusted Third Party.

To give a general idea of how the system functions we will describe each of these components.

The Initiator is responsible for the system initialisation. It receives the information about the eligible voters and the ballot formats needed for the election from the voting session organiser.

In order to realize a simple voting system that can be used by all voters without requiring special skills, a Voting Application client is provided, which allows the voter to cast a ballot following a set of guided steps. When the application starts to execute it presents the voter with the choice between the voting procedure and the verification

procedure. It also provides access to the information about the organiser of the voting session, the type of vote (e.g. referendum, opinion survey, election), the information required to vote and the help function (Lanzi et al., 2003).

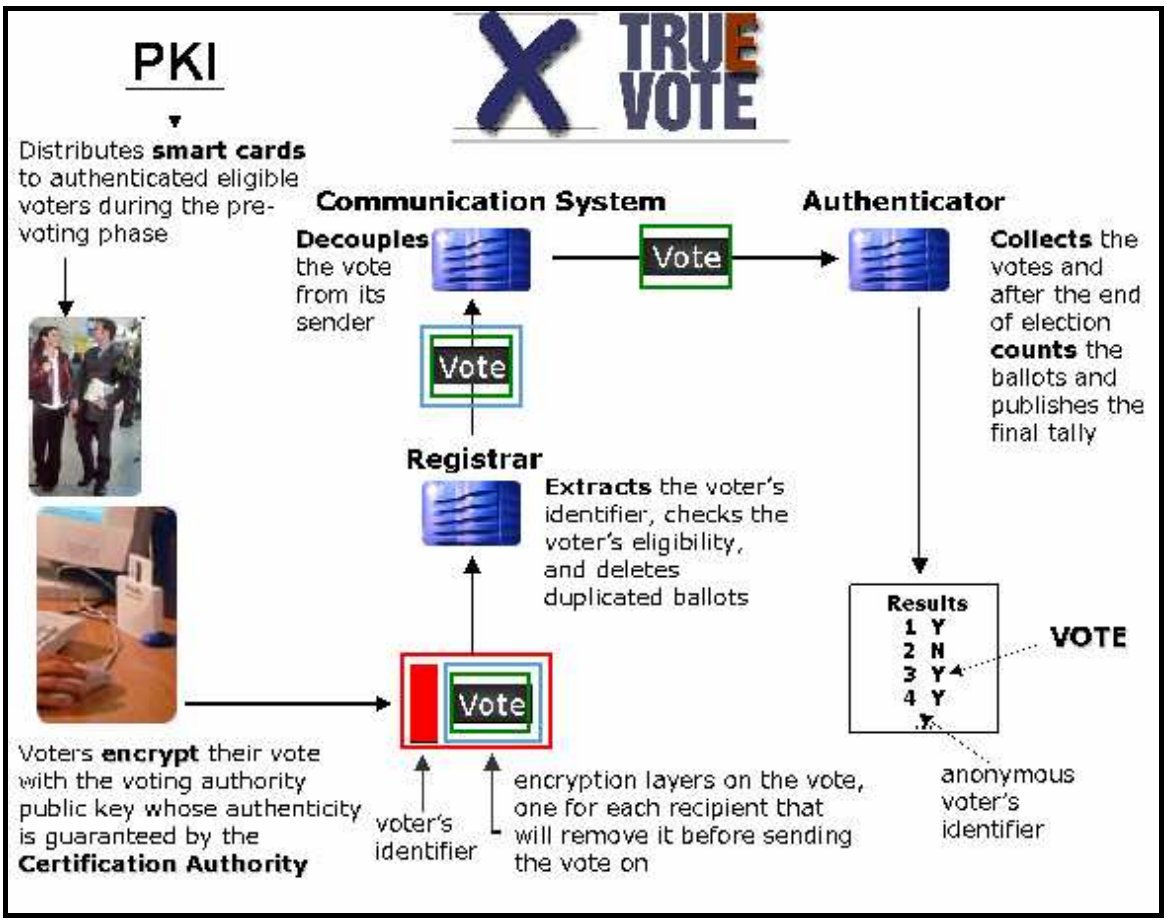

Figure 2.7 The electronic voting process.

The Election Centre interacts with the Trusted Third Party at the end of the election and with the Voter Application during the entire voting phase. As mentioned, the Election Centre is comprised of a set of independent modules. The Registrar is the module in charge of registering the voters, verifying their eligibility and providing a certified voter identifier, and of distributing the ballots. The Validator module guarantees the authenticity of what the voter voted before it is sent to the ballot box. Once the voter has committed to his choice, the Voting Application computes two blinded hash and request a double validation to the Validator. The first blinded hash is computed on the vote, while the second is computed on the vote encrypted with the Authenticator's public key (Lanzi et al., 2003). The Forwarder module operates as a ballot box where all the vote messages are collected until the end of the voting session. Then they are shuffled and sent in random order to the module performing the tally. This prevents traffic analysis that could link the vote input to the vote output, thus acting as anonymiser between the voters and the tallier. This ballot box also removes duplicated ballots and discards invalid ballots to prevent attempts to stall the system. The Authenticator module is only active at the end of the voting phase when it tallies the votes. The Authenticator receives

the shuffled encrypted vote messages from the Forwarder. It then decrypts the votes, verifies their validity and tallies the results.

The Trusted Third Party component is involved in the verification of the system. It receives statistical information from the various modules of the Election Centre in order to compare it and discover if any modules tried to cheat. It also receives from the Authenticator all the vote messages received and the decrypted votes. It cross-checks the list of voters received from the Registrar and the Validator, and the list of votes from the Forwarder and the Authenticator (Lanzi et al., 2003).

In the protocol development, great attention has been paid to guarantee system democracy. This means that only eligible voters are allowed to vote and they may vote only once. Voters must be identified by the system, their votes must be anonymous and secret, yet at the same time the tallier must be able to distinguish votes cast by valid voters from those cast by voters that are non-eligible.

So how would voting with the TRUEVOTE system work in practice? First of all, the institution that wants to have a voting session passes a list of the voters to a Polling Authority (PA). If the members of the selected group do not have digital certificates, they are identified by a Registration Authority (RA) and receive digital-ID certificates (smart card and PIN codes) from a Certification Authority (CA).

With a valid digital-ID certificate the voter goes to the nearest voting kiosk or uses the home PC to express his/her opinion. The Polling Authority will collect the votes and publish the results. Voters will then verify that their vote has been accounted for in the final counting.

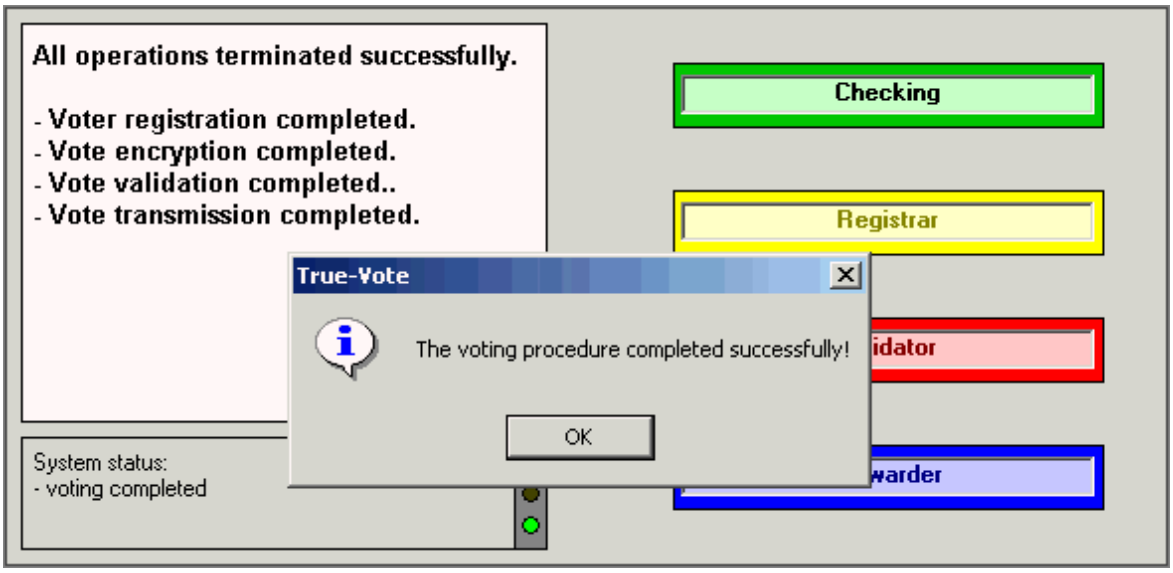

Figure 2.8 The final TRUEVOTE screen

3
Methodology: Design oriented research

3.1 INTRODUCTION

As explained in Chapter 1, the Social Informatics approach is multidisciplinary and design-oriented (e.g., Van den Besselaar and Rip, 1987; Schot and Rip, 1997; Lamb and Kling 2003, Zijm 2005),, and this has also implications for the approach and methods. It is not 'applied research', but problem-oriented interdisciplinary research aiming at improving our understanding of the dynamics of technical change, design and use.

To answer our research questions, we applied a combination of research methods. First, we have used a range of methods to understand the social environment of the systems to be developed: who are the social groups involved, and what are their needs, interests and expectations. Secondly, we have applied a multi-method strategy to evaluate the systems and to investigate the (first and second order) consequences.

The research on users, user needs, and on effects of the system is ideally done in interaction with the design and development project. This of course does not always work out perfectly – it is still more an agenda than reality.

3.2 RESEARCHING USER NEEDS AND OPINIONS

3.2.1 In-depth interviews

To gather information about the actual problems citizens encounter when moving to another European country we interviewed people who had actually made the move abroad. We conducted loosely structured interviews with these mobile citizens using a list of topics. The number of interviewees was limited due to our time constraints. Also, the interviewees did not cover all EU countries. Therefore they cannot be considered to be representative. Nonetheless, the interviews did teach us some interesting lessons about problems mobile Europeans have, and about existing strategies to cope with those. Both were important for the design and development of the FASME Card.

To get a complete overview of the problems that people may encounter when migrating from one European country to another it was important to select respondents with different characteristics. Different characteristics may indeed lead to different problems. The characteristics we considered were the following: gender, age, educational level (people with lower education might find it more difficult to get certain administrative tasks done, as handling administrative issues requires skills), individual/family, duration of migration, category (government, company, student, retiree), occupation/reason (job, study, relationship), language(s), and disability.

At least a part of mobile Europeans get support from professionals. To get a more general overview of the problems migrating European citizens encounter, we therefore also interviewed so-called intermediaries: Either professional recruiters and transporters of international migrants, or people who work at a relocation office. The intermediaries at relocation companies assist migrating citizens with all aspects of official documentation and accompany them for registration with the foreign police, the town hall and the tax office. They also assist migrants with customs clearance and with acquiring driving licenses and car registration papers. They explain the new country's health, financial and public transport systems. Their service is structured so as to identify, and deal with, all aspects of the three stages of relocation; pre-arrival, arrival and post-arrival.

> *"We usually get to know them a little bit before they get off an airplane. We fax them, we e-mail them, we phone them, we have made some contact. The client is not the family. The client is the company. So if you take Coca Cola, we've already negotiated with those big companies what the rules of the game are. For example, Coca Cola has a very open policy on relocation, 'we have no time for it', they say, 'everything that needs doing, you do it, hold their hand, drive them, take them, be with them, talk to them'. And there is a price attached to that. Some companies say 'only do housing, get them in a house and police and town hall and shopping and all that they can do themselves'. Or they might say 'don't do housing, because we have a company apartment for them. You don't have to look for a house, but you do have to do everything else'. In that respect the company dictates what we do for the family and the family just gets the friendly handholding."*

Relocation professionals are a valuable source of information because they have up-to-date information about those aspects which affect expatriates when they are relocating. They deal with all administrative aspects of relocation and give full support and practical advice to their client families.

> *"For example, when they come here and they work for Cisco, and they are young, and single, then our facilitation is much simpler. You want a home, what is your salary, these are the kind of homes you can afford, and this is what your outgoings will be per month. And we just take them to West or to the Pijp[10]. Because we know that this is what they need at that moment. We are not going to the do the whole 'Holland, and life' and so, because they have got different interests. As soon as you start to get more than one person relocated, whether it is a couple or a family, you have far more things to discuss: education, learning the language, working spouse, paper work. We are the facilitator of their questions. They ask a lot of questions, we will give the answers."*

[10] West and the Pijp are neighbourhoods in Amsterdam.

3.2.2 Survey

A survey was used to validate the results of the interviews. We developed a draft questionnaire, which was derived from the results of the face-to-face interviews. It was adapted to the local situation in one of the participating cities, and tested there (Walsh, 2000), We used this as input for the design of the final version of the questionnaire that was used in the project.

The questionnaire had closed and open questions, and consisted of three parts (appendix A1). The first part asked the respondents about their personal data, the second part inquired about the migration data. Finally, a number of questions about specific administrative tasks were asked. We pre-tested the questionnaire among ten subjects to ascertain which questions were not clear, which questions needed to be refined, and which questions were missing. Their feedback gave us reason to make some changes prior to putting the survey online.

The questionnaire was put online, as this had various advantages. It enabled us to reach all sorts of European citizens within a relatively short timescale, and it did not require many resources. Of course, this leads to self selected respondents – but for studying the diversity of problems of mobile Europeans, this is not a problem. The number and diversity of Web users has increased enormously, and therefore we may not have missed important groups – even if the web users are still different from the total population.[11]

The questionnaire was built using HTML (HyperText Mark-up Language). We tested the design of the questionnaire on a wide variety of operating systems and commonly used browsers (Microsoft Internet Explorer and Netscape Navigator for Windows and UNIX) and also on different screen sizes and resolutions. We did this to ensure that the interface was designed in such a way that the questionnaire was easy to use on any machine. We did not encounter any browser-specific problems. Next to the HTML form, we wrote an underlying Perl script to make sure the data could easily be analyzed in SPSS. The Perl script had, obviously, been tested thoroughly as well. Due to the large number of administrative services that we wanted to obtain information about, we were unable to keep our survey as short as we would have liked. To simplify the usage of the form, a hyperlink structure directed the respondents to the next appropriate question thereby skipping questions that were not applicable to them.

The respondents were recruited in different ways. First of all we used e-mail. We sent an e-mail to all project partners (approx. 100 people) and asked them to distribute the URL to all the possible respondents they could think of. By asking these respondents, in

[11] Of course, we are well aware of the disadvantages that web questionnaires can have. The biggest disadvantage is that many people cannot be reached through the Net. Gender, education, age, language, disabilities and other characteristics may all influence *whether* and *how* people use the internet. For example, the Pan European Internet Monitor shows us that there are large differences on internet usage when we look at age, gender and income level. Men spend significantly more time online than women; however it seems that women are catching up rapidly. Of all active Internet users in Europe in 2003, 36% was female. This is in sharp contrast with the situation in the United States where, for the first time ever, more women than men are surfing the Net. According to research done by Nielsen/Netratings 50.8% of the American internauts were female in the same period.

their turn, to do the same, we hoped to create a snowball effect. We also asked the partners to put hyperlinks to our questionnaire-site on their web pages. We also sent e-mails to the university departments, several companies, and friends with international friends. Other potential respondents were approached by posting notices on newsgroups, websites and mailing lists[12] relevant to the research. Finally, many European expatriate organisations were approached. We also distributed a paper version of the survey at the office for foreigners of the City of The Hague (partner in the project).

The results of the questionnaire were compared with the results of the in-depth interviews. Together they created a rather comprehensive idea of the problems that mobile citizens in Europe encounter, and of the strategies they deploy for solving those.

3.2.3 Focus groups

Although the group of intended users of the e-government system is potentially large and diverse, it is also well defined. In case of the e-voting system this is different. All people are potential users, but without experience with the new technology. So it is less easy to interview users about their de facto problems the system should a solution for. In case of e-voting users might have to still shape their opinions about the pro's and cons. Therefore we decided to use focus groups in order to get the opinions of voters and pollsters.

Using focus groups has become a key method for the collection of information of a qualitative nature. A focus group consists of a small group of individuals, usually numbering between six and ten people, who come together to express their views about a particular topic defined by the researcher. A facilitator leads the group and guides the discussion between the participants. In general, focus groups last one and half to two hours and are tape-recorded. The tape-recording can be transcribed for analysis. The focus group enables the researcher to explore, in depth, participants' views and experiences on a specific subject such as the use of the internet for casting a vote. In the normal course of a focus group participants will raise issues relating to the subject that the researcher might not have previously considered and will comment on each other's experiences and attitudes (Cronin, 2001: 168).

We wrote a paper on the methodology. This paper proposed a common method of conduct and was dispersed to all partners. At the first project meeting in Milan the methodology was discussed, and this resulted in some minor adjustments. The method was used in twelve focus groups and one online forum. They were organised by five partners of the project (Abacus, CGIL, Glocal, Newham and RCM).

We decided to organise discussions with 8-10 end-users per group, and discussions with more or less 5 pollsters per group. However, the size of the group was sometimes determined by logistical issues. For example, exploring the user requirements of

[12] www.elynx.nl; www.swi.psy.uva.nl/usr/oostveen/home; www.undutchables.com; www.belfastcity.gov.uk; www.xpats.com; www.expats-network.com; www.treeofliberty.com; www.expatsinbrussels.com; british-expats.com; www.InsideTheWeb.com (Teesside Expats Locator Service); alt.politics.europe.misc; alt.punk.europe; alt.politics.immigration; soc.culture.europe; misc.immigration.misc; and several mailing lists.

pollsters at a certain location, where there are only a small number of pollsters, necessarily defined the size of the group.

In focus groups attention must be given to participant characteristics in relation to the topic being discussed and effort and thought must be given to recruitment sources and strategies (Bloor et al, 2001). Careful consideration of group composition is vital. There has to be sufficient diversity to encourage discussion. However, groups that are too heterogeneous may result in conflict and the repression of views of certain individuals. The researchers should be aware of differentials between participants that may cause some views to be silenced (for example, groups where individuals vary in status and in power). Since the topic of online voting isn't particularly sensitive[13] and concerns every citizen above a certain age, it was possible to have a heterogeneous group. The focus groups of end-users consisted of voters of different ages, sex, ethnicity/race, level of income, level of education, experience with computers, voting behaviour, and political preference. The potential participants in the pollster's focus group depended on the locations where the TRUEVOTE system was being tested. People involved as officials at these elections, politicians, and other experts were able to serve as focus group members.

All the partners organised two end-user focus groups and one pollsters' focus group. We tested the approach in Newham (two focus groups with in total fifteen end-users) and it proved successful. The remaining sessions were organised in a similar way. In the focus groups, systematic random sampling of participants was not needed because the aim is not to make generalizations about a population in the same way that large-scale quantitative methods may have as their goal.

It was important to give all the focus groups the same structure. For this purpose we used different tools and techniques. First of all, we developed a pre-group self-completion questionnaire. Some basic socio-demographic information such as age and marital status were required for analysis purposes and this was most appropriately collected immediately before the group started. It provides a convenient time-filler in the awkward minutes before a group starts and where one is waiting for possible late arrivals. The questionnaire involved the collection of more than just socio-demographic background data. We wanted to establish not just the age profile of the group members but also their experiences with computer use, their voting behaviour, opinions about voting and other issues relevant to the TRUEVOTE project.

The participants may have no prior knowledge about the topic of electronic voting, and therefore, we thought it important to give them a short introduction about the research topic. For this purpose a power point presentation was prepared. We were aware that too much information could be counter-productive as it may confuse the participants and leave them unsure about their role. For the facilitators we wrote an additional text to accompany the power point presentation. The text was based on our 'state or the art'

[13] A research topic like Kitzingers' *Understanding AIDS: researching audience perceptions of acquired immune deficiency syndrome* (1993) is much more likely to find strong feelings and radically opposed views among group members. In cases like this it is wiser to run separate groups avoiding disruption and distress, but giving the researcher the opportunity to make comparisons.

research about electronic voting, highlighting both the possible pro's and cons of e-voting.

The facilitators of the TRUEVOTE focus groups used medium level moderation. They had to perform a guiding role in the discussion, ready to interject, ask questions and probe for further information when necessary. We agreed that the timeslot of the focus groups had to be less than two hours. Within that period sufficient time was to be allocated to the completion of a pre-group questionnaire and to post-group debriefing. For the facilitators it was important to have a list of issues that needed to be discussed at hand, so that the different focus groups would all deal with the same topics. Otherwise comparison, in the analysis phase, would be almost impossible. It was important not to have too many issues for discussion, because the time was limited and all the participants had to have the opportunity to say what was on their mind.

In focus groups the facilitator seeks group interaction (Bloor, 2001: 42). The facilitator's questions are thus a 'focusing exercise', an attempt to concentrate the group's attention and interaction on a particular topic. The exercise need not, and frequently does not, take the form of a question, instead the group may be required to perform a specific task. One commonly used type of focusing exercise is a *ranking exercise*: the group is offered a list of statements and is asked to come to an agreement, among themselves, about the ranking of the statements in order of importance. Different groups will commonly produce some differences in rankings. But more importantly, the discussion about the rankings serves to illustrate the deep differences (along with some important similarities) in the tacit understandings of each different group (Bloor, 2001: 43). We developed two ranking exercises for the TRUEVOTE focus groups. These focusing exercises were useful as they gave impetus to group interaction. Also the 'props' of the exercise (the printed cards lying on the table) are themselves a convenient reminder of the group's task and thus a silent safeguard against straying into irrelevancies. The task itself also functions as an ice-breaker.

When the project had come to an agreement on how to organise the focus groups, the five demonstrators organised groups at their own location. At Abacus one pollsters' focus group was held at their office in Milan. CGIL organised two focus groups, one with people working for the trade union (pollsters) and one with workers who, at the same time, were delegates of trade unions in big companies (voters). Glocal in Finland organised three focus groups at their office in Nurmes. Two focus groups were held with voters and one workshop with pollsters. Most participants were selected via the Glocal local community network. Some respondents were contacted by phone after an article about the intended focus groups was published in the local newspaper. In Newham, two focus groups were organised with voters at the Carpenters Estate Community Centre. The respondents were all residents of the Carpenters Estate. Letters were sent to 50 residents of the estate who had shown interest in ICT skill development. The Carpenters Estate Tenants Management Organisation Committee also publicised it through word of mouth. Finally, the University of Milan organised two focus groups with voters and two focus groups with pollsters. They also initiated an online forum about electronic voting on the RCM community network. The voters' focus groups were held at the University of Milan. For the group discussion with RCM users, participants were selected using the Digital Cities Survey; seven people were selected by the

University of Amsterdam among 179 RCM users who had told the researchers, in the questionnaire, that they were interested in electronic voting. They were contacted by e-mail. The participants of the second voters' focus group (discussion with Internet users who were not involved in RCM activities) were selected by the facilitators. They selected people of different ages, professions and computer skills. These respondents were contacted by e-mail and phone.

The project considered whether or not it wanted to pay the participants an attendance allowance. In the case of Newham it appeared to be the only way to get people to attend the discussion groups. After two organised group discussions where no participants turned up, the organisers of the Newham group discussions decided to pay the 'end-users' respondents a fee of £15. This incentive helped the turnout at the focus groups. The discussion meetings in Finland were held in a rural area, which meant that many people had to travel quite a distance to get to the workshop venue. Glocal therefore paid for travelling costs. In the other locations there was no need for an incentive to get enough response.

There are vast differences in the socio-demographic makeup across the respondents in the different demonstrator groups. Some socio-demographic characteristics of the five demonstrator groups include ethnic diversity, migrant populations and income inequality. For instance, the respondents at the Carpenter Estate in Newham have very diverse cultural and ethnic backgrounds. In Italy, however, the respondents are all Italian and only have different religious backgrounds. The respondents who participated in the Finnish workshops are mainly from a rural area with a high rate of unemployment, while the other respondents share the common factor of being from large urbanised areas. The underlying socio-economic status of communities is important because it can be reflected in big differences between voting behaviour, computer literacy and consequently acceptance of online voting.

After the focus group sessions we collected the data input from all the involved partners. We collected the completed questionnaires and processed and analyzed them with SPSS. The audio recordings were transcribed, translated into English texts and summarized by the local organisers[14]. After that, we conducted content analysis of the protocols and summaries.

3.3 STUDYING COMPLEX ICT APPLICATIONS IN CONTEXT

3.3.1 Evaluation workshops

Presentations and demonstration

Evaluation is concerned with gathering data about the usability of a design or product by a specific group of users for a particular activity within a specified environment or work context. Evaluations can be done in many different ways. At one end of the spectrum designers can be interested in getting quick informal feedback of the 'and what do you think of this idea?' type. At the other end of the spectrum there are

[14] CGIL, Newham, Glocal, the University of Milan and Abacus

evaluations that are much more rigorously planned and controlled (laboratory experimentation or large-scale surveys), based on real systems. The kind of evaluation models that are used in different evaluations will depend on the nature of the system that is being developed (Preece et al., 1994).

At the end of the FASME e-government project there was not a complete running prototype which influenced the evaluation in many respects. As a consequence, the aim of the evaluation was to learn how to further improve the concept, the prototype, and eventually the complete system.

Choosing our method of evaluation did not only depend on the questions for which we sought answers, but also on logistical factors such as the time available to do the evaluation, availability of equipment, access to users and so on. Because the development of a usable prototype took longer then planned, the time to do an evaluation was restricted. We also encountered some problems with the equipment. Only one functioning demonstration kit could be set up and it had to be moved from evaluation site to evaluation site, making simultaneous evaluation sessions impossible, causing the evaluation to be more time-consuming than necessary. In spite of these constraints, successful evaluation sessions were carried out in the cities of Amsterdam, Belfast, Cologne, Grosseto and Newcastle.

We wanted to measure the opinion of potential users in relation to questions like: Do you think the functions offered by the system are useful to you, and what useful functionality could and should be added? Do you think it can be reliable, and what should be done to improve reliability? Do you think the system protects privacy, and what should be done to improve the preservation of privacy? To gain information about these issues evaluation sessions were held in different cities with five different categories of relevant users (citizens, clerks, operational administrative management, executive management, and service providers).

The FASME system was introduced to the participants of the evaluation by way of a presentation and demonstration of the prototype. For pragmatic reasons, one general presentation (PowerPoint and text) of the system was prepared, with an option to go into deeper detail, if questions emerged. All presentation-slides were translated into the local languages, and so was the corresponding speech (in Grosseto with almost simultaneous translation). Additionally, the evaluators made their own PowerPoint presentations to explain the idea of FASME and the way the system functions for the specific local situation and the type of participants. An evaluation kit was sent to the evaluators by the technical partners in the project.

Researchers from University of Cologne conducted evaluation sessions with users from different categories in both Grosseto and Cologne. In Grosseto the members of the audience were invited by the municipality of Grosseto. Two sessions with different user groups were organised. The first session represented the perspective of the citizens; the second one provided an administrative view on the system. Support was given by a researcher from the University of Sienna, which helped to solve the language problem. Similar to Grosseto, two sessions were conducted in Cologne with users from an administrative background. In addition Cologne University carried out several smaller

evaluation sessions with citizens, mainly students. The University of Amsterdam organised evaluation workshops with citizens.

Members of staff from Newcastle City Council and ICL carried out the evaluation session in Newcastle. The evaluation session focused upon 4 user perspectives: Clerks, Administration, Service Providers and Executive Management. A generic presentation was delivered to all the user groups together and this was followed by a demonstration session of the prototype.

For the participating cities in which no evaluation workshops took place (Antwerp, Belfast and Naestved), we organised a joint workshop. The civil servants from these cities were shown the prototype of the FASME system. In the city of Belfast an additional presentation was delivered to the municipal IT department and to Business Support/Admin staff.

Observation of users
After the introductory presentations, hands-on demonstrations were given showing different parts of the systems, which were available at that time. Due to hardware restrictions, there was only one working system available at each one of the evaluation sites. So first, a hands-on demonstration was given by the evaluators, and then the participants were invited to use the system themselves. Participants could enrol their fingerprint in order to show them how the fingertip sensor worked. To place them into an almost real world environment, they were given a usage scenario, their fingertips were read by the system and they were able to discover the system capabilities themselves. By observing the users we could see how user-friendly the system was and even the help-system could be evaluated.

Evaluation questionnaires
After the presentation and demonstration, short questionnaires were distributed and were completed by the participants (see appendix A2). The answers provided information about the usability and other qualities of the system. The procedure with respect to the questionnaires was undertaken from each of the user perspective's point of view. With different questions for each user group, we ended up with five different questionnaires, each of which was translated into the relevant languages. After the sessions, we received the completed surveys for further analysis.

Group discussions
The final part of the evaluation was the use of group discussions to obtain further views that were not covered by the questionnaire and to answer any queries that the participants may have. Following the discussion, a brief overview was given about the next steps in FASME and about possible implications. We chose this data collection technique because it is less formal and doesn't create such a strong 'us and them' distinction between evaluators and users, and doesn't preclude access to information about informal and situated use of the technology (Preece et al, 1994). Preece points out the advantage of interpretative evaluation: "For example, if in an interview the evaluator does not ask a particular question because she does not think of it or does not consider it to be important the user is unlikely to talk about the topic – why should she, if she hasn't been asked?" (Preece et al, 1994: 657-658). We collected the results of the discussions for analysis.

3.3.2 Real life experiments

When the TRUEVOTE system for e-voting and e-polling was developed, we tested it in fourteen field experiments. This enabled us to investigate the problems and opportunities of applying this type of technology. The experiments focused not only on the technical functionality, but also on organisational aspects and on usability. Each of the partners performed two or three voting sessions between December 2002 and March 2003. The first and second voting sessions were on local issues, selected individually by the institution that organised the ballot. This was quite critical, as the selected topic had to be sufficiently relevant to the voters to encourage them to participate in the experiment. The third voting session was on a single topic relevant in all the five European countries, and took place in parallel in the experimental sites. Organising a multiple site voting was important from a technical as well as from an organisational perspective. Technically, we used it to test the voting application in terms of concurrent access, and to fully check the interoperability of two different Certification Authorities (Postecom in Italy and Certinomis in France), as interoperability is a key technical issue of the project. From an organisational point of view the multiple sites voting experiment was interesting as it increased the organisational and logistical complexity.

In traditional voting media, the anonymity of the voter is guaranteed to a high degree. As e-voting is, in principle, independent from where you are at the moment of voting, the identification of voters is much more sensitive than in traditional voting, where one goes to the local polling station with the documents that allow one to cast the ballot. Therefore, the use of e-voting systems requires sophisticated identification and authentication of the voter, generally based on smart card technology with some form of biometrics or pin code. In fact, the institution issuing the card will ask for personal data from the voter to create the digital certificate and put it on the card (there is far more information needed than with traditional voting procedures). The organisation issuing the card will make sure that the voter receives the smart card with his digital certificate.

In order to find potential voters, each demonstrator chose the instruments (phone, traditional mailing, e-mail, posters, etc.) that were most available to them. In Orsay all the eligible voters on the official voting roll (some 10,450 citizens) were sent a letter inviting them to participate in the experiment. More than 9000 letters were delivered house-to-house. Voters could sign up for the experiment either by mailing a form to the city hall, leaving it at the front desk there or logging on to the Orsay city website. Each volunteer voter had to provide name, address, and date of birth. Of the 10,450 registered voters, 924 volunteered for the experiment. Using the data delivered, Certinomis created personalized smart cards, each with its certificate and activated PIN code. Each smart card was set to certify the identity of one voter and then sent to the volunteer, along with voting-date information. In Newham the eligible voters were the residents of the Carpenter's Estate. They were recruited by mailing each resident a letter and the Mayor issued a press release. Of the 1400 inhabitants of the Carpenters Estate, 83 accepted the invitation. Trade union CGIL involved different local groups and categories in the experiments, namely generic employees and members of the Regional EDP centre who work at the regional coordination site (in Sesto S. Giovanni); members of various categories (public employees, retired people) and of various provinces (Pavia, Milano). In the two community networks, all registered members were invited

to participate. In addition, a few other people opened accounts on RCM or OYK especially, because they were interested in the voting experiment. RCM enrolled 190 volunteer voters (plus 118 for the control voting session) and OYK signed up 310 voters. All the partners (except Orsay, which held no first-session vote) recruited additional volunteer voters between the first and the second voting sessions. This further recruitment led to the following increases in numbers of registered voters: Newham: from 83 to 96, CGIL: from 326 to 357, RCM: from 190 to 310, OYK: from 310 to 400 participants. No further recruiting was done after the second ballot, so the number of registered voters in the second and third rounds remained the same (see table 7.1, Chapter 7).

We offered different voting/polling media, in order to be able to investigate the effect of media on participation and articulation of opinion. In the three 'real communities', the voting was done by dividing the population into three groups all using a different medium: traditional paper based voting; electronic voting from home; and e-voting from a kiosk. In the two virtual communities, online voting with the TRUEVOTE system is one of the two modalities; the second is online voting with CAWI (Computer Aided Web Interviews). This variety of used media enabled us to investigate whether the medium influences the participation and the opinion of the voter, as theories of social identity suggest.

The voting sessions included both single choice (yes/no) and multiple choice ballots. More precisely, the two local voting sessions in Newham asked residents about security issues at the estate, while for CGIL the ballot issues concerned the position the trade union should take on some political hot topics (such as the Italian laws about immigration, the relationships between CGIL and the European Social Forum, the war in Iraq). In Orsay the ballot sought to find out the citizen's opinion about the extension of a regional administrative network with additional municipalities. The topic for the first ballot of RCM was defined in collaboration with the Milan City Council and was about priorities in organising activities during Christmas time, whereas the Province of Milan chose public transport in the Milan region as the topic for the second ballot. In the regional community network OYK, the first ballot was about welfare services and measures to be undertaken in the case of a crisis in the municipal finances, while the second one was on the desirability of Finland entering the NATO. The third ballot, common to all partners, was about possible actions to decrease Europe's dependency on oil. We studied the voting experiments using a variety of methods and tools.

Questionnaires

To collect crucial information to evaluate the system, we used three questionnaires for the voters. The information acquired this way related to the behaviour and opinions of the people involved in the demonstration as a final users. There were two main versions of the questionnaires (see appendix A3).

First of all, we had a pre-ballot questionnaire. This first survey was completed when registering for the smart card. This questionnaire asked the voters to provide information about sex, age, occupation, computer literacy, way of using computers, previous voting behaviour, opinion about e-voting, and opinion about the effects of ICTs on society.

Secondly we had different questionnaires which had to be filled in after the second and third ballots. In these post-ballot surveys we asked specific questions about the usability of the system, about the quality of the system in terms of secrecy (privacy) and safety (against fraud), about respondents viewpoints related to voting, and some questions related to the voters' identity. Finally, we asked where the voting was done (at home, work, school, kiosk, etc.) and in some cases what the participants had voted. We used different questionnaires for the various voting situations (e-voting from home or work; e-voting from a kiosk; voting with CAWI; traditional paper-based voting) and the questionnaires were translated into the various relevant languages. The reason we asked the voters to fill in three questionnaires, at different stages of the demonstration, was to take into account possible changes of opinion, attitude and behaviour due to the "learning process" in using different voting media. The questionnaires will allow us to find an answer to the following research questions: Is the system easy to use, quick enough, understandable and transparent in the various dimensions: use in general, access, vote, correct mistakes, send the vote, verify the vote? Does repeated use of the system affect the use, usability, and other factors like trust, and fear for privacy, and for surveillance? What is the opinion of users about e-voting, depending on the topic of ballot, the context of ballot, and their personal characteristics? Is trust in the e-voting system related to the technical and organisational characteristics of the system (e.g., possibility to verify and audit the vote and the procedure)?

Observation
We have observed how the users coped with the TRUEVOTE system during the field experiments in the different real communities. In this way we were able to spot difficulties with the use of the system and afterwards we could ask the users questions about the usability. Did they find their way in the system, did the system work fast enough, and did it give enough help? The information gathered in this way, provided us with the context of the analysis of the use, participation, and ballot results.

Open questionnaire
One of our research tools was a 'check-list' for the demonstrators to collect information about the TRUEVOTE voting sessions (ballots). We developed a common checklist to produce comparable sets of information (see appendix A4). The information collected through the checklists concerns the point of view of the demonstrators. We used the information gathered from these checklists, together with the results of the three questionnaires to analyze the result of the TRUEVOTE project in terms of impact on the involved population.

From a general point of view, it was necessary that each partner collected and described all the relevant issues that occurred during the experiments, paying attention, in particular, to any problems and difficulties. In particular, it was important to observe and describe, for each voting session the following issues:

1. The average amount of time to complete the voting task
2. The percentage of participants who finished the voting task successfully
3. The number of cases in which the participants were not able to complete their vote due to an error from which they could not recover
4. The number of times the participant used the help line or on-line documentation for each task

5. The number of positive or critical statements about the on-line help documentation
6. Number of and types of errors, including:
   - *Non-critical error*. A participant makes a mistake but is able to recover during the task.
   - *Critical error*. A participant makes a mistake and is unable to recover and complete the task. The participant may or may not realize a mistake has been made.
7. The number of indications of frustration or joy from the participants.
8. The number of subjective opinions of the usability and aesthetics of the product expressed by the participants

Besides paying attention to the above mentioned issues, the partners also had to answer approximately 40 questions about organisational and logistical issues, technical issues, user issues and legal issues. The checklists provided an answer to several questions: Did the demonstration show a smooth operation of the system? Did the various system components interact properly? Did any breakdowns occur, and what were the implications of these breakdowns? What are the (possible) political, legal, organisational, social and technical problems that arose during the course of the experiments?

Log files

One of the main data sources was the results of the actual voting sessions, in terms of final voters' participation and outcomes of the ballots. This data helped us to answer the following questions: Do we see differences in usability between groups, and situations (organisational, issue of the polls etc.)? Does the medium used in the voting (traditional, kiosk, online) influence participation (level, demography)? Is trust in the e-voting system related to the topic of the ballot? Does the medium used (traditional, kiosk, online) influence the outcome of the ballot?

4
From Small Scale to Large Scale User Participation: A Case Study of Participatory Design in e-Government Systems[15]

ABSTRACT

Most experiments with participative design are with small scale, stand alone and not very strategic applications of ICT in organisations. However, modern ICT applications are increasingly based on complex and large scale network technologies. What PD issues arise in this type of projects? What methods can be used for user participation? And, what does this imply for PD strategies?

4.1 INTRODUCTION

Modern societies are increasingly becoming 'network societies'. Trying to avoid technological determinism, Manuel Castells argues how ICT based communication networks form the material base of the emerging network society (Castells, 1996). If this is the case, than we witness at present the social and technical shaping of the basic parameters for society and economy, which will have long term effects on all social domains, such as the organisation of the economy, organisations, government, and the public services. Large technology development programs have been launched to support the design and building of basic models, systems and infrastructures for (interactive) information, communication and transactional services that will gradually replace the traditional arrangements. In the dominant political discourse, these developments are advertised as the unavoidable route to a new technical infrastructure for sustained economic growth, for employment creation, and for improving the quality of the life: an 'information society for all' (European Commission, 2004). [16]

However, we know from technology studies that technology is not neutral, as it is characterized by design specific affordances and embodies specific scripts, through which the designers consciously or unconsciously try to configure users. At the same time, users may appropriate the new technologies in various and unexpected manners, and in these processes of diffusion the emerging socio-technical systems may change

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[16] The European program for this is – among others - the sequence of Information Society Technologies programs, as part of the European *Framework Programs.* The case study underlying this paper was part of a 5th Framework Program research project.

[Bijker et al., 1987; Bijker and Law, 1992; Van den Besselaar, 1998; Van Lieshout et al., 2003). In other words, we are not moving towards *the* e-society, based on e-business, e-commerce, and e-government, but we have to evaluate critically in what direction we are moving, what alternative options are possible, and what social choices can, and have to, be made.

Until Thomas Hughes published his book 'Networks of Power' in 1983, social science research on technology had focused mainly on specific isolated technologies or technical artefacts like the steam engine and the car. "More recently, it has been recognized that an important characteristic of modern technology is the existence of complex and large technical systems – spatially extended and functionally integrated socio-technical networks such as electrical power, railroad, and telephone systems" (Mayntz & Hughes, 1988). Hughes' book showed us that in research the 'social' and 'technical' side cannot be separated (Hughes, 1983). LTS have the following properties (Gökalp, 1992):

- LTS are large scale, affecting many people and institutions.
- LTS are complex: political, legal, administrative, organisational and technical issues are relevant in the design, development, implementation, maintenance, and use of these systems.
- LTS are infrastructures, and face difficult issues of standardization.
- LTS generally embody political ideas and ideologies.

A full scale FASME system is typically a LTS, embodying the political ideology of the unified Europe. It aims at designing a complex cross-national infrastructure for e-government, involving many people and institutions.

The old question posed by Langdon Winner (1980) 'what do we do when making this technology work?' is still very relevant, but increasingly on the level of large technical systems and ICT based infrastructures (ICTIs). If technology is not neutral and a product of human action in a social context, can we use PD to democratize the development of the ICTs in the information society? How to enable a variety of actors, interests, and criteria to play a role in the design process, and how can these interests and the outcomes be balanced?[17] Can we use lessons en methods from participatory design to include the variety of political views and social interests in the socio-technical shaping of future trajectories of ICTIs?

4.2 FROM SMALL TO LARGE SCALE PD

In a previous article, we evaluated fifteen 'best practice' PD projects from the 1970s to the early 1990s. The general conclusion from all these projects is that under appropriate conditions, users are capable of participating actively and effectively in information systems development (Clement and Van den Besselaar, 1993). The evaluated projects differed in many respects, but also had some important common characteristics. One of the similarities was that most projects focused on small stand-alone applications of IT,

[17] In this paper we do not develop a theoretical perspective on the development of ICTIs. Elsewhere we analyze the development of ICTIs in terms of social learning and based actor-network theory [9]. In this way also the temporal dimension of PD (sustainability) can be taken into account.

indicating a low organisational complexity of the projects: "Since most projects have been relatively small, we do not yet have much experience on which to draw for participative approaches to develop large applications, integrating existing systems or creating technical and organisational infrastructures to support PC based "end-user computing" (Clement and Van den Besselaar, 1993). Comparing PD with other efforts of democratizing technological development we found that "participation in small-scale and micro-level technical development projects is relatively successful, whereas intervening in large-scale projects at company level or sectoral level generally is unsuccessful" (Van den Besselaar, 1998). Furthermore, most projects were led by a PD-researcher, who also provided the resources. And, the 'political' goal of the project generally was the improvement of the working conditions of employees, in negotiation with management. Much has changed within PD since then, but the projects are still predominantly small scale, stand alone, and researcher led.

From participation in the design and development of small scale isolated systems, we now move into the directions of participation in systems innovation (Sahal, 1985) in the development of large technical systems. Is it possible to use PD methods in more complex environments? In infrastructural developments the number and variety of involved users is often very large. In the international e-government case we will describe below, we had to deal with many different user categories, coming from different countries with different cultural backgrounds, opinions, norms and values, all influencing the requirements, expectations, evaluation and acceptance of the new technology. Another issue is the nature of participation. In small scale projects, users can be engaged in directly shaping their own working or living conditions, in other words the relation between interests and design is rather direct. This holds for the *end users* (workers, citizens) and for the (operational) *managers* of the systems. However, in the design and development of ICTI, participants have different roles, focusing on political and strategic issues. In other words here also *citizens, decision makers,* and *politicians* are involved. This has important implications for organising PD, as many PD techniques are based on the direct interaction of the user with the technology, in a more or less real life context. In ICTI design, this generally cannot be done. For parts of the system, like the more operational aspects of the infrastructure, it may be an option to build prototypes for experimentation, or to do ethnographic observations of technology use in context. However the more general political and normative dimensions, as well as indirect and long term effects, cannot be accounted for in this way; nevertheless they should be reflected in the design.[18] To do this, we need other approaches to complement traditional PD methods. In this way PD becomes a part of a larger techno-political agenda, as PD (alone) is not the answer to every design or assessment problem (Miller, 1993).

In this paper we present one of the case studies[19] in which we tried to involve users in the design and development of a prototype of an infrastructural system, by combining

[18] We cannot go into detail here, but technological development is also a long term process. During use and diffusion the technology develops further. For this the term 'innofusion' has been coined, as a combination of inno(vation) and (dif)fusion. [9, 63]

[19] The case is part of a larger research program on the role of users in the design of large technical systems. [9, 18, 25, 26]

PD approaches with approaches developed in the technology assessment tradition (Van den Besselaar, 1998). More specifically, we combine local involvement of users in design and development activities, using a variety of PD methods, with researching the potential long term effects of the systems proposed. And both inform social choice in design, development and social integration of the new technology.

4.3 THE CASE: THE FASME PROJECT

The FASME project aimed at designing and building an internet and smart card based system to support mobile Europeans with administrative transactions between countries.[20] The case is typically an ICT based infrastructure, as it is complex, international, involves many different users, institutions and regulations, and the system embodies the political ideology of a unified Europe. Millions of EU citizens reside in other member states, and this number is expected to increase considerably in the future. Mobile Europeans have to deal with many time-consuming administrative procedures, which differ between the various European countries (Oostveen and Van den Besselaar, 2001a). When moving to another EU country, people often have to queue for hours to provide information, show their passport, hand over formal documents, and complete forms. One has to find one's way through many different departments and agencies, and this can be very hard. Foreigners generally need to visit a multitude of departments more than once to get things arranged. The project assumed that, in order to facilitate the European citizens' mobility, one needs to streamline a lot of the current bureaucratic obstacles. Especially a flexible way of getting the required documents from one country to another over the internet, was seen as an important step in the right direction. The basic idea the project started out with was to create a system that would enable the citizen to download the required information on the smart card, and to use this electronic document to arrange things in the new country. In order to realize such a system many problems had to be solved, as the information provided should be *authentic*, *current*, relevant, and referring to the person that uses the information (*identification*). The citizen on the other hand wants to be certain about *privacy*, which means that the municipality cannot read other information from the card than the citizen wants to show. Thirdly, the system should be *reliable* and not vulnerable to breakdowns or hackers, as the expatriate citizen heavily depends on it. This, by the way, did not only hold for the smart card, but also for the intended biometric identification technology. How good and reliable is a PKI based fingerprint system? Finally, the system should link many different administrative systems in various countries. As the legacy systems in the participating municipalities are very different, a *middleware* problem had to be solved: the interface between the local systems and the FASME system.

[20] The EU funded FASME (Facilitating Administrative Services for Mobile Europeans) project consisted of seven European cities and municipalities, three University based (applied) computer science departments, a University based social informatics department, and two consulting companies. The partners came from Germany (4), the UK (3), Netherlands (2), Belgium (1), Denmark (1), Italy (1), and Switzerland (1). The project ran for about two years. The project team consisted of four computer scientists, specializing in network security and systems architecture, two applied computer scientists specializing in business systems, some fifteen representatives of the various municipalities, four representatives of the two consulting firms, and two social informatics researchers. The latter two had the task of – among others – representing the end users: the citizen.

Another problem the project aimed at addressing is the exploding number of cards people carry with them. Quite a few of those are only used on an incidental basis. As a consequence, one is not able to find the correct card at the scarce moments one wants to use it, or cannot remember the password. The project saw the FASME card as a multifunctional card, which could replace various single function cards. In this way, the card would be attractive for many people, and therefore cheaper to produce. On the other hand, a multifunctional card creates new problems. Firstly, current storage capacity on a smart card is restricted, given the standardized size of the card (it has to fit in standardized card readers). To work around this capacity problem, a programmable smart card was proposed for the transport of a variety of personal documents in digital form (Riedl, 2001), based on JavaCard technology. In contrast to common chip card technology, JavaCards are more flexible with respect to business process and software re-engineering, and they provide more support for high level data access control. Moreover, the JavaCard language was expected to become one of the more popular programming languages in the near future, and this made the technology attractive for the designers and programmers in the project team. The advantage of a programmable card for the user would be that he or she may change the applications on the card, depending on what is needed. Of course, this may require technology and skills at the users' side, but that problem was postponed to later.

Apart from technical problems, producing a multifunctional smart card also faces a variety of contextual problems. Introducing a smart card generally requires the users to adapt their business processes, and therefore it may be difficult to convince them to participate. Besides that, a multifunctional card has to cope with a variety of legal requirements, different for the different functions. As a consequence, the logistics of producing (and replacing) the card becomes complex, with long lead times. Finally, the process of reaching an agreement about the card may be rather difficult, and many actors with different views and interests are involved in the development (Coulthard, 1999; Hooijen et al, 2005; Oostveen and Van den Besselaar, 2001a).

When the project started, the technical and business partners proposed to develop and implement a model for international e-government for three predefined services, as a learning process. In a later phase the concept could be extended to more services. The first two services were decided immediately: registering a person and registering a car in a new (foreign) place of residence. The model would be based on the existing legal and administrative procedures in seven European cities: Antwerp (Belgium), Belfast (Northern Ireland), Cologne (Germany), Grosseto (Italy), The Hague (Netherlands), Neastved (Denmark) and Newcastle-upon-Tyne (UK). The initial idea was to use the JavaCard for downloading relevant documents through the internet and then storing them on the card, using biometric (fingerprint) identification and authorization techniques.

Two types of users were defined at this moment in the project. In the first place, the designers needed the input from the municipalities to understand the administrative processes, and especially the legal regulations. Secondly, the question was whether mobile European citizens would accept the technology. Social research was planned into the factors that might influence acceptance, as support for marketing the

technology. However, the social researchers first focused on user needs, and on technology assessment issues, and postponed the acceptance issue to a later phase.

4.4 THE STAKEHOLDERS

We started with analyzing the social context of international e-government technology. The first thing to do was determining the relevant stakeholders. The most obvious were the municipalities, as the system was intended to integrate local municipal information systems. The municipalities were extensively represented in the project. However, a closer look showed that the municipalities form a layered set of users themselves. First of all, the management of the services addressed by the system, and the clerks working with the existing information systems, are two groups of relevant users, as the new technology will interfere with their practices and interests. And, the project of course depended on their knowledge of administrative procedures and regulations. Another category of important stakeholders is the political leadership and strategic management. In the participating cities they did have a strategic perspective on e-government, and this is not necessary in line with the views of operational management or clerks. Thirdly, local public services are embedded in – but not necessary completely dependent on – national regulations and procedures. Therefore changes on the local level and the national level may interfere with each other. A debate about e-government policies and about related intergovernmental relationships is very different from a (participatory) design discourse on the operational level of development and implementation of systems. Nevertheless it has to be taken into account when developing e-government technologies. The main second group of intended users is of course the citizens. But this group is also very heterogeneous, as citizens differ in needs, opinions, and resources.

We distinguished the following classes of users:

- The end user of the services (client). This is a heterogeneous class in terms of age, gender, family status, main activity, education, language skills, nationality, country of destination, etc.
- The end user as citizen with political opinions about mobility, migration, international cooperation, and about technology, security, privacy and trust in e-government systems.
- The clerk using the new systems in changed work arrangements.
- The administrative management responsible for the way the services are organised and operated. As more services could be implemented on one smart card, this group may be heterogeneous too.
- Technical management, involved in shaping the technical infrastructure, and the coupling of heterogeneous databases and protocols.
- The strategic management and politicians, engaged in the legal and political deliberations about regulations and their translation into administrative procedures. Also this is a heterogeneous group, as visions and interests may differ, depending on the political point of view, the administrative sector involved, and depending on their position in the governmental system (local or national).
- The producers/and providers of the smart card, who may be different from the administrative bodies using the card.
- Other parties that may use the multifunctional card, such as providers of other public or private services.

These potential users all have a different relation to the proposed ICT infrastructure, resulting in different interests, opinions, and requirements, depending on their diverging positions and perspectives. Can all these perspectives be made explicit, and in what way? Can we introduce the different perspective into the design process? Is it possible to combine the results from the (technology) assessment of indirect and long term effects, with participatory design strategies and methods?[21]

4.5 ORGANISING USER PARTICIPATION

As stated above, we have used a number of techniques and tools within our project to involve the different categories of users. We studied literature, of course. We also interviewed representatives from the various user groups and other involved parties. We used group discussions and scenario workshops to clarify existing procedures and to test the developed prototypes. In what follows, we briefly describe our approach and methods, and in the next section we will discuss what the user involvement meant for the users, and for the project. Learning occurred on two levels. First of all we learned about the possibilities and problems when organising PD in complex systems design. Secondly, we learned about the risks and opportunities of e-government systems, and how they are related with the design of the system. The analysis presented here covers the first 18 months period, which included a study of user needs, an interactive design process with the intended users, and an evaluation of the first testable prototype by various user groups.

4.5.1 The citizens

As described, the project quite early selected specific services to focus on. This was done without any interaction with the intended user. Nevertheless, during the first phase of the project we set out to establish the user needs. For this we held in-depth interviews with expatriates from various countries, in order to catalogue the problems they encountered, and in which circumstances. To get a more general overview of the problems migrating European citizens encounter, and of the (non-electronic) solutions already available, we also interviewed several intermediaries, who are engaged in transporting and supporting international migrants. These intermediaries assist migrating citizens with all aspects of official documentation and accompany them for registration with the foreign police, the town hall, the tax office, and so on. They also assist migrants with customs clearance and with acquiring driving licenses and car registration papers. They explain the new countries health, financial and public transport systems. In addition to the migrants themselves, these professionals were a main source of information. Finally, we contacted organisations of expatriates.

Limited resources forced us to do our interviews in the Netherlands only. As it is not at all necessary that migration problems are similar everywhere, we did set up an online survey to check whether the findings from the interviews cover the problems mobile Europeans encounter in an adequate way. The respondents form a self selected sample,

[21] Elsewhere, we have focused on these differences and the differ-rent user needs that are related to characteristics of users (Oostveen and Van den Besselaar, 2001b).

but we were more interested in the variety of problems mobile Europeans encounter, than in a representative picture.

4.5.2 The municipalities

Throughout the project, we organised five workshops in Cologne, Grosseto, Newcastle, Belfast, and Amsterdam, with intensive group discussions between administrative experts from the municipalities, and the technology designers from the project. The experts from the different countries described the actual administrative processes that European citizens are faced with when they move to another country, in order to give the technical designers of the system a detailed picture of the procedures. We also conducted in-depth interviews with civil servants from the seven participating municipalities, to learn about contextual issues relevant for the design of the system. In the workshops also the potential solutions were discussed with the specialists form the participating municipalities, to obtain feedback about the possibilities and problems these solutions could encounter in the various countries.

During the workshops and interviews it became clear how the proposed system related to the larger national contexts, and therefore we conducted a series of interviews with other, more strategically and politically informed specialists, about the political, legal and administrative issues of administrative services, relevant for the design of e-government systems.

4.5.3 Technology assessment studies

Parallel to this, we conducted several studies to improve our understanding of the dynamics of smart card technologies in e-government. Among others, we studied privacy regulation in various countries, and we did several case studies to find out about the dynamics, results and effects of earlier smart card projects. As these projects turned out to have many similarities with each other, and with the FASME project, the case studies were an important source of information for the design of the FASME system (Hooijen et al, 2005; Oostveen and Van den Besselaar, 2001a, 2001b).

4.5.4 Testing the prototype

By month 15, the developers had put together the first prototype, in interaction with citizens, civil servants, and social scientists that had done the user studies and the TA studies on the social implications of complex e-government systems.

We designed a series of evaluation sessions, in order to inform the designers of how to continue. The same categories of users that were involved in the user needs analysis, participated in the evaluation: a variety of citizens, clerks, operational administrative management, executive management and service providers (both public and private sector). The data gathered during the evaluation sessions were twofold: protocols from focus-group-like discussions and survey data. First, we held demonstration sessions of the prototype with end-users in a focus-group setting. We investigated the usefulness of the approach, and the problems to be encountered in a next development phase. We organised similar focus-group-like discussions with clerks, operational administrative management, executive management and service providers from the seven cities involved in the project in order to confront the concept of the system with the cities'

perspectives. Does it work; can it be implemented in real life situations, and with which consequences?

We chose this data collection technique because it is less formal and does not create such a strong 'us and them' distinction between evaluators and users, which doesn't preclude access to information about informal and situated use of the technology (Preece et al., 1994). During all focus group sessions, we had in depth discussions, resulting in a list of critical issues and questions, and in many suggestions for the further development of the concept and for the implementation.

After the focus groups, we asked the five different categories of users to answer lists of questions. The questions were related to requirement dimensions that were identified earlier on in the project: usability, availability, performance, security and impacts/effects.

4.6 THE RESULTS

In this section we discuss the most prominent issues that came out of the participation of the various categories of users. We wil not go into the details as far as the exchange of detailed information of administrative procedures and technical solutions is concerned, because that has been reported elsewhere (Riedl, 2001a, 2001b). Therefore, we will address these only where more general and political issues were implied – as that is the focus of this paper.

4.6.1 The citizens

We started the project by trying to establish an inventory of the issues that formed real obstacles for migrating Europeans. Interviewing over a dozen of migrants provided us with a clear overview of the *types* of informational, administrative, and other problems mobile Europeans are de facto confronted with. What public services do citizens use when they move to another country? What are the most important administrative tasks for them? What kind of problems do they encounter? Would the JavaCard infrastructure be helpful in solving these problems? From the interviews it became clear that five issues are especially important to the participants. First of all, the respondents had big problems with administrative services because of the amount of time they take. People have to queue for hours to provide information, show their passport and submit forms. Most administrative services require the citizen to visit the offices in person, sometimes more than once. "It took three visits to the Foreign Police office to get registered. I was advised to get there early in the morning and join the queue. When the doors are opened a certain number are allowed in and the rest is told to come back tomorrow. First time – too late; second time - I should have registered first at the town hall; the third time was finally successful." Secondly, the interviews showed that many of the administrative problems came up in the *private* sector, and not with public authorities. For instance, people experience problems with telephone companies: "I was not registered in Sweden and therefore needed a guarantor before I was allowed a phone. My boss became my guarantor" and "The telephone company requires a six months bill statement from the bank, but I have just arrived here." Getting car insurance is also problematic: "If you are a foreigner and you move to England you won't be able to get any car insurance, unless you have been driving in the UK for two years. The first two years you pay a

very high price." Banking isn't always easy either: "Generally you need a cheque guarantee card. When you buy something in the store you have to show them this card. If you don't have an account in the UK already, you won't be able to get a card like this for six months." For FASME to be successful, it seems of crucial importance to acknowledge the role of the private sector as an information supplier and user. Banks, car insurance companies, etc., provide and require information that is at least as important as 'official' information. But especially in the private sector a JavaCard might encounter acceptability problems, as many smart cards are already used in the private sector. A third issue is that migrating people have many difficulties in finding out how the local system they are migrating to works. All the interviewees emphasized this. They were all aware that the information generally is available, but that it was quite a task to find out where. In practice, friends or colleagues provide support: "I had very few problems moving here because the girlfriend I had then helped me out with everything. Under different circumstances, like being on my own, practically not speaking German, and not knowing how things worked, my experience would have been much more difficult." Thus it is mainly the social network that helps people to find their way in a new country. This finding actually influenced the design of the prototype with a third service, an information system helping to find one's way through the local environment. Fourthly, several of the respondents remarked that rules and regulations seemed to change frequently. Even for relocation consultants it is difficult to keep informed about legislation and changes in law: "There are websites, we look it up. We have very good relationships with the employment office, the Ministry of Justice, the foreign police, but we can still hardly keep up. The law changes very quickly. And there are other things that drive us crazy. How you register a foreigner in Haarlem is completely different to The Hague. How you register in The Hague is completely different from Amsterdam. So although you still need a birth certificate and things... you need those wherever you go, the way of processing the people is very different." Finally, the various national systems work differently, and even within countries different rules seem to apply to different cities: "Some of the administrative problems are recurrent and cause confusion. For example, in Italy, the Health Insurance card has to be renewed each year for non-Italian citizens in Turin, although strangely not in Ivrea. And depending on where you live, a residence permit needs to be renewed between every 5 to 10 years." This is also a problem FASME has to cope with.

Reason of travel	**Female**	**Male**
Missing	2.2	7.5
To be with partner	19.6	1.9
Study	21.7	18.9
Work	52.2	67.9
Other	4.3	3.8
Total	N = 46	N = 53

Table 4.1. Primary reason to travel abroad

We used the findings of the interviews to design a questionnaire. This was used to get more information about how frequent mobile Europeans are confronted with the various problems, about existing help structures, and about cross-national variation. The sample

consisted of 45.1 percent females and 52% males (2.9% did not indicate their gender). The most popular age group for both genders is the 25-34 age brackets, accounting for 65% of the total sample. The majority of the sample is employed on full-time basis (73.5%). There is no obvious gender difference relating to this. Nearly 12 per cent of the respondents are student. Work is the primary reason to travel abroad for most respondents, followed by study (Table 4.1). We can see that women travel more often to be with their partner, while men travel more often abroad for work reasons.

The results of the online questionnaire support the findings from the interviews with mobile Europeans. First of all, the time issue also comes up in the questionnaire. Most people find dealing with administrative tasks very tedious and run into a number of time-consuming problems. From our data we learned that about 46% of the respondents encounter 1 to 3 different problems. Slightly more than 25% has not one single problem at all moving from one EU country to another and some 8% per cent of the respondents experience more than 6 problems. Secondly, the survey – like the interviews – showed that many of the problems associated with administrative procedures actually took place in the private sector e.g. banking, housing and health insurance, and not with public authorities.

Administration Category	**% of sample with a problem**	**Female %**	**Male %**
Welfare Benefits	16	15	17
Passport	15	16	14
Police	12	11	12
Housing	30	44	21
Utilities e.g. electricity	11	15	8
Medical Care	19	28	11
Health Insurance	15	22	9
Banking	33	30	36
Driving Licenses	14	17	9
Car Registration	10	11	9
Car Insurance	13	17	8
Tax	27	24	30
Pension	13	7	18
Telephone	11	15	8
Municipality Services	12	9	15
Other	6	2	9

Table 4.2 Problems related to % sample and gender specific

Table 4.2 gives an overview of the 15 different administration categories. From this we can see in a glance that housing, banking and tax constitute the three main problem areas for mobile citizens. Thirdly, the questionnaire underlines the fact that government is often not very helpful when problems concern government administration. Private institutions are in average more helpful than public institutions to create help and to solve problems. We found that friends and colleagues are very helpful in some problem categories. Friends help to translate forms, make a lot of phone calls and drive people to

the right offices. Understandably, family and partners are less helpful, as they generally are foreigners themselves. Finally, the problems mentioned differ per country of origin and country of destination. Unfortunately we were not able to cover all countries in our user studies, but these results show the necessity to do this.

4.6.2 The municipalities

The administrative users confirmed some of the issues that were mentioned by the citizens. Apart from that, the interviews and workshops with administrative users showed the complexity of large-scale e-government projects. First of all, different countries apply different e-government strategies, and projects need to fit into these partly diverging strategies. For cross-national infrastructures this creates a set of often contradictory requirements. As we have seen, mobile Europeans stressed that rules were very different in the various national systems and that these rules seemed to change frequently. The administrative users did indeed point out that there are strong differences in civil services and public culture to be encountered in Europe. For instance, while registration of residence is mandatory in Germany or in Italy, there is nothing like registration of residence in the UK. In the UK the citizens will use their utility bills to provide evidence of their living place.

During the interviews and workshops with the civil servants we looked closer at existing infrastructures in European municipalities. This revealed that the implementations of the principals of data protection differ strongly for different countries. The heterogeneous situation with respect to data protection is strongly shaped by legacies and local traditions, and it partially contradicts data protection rules on the European level.

In the workshops, the problem of international administrative transactions was translated into the technical problem to map a document set about a person in country A into a different but ‘equivalent’ document set valid in country B. It was decided to use XML and an ‘ontology’ for this. The system architecture required the municipality providing documents to translate its own data into an XML format, using the common ontology. On the other side of the transaction, the municipality receiving documents has to translate the intermediary XML-format to its local format (Riedl, 2001b). Interestingly enough, examples of this already exist in the ‘paper-based world’, and a representative of one of the participating cities put this forward to the design team. The system designers then borrowed the ‘template principle’ and the underlying ‘ontology’ of the paper-based system (Riedl, 2001a, 2001b; Oostveen and Van den Besselaar, 2001a, 2001b).

After this, we investigated the process of introducing this paper based procedure, with an important result. The basic agreement about the introduction of the paper templates was reached on September 8, 1976. Between 1982 and 1994, twelve European countries have implemented it, which is a remarkable slow process. Why does it take so long? Germany, for example, is still not using it, although the government intends to join the agreement. However, this will require legal changes, which generally are a difficult process as laws are interrelated and changes in one law affect many others. Therefore it was decided to postpone the agreement on the templates until the next general revision

of German laws, which was not expected to start before 2004. Consequently, in Germany the agreement will not come into effect before the end of the decade (Oostveen and Van den Besselaar, 2001b). Designing and introducing e-government systems will of course face similar problems as the paper-based procedures, and this radically puts the optimistic promises of e-government technologies into perspective.

Not only administrative rules and principles of data protection differ between European countries, the concepts and classifications are also not the same. Administrations are basically classifications of people and the concepts used within administrations differ radically between countries. Consequently, cultural heterogeneity may become problematic in an increasing number of cases (Oostveen and Van den Besselaar, 2001b). Take, for example, the concept of 'father'. In the Netherlands, one is only the father of an extramarital child after formally 'recognizing' the child. In the UK, this concept of 'recognition' does not exist. Thus, after moving to the Netherlands, an unmarried English father may not be acknowledged as father in formal situations. Another example is the concept of marriage, which always appeared to be very straightforward. The definition of marriage has recently changed in the Netherlands by an enactment of the law in 1998 to open up marriage for persons of the same sex. The law came into effect in April 2001. Because of the possibility of homosexual marriages there is no longer a legal distinction between husband and wife: both are addressed as 'partner' by the law. Same-sex couples may get married, but after moving to another country they may face complex problems as their legal situation becomes unclear.

These classification problems have implications for the design of the system, as it should enable a flexible mapping of administrative categories. Originally, the JavaCard would be able to authenticate the cardholder with biometric fingerprint techniques, to encrypt and decrypt the personal data, to transform the data according to the requirements of the receiving country and to record the registered data as produced by civil servants at the new destination. The civil servants pointed out that, because of the different classifications and concepts used throughout Europe, it would be very difficult to realize this architecture.

4.6.3 Evaluation of the prototype

This first evaluation of the prototype was influenced by a set of contextual factors, such as the time available to do the evaluation, availability of equipment, access to users, and so on. Because the development of a usable prototype took longer than planned, the time for the evaluation was restricted. There were also some problems with the equipment. Only one functioning demonstration kit could be set up, and it had to travel from evaluation site to evaluation site, making simultaneous evaluation sessions impossible. Consequently this put even more time pressure on the evaluation sessions. Despite these constraints, useful evaluation sessions were carried out in the cities of Amsterdam, Belfast, Cologne, Grosseto and Newcastle.

The user interface, that is "those aspects of the system that the user comes in contact with" (Moran, 1981), is a very important aspect of any system. But usability has not been given first priority during the early stages of the development of the system. Nevertheless, from the focus group discussions we learned that the system is relatively

easy to understand and easy to use for most users. However, some level of IT literacy was needed, and this may cause problems especially for older people – a possible important user group, as retired people increasingly migrate to other countries.

We involved the various users in the evaluation, and found some interesting differences between them, actually reflecting the different perspectives and roles of the various user categories. The citizens and clerks view the system more from a usability perspective, whereas management was more interested in the safety, and in the integration with existing systems and organisational structures and procedures. The clerks generally rated the system more critically than the other groups, and this may reflect the fact that the system most directly influences their positions. Citizens and clerks, e.g. the people that will have to really deal with the system, were more in doubt about the *usability* of the system than the administrative management, the executive management, and the service providers. There was quite a significant difference in their rating. The clerks expected the system to be rather vulnerable to technical break downs, and that this would seriously decline the permanent *availability* of the system. In this dimension they were more sceptical than the other respondents. More generally, the opinions of the various users were less positive with respect to those dimensions that are most directly important to them, and this is especially true for end-users and clerks. The other dimensions are rated higher. This is an interesting lesson, as it shows that average scores generally may be too optimistic, and that it is better to focus on the more critical parts of the evaluation. Doing that, one learns much more about required improvements, and that is what the evaluation of the prototype tried to accomplish.

From the group discussions and the questionnaire we not only learned about the performance of the system, but also about contextual and social issues. The idea of the project to be an innovation in (public) service provision was recognized by the participants in the evaluation session. They realized that following this path would require traditional services to be changed, and that it may also lead to possibilities for new services.[22] A main problem pointed out by clerks and by operational and technical management was the proposed system requires adaptations in existing systems, procedures and organisations. Several aspects of this where discussed. Firstly, there is a need of middleware between the proposed system and the legacy systems operating at the level of the municipalities. As these legacy systems differ from each other, there is not one solution and this middleware needs to be produced for every individual participant. Costs may be a real issue here, especially for smaller municipalities. Secondly, the proposed system fits well in general e-government strategies and one-stop-government initiatives. However, to make these initiatives and strategies work, organisational procedures have to be changed, and even more important, required skill levels and career possibilities of clerks may change considerably. e-government experiences show that clerks with high and general skills are needed, instead of the traditional specialized clerk who starts on a low level, and gradually becomes more expert in a specific field. In one of the participating municipalities, this already had let to a strategy of replacing traditional clerks with part time university students[23]. The

[22] See Oostveen, A., and P. van den Besselaar, 2001a for a more general discussion of this issue.

[23] The main constraining factor mentioned were the legal regulations that make organisational change in the public services rather difficult.

latter are highly skilled and flexible, and do not require any career options, as they generally leave the municipality after graduating. For the traditional lower educated clerk, it is much more difficult to be the interface between the citizen and the city hall for a large number of services. Also from this perspective, e-government has important social implications.

Other more general issues that came up were related to the security of the system, and to privacy protection. Here the citizens were more critical than the other user groups. In answer to questions like: "I trust the FASME kiosk in that my privacy is protected", and "Losing the card is not dangerous, because of the fingerprint technology", respondents state that the system is not as secure as they would like it to be. However, at the same time the majority of the respondents felt that "this type of systems can be made reliable". The same ambiguity was found with respect to biometrics. Finally, the participants saw a danger of total control over citizens' movements by tracking systems. A suggested solution was to design the card in such a way that no personal information can be transferred without explicit permission by the citizen.

4.7 LESSONS

4.7.1 Participation by end users

The involvement of citizens differed from traditional approaches. Firstly, as the project was in an initial and experimental phase, motivation to participate could not be based on the immediate effects the systems would have on the citizen. Secondly, participation took place through representation; not by peers, but by the social researchers who functioned as an intermediary between the citizen and the design team. Nevertheless, all the mobile citizens we approached were willing to give us their time for extensive interviewing about problems they had faced, and often still were facing while living in other EU countries. They were actually very motivated to tell us in detail what the problems were, and how they solved them or worked around them. The interviewees all expressed that support systems would be highly appreciated.

4.7.2 Participation by the municipalities

The representatives of the seven municipalities participated in a different way, as they were part of the project team, and were aware of the important role they had. In the beginning they had some problems to define their role in the project, and it took a while for them to sort this out. When asked, the administrative users said they felt that their opinions were valued and more importantly, they also felt that their input had influenced the design of the system, which is indeed the case, as we described above. They had the feeling that the technical partners and the social scientists in the project listened to their comments and feedback. We found that this is very important to keep users motivated. "Let me say that our duty in the project has been mostly to produce input: national laws, how the services work, technical platform, data base etc. We have the feeling that particularly regarding our technical structure we were listened to and have influenced the design of the system in that respect".

The administrative users also found their involvement in the project useful for their work at the municipality. Among other things, they gained insight in the business processes of administrative services in other countries and cities. “Participating in this project has been very useful for us. Speaking in general we learned how to work together with other partners with very different national laws.” Their involvement furthermore gave them an increased awareness of identity, identification and cardholder verification issues, and about biometrics and protection issues. Finally, being involved in high tech projects was also seen as PR in the direction of citizens and the press.

4.7.3 Participation: the process and the effects

We have already pointed out that defining the users of the system is difficult, and “an unambiguous definition of user is impossible” (Carmel et al., 1993). Yet we have managed to incorporate the most important intended users. In this section we focus on the process dimension: How did the users and their representatives interact with the technical and business partners in the project? Various lessons can be learned.

First of all, not only users have their interests and opinions, so do the technicians! Apart from that, the system designers’ control over their work is limited, as they are influenced by the standards of the field (*technical* norms). These norms are not a priori supportive of users’ interests and often even in conflict with them. Other types of norms influencing the technicians work (technical as well as legal ones) can be found in the field of data security and data protection. These norms have the advantage that they can act as some kind of guarantee that minimal standards are taken into account (Wagner, 1993), but they also create constraints. In the project, up to date modelling and programming tools were applied, but the users were not familiar with them, and this hindered communication between developers and users. Secondly, conflicts between participants’ values and norms, and opinions and interests may prevent the various stakeholders to compromise. Although not all conflicts will be resolved, we experienced in working with citizens, municipalities and other partners that careful operation in a project helps to reach acceptable compromises. Thirdly, disagreement is often based on misunderstandings. The more groups participate in a project, the larger the problem of interdisciplinary (mis)understanding becomes: the asymmetric relation between participants’ knowledge and communicative practices makes mutual understanding between citizens, municipalities, technology designers, and social researchers extremely difficult. Everyday language leaves too much implicit and fuzzy, but the language of experts often is too specialized to be able to handle the subtle issues generated by users. “This is why participants have to engage in the long-term project of developing a *third field* which builds on both: general communicative competencies and a corpus of knowledge, techniques and visualization on which to build a shared understanding ...” (Wagner, 1993). Unfortunately the duration of the project was a bit short to realize such a ‘third field’. Solutions to solve this problem of interdisciplinary understanding would be the allocation of more resources (time, money, education and assistance) to involving the different groups of users. Fourthly, practical constraints play a role too. In our case, the short duration of the project made it difficult to include all user needs as they emerged, as the main terms of reference for the project were already fixed. However, this also reflected the own interests of the technical partners in specific technologies.

As already emphasized, the participation of the different categories of users has been very useful for the project. Involving the users has drawn our attention to crucial issues that would have otherwise gone unnoticed. Initially, the user participation focused on the operational issues of the system, and we have described above the impact the users did have. Working in a concrete technology development project with an interdisciplinary team also gave rise to more fundamental and normative discussions about international e-government. During the PD process, users and developers moved away from a restricted functional perspective towards a more civic perspective on the social effects of e-government technologies, and the implications for design. To mention only one example: when discussing the operational and technical problem of how to map various forms, such as a birth certificate, the fundamental question came up how and why concepts used in these forms differ between countries. This then resulted in increased understanding of the cultural meaning of administrative databases (Oostveen and Van den Besselaar, 2001b). Lack of space prevent us from describing more examples, but the growing shared understanding of the social, cultural and legal complexity of international e-government let to the decision not to continue the project after the first phase. Although the technical issues were more or less solved, the complex social and legal context asked for a radical rethinking of the strategies for facilitating mobile Europeans.

4.8 CONCLUSION AND DISCUSSION

In the case study, we combined a variety of traditional PD tools (interviews, a survey, workshops and scenario based evaluation) with social research and technology assessment. This combination resulted in crucial input for the design of the system, as well as in discussions and a shared awareness about fundamental social dimensions of e-government systems, which were directly related to design options, and to the context of use. However, many of these bigger issues cannot be solved on the level of a single project, because they relate to the politics of public administration and public services.

In other words, the combination of technology assessment with PD practice can be successful, but is not enough. What else should be done, in order to stimulate social responsive technology development? First of all, we think our case was relatively unique in that PD and TA were substantial and influential parts of the project. This is generally not the case in technology development projects, even not in those funded with public money. Take for example the large *framework programs* of the European Commission, in which one finds a lot of talking about users, but we have the impression that despite this, user participation and technology assessment hardly plays any role in most of the projects. Therefore there is a need for an explicit technology policy, stimulating the integration of PD in technology development projects. Public technology policies should require PD and TA in all projects. If large technology programs would more strictly require PD, interdisciplinary collaboration in technology development could become the normal pattern, and technology development could become more socially responsive. This is especially important, because at this moment the ICT infrastructures and models are developed that will influence peoples lives in the decades to come. We have learned in this and in other projects that such an approach is

possible, and that user participation does not hinder or slow down technology development at all, but that it actually enriches it.

Secondly, to convince policy makers to move into this direction, there is an urgent need to intensify the public debate about ICT infrastructures, the required role of users in design and development, and the social values and interests involved. Only if public awareness about the possibilities and risks increases, these issues will enter the political agenda. Therefore there is a pressing need for a public debate about social responsible technology development, and the ways to organise this. Technology development should be combined with participatory design and with technology assessment, but also with a public deliberation about the political and normative issues related to ICT infrastructures.

5
Linking Databases and Linking Cultures: The Complexity of Concepts in International e-Government[24]

ABSTRACT

International e-government implies cross-national coupling of administrative systems. As administrative concepts and classifications reflect social and cultural differences, international e-government applications are even more complex than those within the national boundaries. We will illustrate this by describing the cross-national differences in the concept of marriage, and discuss some of the implications for developing e-government applications.

5.1 INTRODUCTION

We live in a world, which is increasingly connected – physically, economically, politically and culturally. These connections are often mediated by large technical systems, such as telecommunications, transport, power and water. Since the integration of Europe into a single market in which goods, services, people and capital are supposed to be able to move freely, the citizens of the European Union member states should be able to migrate from one European country to another with as few problems as possible. Yet, the administrative procedures in public administration in European member states often prove to be inefficient and time-consuming. Despite the emergence of the single market and the greater connectedness of many crucial industries, including financial services and air travel, the administrative procedures which must be conducted to enable people to live in and move between countries remain localised to the norms and traditions of different nation states, even regions or towns. In this paper, we discuss a systems development project that aims at facilitating these administrative procedures for mobile Europeans. The FASME project aims at developing a prototype of a system that supports mobile Europeans in solving these administrative problems. The main goal of the interdisciplinary project is to show a concept of user-friendly administrative procedures between European member states, in order to make mobility within Europe easier. We will conceptualise it as a large technical system (LTS), a concept that will be explored more fully below. This enables us to clarify the complexities, risks and constraints such projects are facing.

[24] A shorter version of this chapter has been published as: A. Oostveen and P. van den Besselaar (2001), Linking Databases and Linking Cultures. The Complexity of Concepts in International E-Government. In: *Towards the E-Society: E-Business, E-Commerce, and E-Government*, pp. 765-774. Edited by B. Schmid, K. Stanoevska-Slabeva and V. Tschammer. Boston: Kluwer Academic Publishers, 2001. ISBN 0-7923-7529-7

Traditionally, Europe has been a source and not so much a destination of immigrants. This situation reversed from the 1960s onwards. Millions of peoples migrated to the countries of northern and western Europe (Salt, 2000). International migration is at an all-time high. In the mid 1990s about 125 million people lived outside of their country of citizenship and the number is still expanding every year (Population Reference Bureau, 1996). Yet, Manuel Castells argues in his book 'The Rise of the Network Society' that there is not a global labour force despite the emergence of a network society. "While capital flows freely in the electronic circuits of global financial networks, labour is still highly constrained, and will be for the foreseeable future, by institutions, culture, borders, police and xenophobia" (Castells 1996: 232). There is, according to Castells, only a global market for a tiny fraction of the labour force, concerning the highest-skilled professionals in innovative R&D, cutting-edge engineering, financial management, advanced business services, and entertainment, who shift and commute between nodes of the global networks that control the planet (ibid.: 233). Nonetheless, at this moment, almost 5.5 million foreign citizens resident in EU member states are nationals of other member states (Salt, 2000). Hence, facilitating mobility within the EU is important for individual citizens. At the same time it may improve the operation of the European labour market.

The FASME system is based on smartcards and the Internet (for details c.f., Riedl 2000, 2001b, 2001c). The FASME smartcard is in fact a digital ID card, using biometrical (fingerprint) identification technology, and containing digital signatures, and personal information about the cardholder. The card should enable the user to access through the Internet available electronic documents in (governmental) databases, and to download these documents on the card or to send these directly to other (governmental) agencies. The authenticity and the age of the documents will be secured, as receiving institutions need to assess the status of the information received. The personal information on the card is meant for the personalization of service provision. Only a few functions have been implemented on the FASME prototype. Smartcard technology is often seen as the core technology for governmental services in the information age. (Lips 1998).

5.2 LARGE TECHNICAL SYSTEMS

Until Thomas Hughes published his book 'Networks of Power' in 1983, social science Thomas Hughes' seminal history of the electrification of the world shows how Large Technical Systems (LTS) operate as networks of many interacting technical and social components [11]. As already described in chapter 4, we see the development of a FASME smart card to facilitate migration between the EU member states as an LTS because it has the properties that we ascribe to large technical systems. To recapitulate, LTSs are large scale, affecting many people and institutions. Secondly, LTSs are complex. Political, legal, administrative, organisational and technical issues are all relevant in the design, development, implementation, maintenance and use of these systems. Also, LTSs are infrastructural and therefore often facing – always difficult – issues of standardisation. Another distinctive feature of LTSs is the close correlation between a given LTS and a particular type of political ideological thought and practice (Gökalp 1992).

The FASME card is meant for enabling access to many (public) services, and quite a few of those are only used on an incidental basis. Consequently, the card has to be multifunctional to attract enough potential users. This implies that many actors with potentially diverging worldviews and interests are involved in developing and implementing the card. Institutions that adopt smartcard technologies will also have to adapt their organisation considerably. Many actors and many functions generally result in many difficulties. That is why high complexity is a main factor in the failure of smartcard projects. In the FASME project, only two services had to be implemented. Nevertheless, even the development of the prototype proved to be complex, with many problems difficult to solve.

5.3 USER INVOLVEMENT

In a LTS a large number of people and institutions is involved, as potential 'users' of the system. Involving user groups is a prerequisite for successful innovation. However, user involvement in the design of this type of complex systems is a relatively new issue. (Clement & Van den Besselaar 1993; Rowe and Frewer, 2000).

It is important to recognize that there is not a 'universal user'. Several types of potential users of a FASME system can be distinguished, with various interests: 1) Various categories of mobile European citizens, who travel for business or for private reasons, and have different levels of support. They differ in gender, age, level of education, marital status, parentage, mastering of languages, disabilities. Their expectation of e-government services varies accordingly. 2) Civil servants whose work will dramatically change in the age of e-government. 3) City councils that have an interest in more efficient, effective, less costly and more transparent services. However, this has to fit in different legal frameworks, political processes and ideologies. The citizen expects improvement of quality of services using ICT, where possible. By improving their relationship with citizens, governments can make their country, region or city more attractive as a place to live and to work. 4) Representatives of employers hiring mobile Europeans. 5) Private sector service providers, among others providers of services that support mobile people.

In the FASME project users are involved by conducting face-to-face interviews with them, by letting them respond to questionnaires, and by involving them in workshops and tests. As we have shown above, there are a number of different users to be identified in any LTS. Because FASME is a European project, which crosses the borders of all the EU countries we do not only find different users but also different cultures, believes, norms, interests and other issues. These differences in cultures, norms and believes between users in EU countries cause the complex cross-national coupling of administrations we will address in the following section.

5.4 CONCEPTS, CLASSIFICATIONS, SYSTEMS

The FASME card is meant for multiple functionalities, and the choice to make a programmable smart card based on Java technology reflects this. Nevertheless, in the

project we only develop a small amount of services (notably three) to show that the technology works. The innovative character of FASME is to build a new 'socio-technical system', based on existing components of technical knowledge, available or almost available components, and an existing social and organisational environment. Generally, in the development of a smart card and the services that have to be supported by it, many actors are involved. On the one hand, it seems to be necessary that a smart card has many functions, to make it interesting for potential users. On the other hand, the complexity that goes with the involvement of many actors is also a main factor that explains the failure of smart card projects. Too many actors, and too many functions, result clearly in many difficulties. In other words, projects are faced with a trade off between many functions and a small number of participants.

The choice for a small number of services to be implemented on the FASME prototype reduces much of the complexity that causes other projects to fail. However, we will give some examples of why even the narrow scope of the card already confronts us with many problems that have to be solved, or at least have to be considered.

One of the services, which is being prototyped within the FASME project, is the registration of mobile Europeans in the city they move to. In most countries this is an obligation for foreigners. As one of our respondents remarked, this registration is the modern version of the city wall: as soon as you are accepted inside, you belong to the new social system. Being registered is the prerequisite for many services, public as well as private. Therefore, citizen's registration is a process secured with many provisions, such as the obligation to be present at the registration office and the obligation to carry recent documents that inform about one's identity and situation. Different countries require different information, but generally one needs to have authenticated information about one's own birth, marriage, and about the children.

Registration requires authenticated information, and after the registration has taken place, it is clear what rights and obligations the person has in the new domicile. This is an important issue, as the registration may have many legal, administrative, and other consequences. In the Netherlands, for example, much information is registered, and many users from within and outside government are regular users of the information in the citizens' administration.

It is essential to recognize that the concepts used for classifying a person and his/her situation, differ between the various countries. Although in many cases this will probably not be a problem, in an increasing number of cases it will be one. For example, the concept of 'father' is different between countries. In unmarried couples in the Netherlands, e.g., the man is only father if he officially 'recognizes' the child. In the UK, this is different, and per implication an unmarried English father can face a situation in which he is not acknowledged as the father of his child after moving to the Netherlands.

Another example of a concept that might cause problems in international e-governmental provision of administrative services is the institution of 'marriage'. The concept of marriage always appeared to be very straightforward. However, the legal definition of marriage has recently been redefined in the Netherlands by an enactment of the law to open up marriage for persons of the same sex. We will explore the changing concept of marriage in more detail to show that a smart card like the FASME

card may contain information implemented on it by one country's government that might not be useful to government agencies of other European countries because of major differences in the definition of rather basic concepts.

5.4.1 Same-sex marriage

In 1998, the Netherlands enacted a law allowing same-sex couples to register as partners and to claim pensions, social security and inheritance. [25] The House of Representatives voted in a large majority (107 against 33) for the bill, and the law has come into effect on April 1, 2001. Another change to the Dutch law makes it possible for two persons of the same sex to adopt a child. The child is being placed in a legal family relationship with the two 'parents'.[26]

The opening up of marriage to same sex couples by the Dutch Parliament caused quite a bit of uproar in European and other countries. To express their objections against the same-sex marriage, the Marriage Law Project of the Columbus School of Law in Washington DC made the following statement: "Legalizing same-sex 'marriage' is not just an internal Dutch affair. Marriage is among the most portable of institutions. In most cases, a marriage entered in one country will be recognized by another country. Although, for the time being, one of the two same-sex 'spouses' must be a Dutch resident, inevitably same-sex couples will marry, move to another country, and then demand that their 'marriage' be recognized in their second country. These challenges will trigger legal conflicts worldwide, forcing countries to debate their policies and pressuring them, in the name of 'human rights', to fall in line." (Coolidge & Duncan, 2000).

One day before the Dutch First Chamber had to vote on the issue of the same-sex marriage, eighty professors of law and jurisprudence at universities across the world sent a statement on the definition of marriage to the Parliament of the Netherlands saying that "marriage is the unique union of a man and a woman"' and "cannot be arbitrarily redefined by lawmakers". In the letter the professors claim that by seeing marriage as the union of a man and a woman they represent the beliefs and practices of the overwhelming majority of humanity. They continue by stating that "our domestic and international laws should preserve, protect and promote the institution of marriage". According to these professors of law, redefining marriage to include same-sex unions will introduce unprecedented moral, social and legal confusion into our communities. They stress that no country is an island and that the actions of the Dutch Parliament will have fateful consequences not only for Europe, but for every country in the world. (Agar, 2000).

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[25] Bill 26672 (On the Opening Up of Marriage) allows same-sex couples to marry and treats these relationships the same as opposite-sex marriage. One of the partners must be a Dutch citizen or permanent resident to contract a same-sex marriage in the Netherlands. Traditional laws of descent do not apply in same-sex marriages, unless the couple adopts a child. Available online: http://marriagelaw.cua.edu/nl_marriage.htm

[26] Bill 26673 allows same-sex couples to adopt jointly. The couple must have cohabitated for three years and have jointly raised the child for one year. For the time being, the child being adopted must also be from the Netherlands (this was added to respond to criticisms from other countries). Available online: http://marriagelaw.cua.edu/adoption.htm

What the opponents of the same-sex marriage believe is that marriage is by its very nature the union of a man and a woman and that this cannot be changed. In their opinion, altering the meaning of marriage will lead to nothing but confusion among people. However, we can ask ourselves the following question: what is 'marriage'?

All societies recognize marriage. And like all cultural phenomena, marriage is governed by rules, and these rules vary from one society to another. Societies also have rules that state whom one can and cannot marry. Some societies practice monogamy, where only one spouse at the time is permitted. This seems to be the definition handled by the Marriage Law Project. However in biblical times husbands (in societies like our own) could have more than one wife. This is known as polygyny and is permitted in a lot of societies in the world today. An alternative form of marriage - one that does occur but is rather rare - is known as polyandry, in which one woman may have several husbands, often brothers (Rosman & Rubel, 1989).

All the above-mentioned marriages involve a commitment between men and women. But there is also proof that marriages between two persons of the same sex have been conceivable to people in a wide range of periods and cultures. Paul Halsall argues in his article "Lesbian and Gay Marriage through History and Culture" that same-sex marriages did occur in sufficiently diverse historical and cultural contexts as to refute the assertion that 'marriage' is irretrievably or 'naturally' heterosexual (Halsall, 1996). Halsall states that the issue of what is 'marriage' is a core issue, which cannot be settled by a priori definitions. He asks himself whether we can establish a general definition of 'marriage'. Maybe we just have to accept that there is no such trans-cultural institution as marriage, and that each society manifests essentially different patterns.

5.4.2 Complications in an international context

Changes of legal concepts mirror the changes in our society. If existing definitions could not 'be arbitrarily redefined by lawmakers' as the professors claim in their statement to the parliament, we would still be in the situation where interracial marriages in the United States would be prosecuted. It was not until 1967 that the U.S. Supreme Court declared that "any marriage between any white person and a Negro or descendant of a Negro" was no longer illegal. It is hard to imagine that in the 60s there were people who opposed to this change in law. Often a religious argument is used to oppose to changes in law. In the case of interracial marriages naysayers argued that: "The Bible says to keep your race pure. There are races today that actually practice this, and this is the way that it should be. What you are doing to yourselves and the children is wrong". People who oppose to the same-sex marriage also often seem to use God and the Bible in objecting to gay weddings. The State Secretary of Justice Mr. Cohen replied to the remarks made by members of the fracties[27] that normative meanings of marriage are not set in stone, but are subject to change. Marriage has, as a secular institution aimed at procreation, lost importance. It can be observed that "…many consider marriage as a God given institution, but then many others no longer do"(Cohen, 2000). In this paper we treat the concept of marriage in the context of a

[27] Members of a political party in parliament.

strictly legal approach. Although, as Cohen states, we do realize that a change of the legal meaning of marriage can have an effect on the societal, cultural and religious meaning of marriage (ibid., 2000).

Marriage is a legal concept that has numerous legal consequences, related to health benefits, tax payment, rights to raise children, hospital visitation rights, sick leave, and funeral leave. More and more homosexual partners enter into a life partnership, and they are becoming aware that these rights are important for them as well. In the Netherlands these rights are now recognized. But even though the same-sex marriage will have a formal status in the Netherlands, the same-sex couples need to realize that they may encounter a lot of practical and legal problems when moving abroad. The recognition of gay marriage abroad will differ per country. Countries that may be more willing to recognize a marriage between two persons of the same gender, will probably already know the registered partnership themselves like Iceland, Denmark, Sweden and Norway.

Whether or not one agrees with the professors of law that marriage is an institute solely based on a relationship between a man and a woman, one has to agree with them that same-sex marriages will not yet be recognized in many countries and that this will probably cause legal confusion. The change in Dutch law will create a lot of complications in an international context. It has never been denied by the Dutch Parliament that there is a lack of clarity, especially with regards to the recognition abroad. Yet, in the view of State Secretary Cohen, this lack of clarity was not such that it should have prevented the adoption of the proposal to opening up marriage to same-sex couples.

Marriage is a legal concept that has numerous legal consequences. Members of the First Chamber raised many questions about the international legal consequences. For instance, if somebody is married in the Netherlands with a partner of the same sex, then moves abroad and marries with a person of the different sex, does the party involved have two spouses? Is according to Dutch law the first marriage valid and the second not? And, at the same time, might it be probable that in accordance with the law of the country where the party stays the second marriage is recognized and not the one concluded in the Netherlands? What is the position of children in the Netherlands and abroad that are born out of one of these marriages? Other questions were asked: will Dutch government offer legal support to married homosexual couples abroad when they seek to gain recognition for their marriage? If so, in what way? Will the Dutch government, on request, recognize a gay couple from a country that does not have registered partnerships as a married couple? Presume that a marriage of a Dutch citizen and one non-Dutch citizen of the same sex is dissolved, and one child of one the parties is not in the Netherlands, what is in such a scenario, the jurisdiction of the Dutch judge to determine guardianship, visitation, or child support? What will the legal position be of a child adopted by a gay couple in case of emigration to a country that does not know marriage between people of the same sex? And finally, if one of the partners of a same-sex marriage dies abroad, how will the survivor pension been arranged?

5.4.3 Implications for design

One may argue that the problems discussed in the previous section are exceptions, and that most mobile Europeans fit in more ‘normal’ categories. However, in post-modern

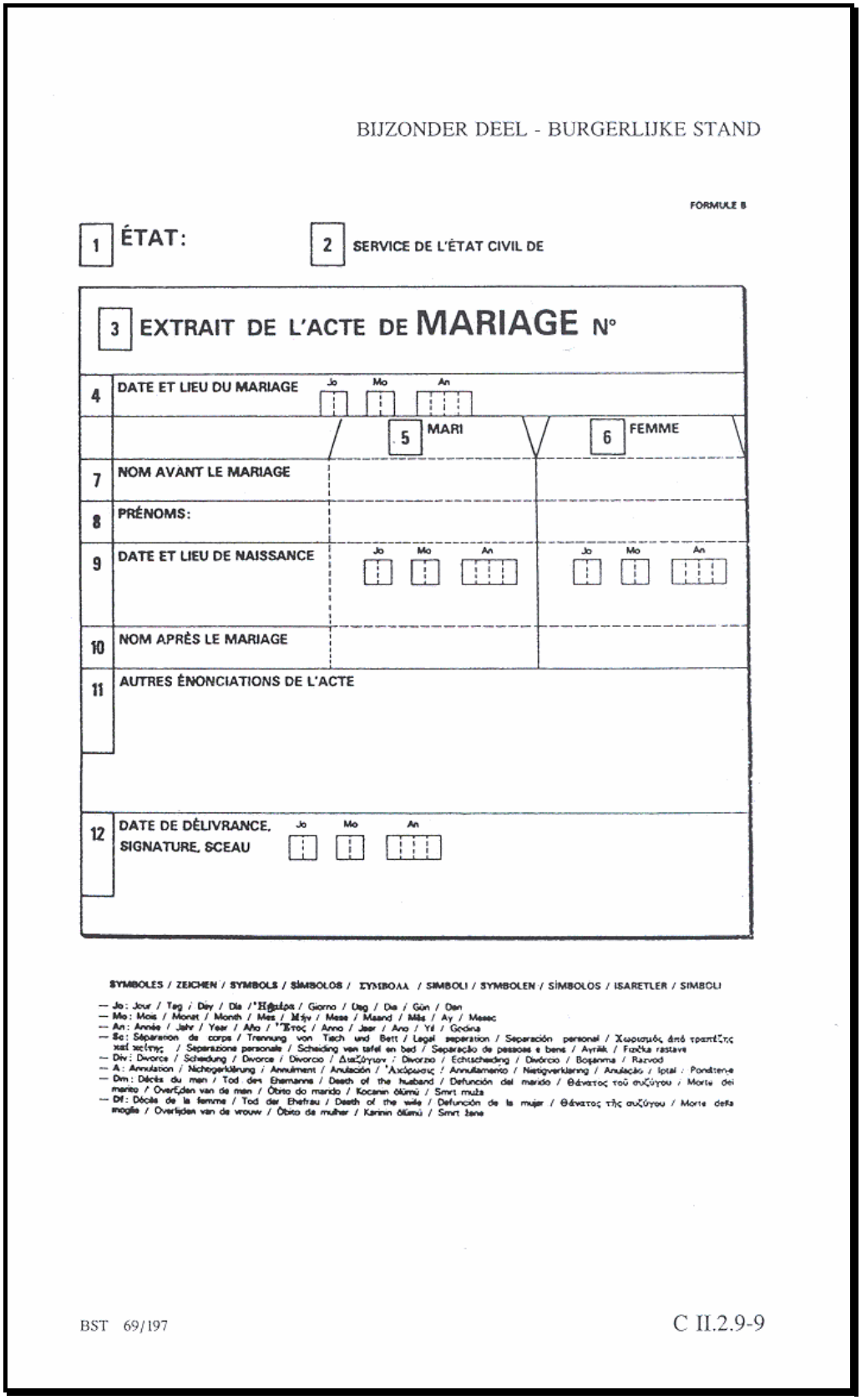
societies, variation in situation and behaviour of people is expected to increase, and what is now still exceptional, may become quite normal in the future. From that perspective differences between the normative systems in the various countries may increase, as will the problems for designing e-government systems for administrative support.

What are the consequences for international e-government of these differences in concepts used to classify people? The problem is to translate an available document set about a person in country A into a different but 'equivalent' document set valid in country B. As far as this translation is problematic, mobile Europeans may have difficulties to provide the required information in the country they are moving to. This is true in the current paper based situation, and in that sense the problems are not specific for e-government. Let us therefore look how document exchange support is organised nowadays.

The introduction of a card like FASME requires smooth cooperation between local, national and international government departments and agencies. In order to come to this cooperation, the participating countries should come to an agreement on the most common concepts. To do so, paper-based systems already exist between several European countries. An example is shown in Figure 5.1.

This picture shows you one of the templates used by different countries as a multilingual Certificate of Marriage. These templates are developed to have a standardised Registry of Births, Deaths and Marriages between countries. The international standardised templates facilitate the transfer of data between governments. An instructive example of the use of this is Turkey. Turkish government does not issue a birth certificate to its citizens, but if a Turkish citizen moves abroad, an international birth certificate is issued. Other governments will accept the data on this certificate as long as it meets the rules of the agreement. National governments handle the provided information from the international templates according to their own legislation. The question that comes up now is how the new Dutch concepts can be mapped upon the template. If other countries will decide in the future to recognize the same-sex marriage, there will have to be changes in the choice of words on these templates or better yet, a translation in the concepts. The concepts 'husband' and 'wife' will need to be changed into 'partner 1' and 'partner 2'. And if same-sex couples may legally become parents of children, the concepts 'father' and 'mother' may need to be changed into 'parent 1' and 'parent 2'. This shows what an impact a change in one country's law will have on the conceptual frameworks of all the other countries.

Another example of this is the scientific titling which in some countries is part of the family name. These titles are mentioned on a template coming from Germany, but a Dutch civil servant will not use the titling in his administration when registering the surname of a German 'Professor Doctor'. It should be clear what data is needed, for every service government provides. A template will work to make translations between concepts as long as each participating country has the right to make certain reservations.



BIJZONDER DEEL - BURGERLIJKE STAND

FORMULE 8

1 ÉTAT:

2 SERVICE DE L'ÉTAT CIVIL DE

3 EXTRAIT DE L'ACTE DE MARIAGE N°

4	DATE ET LIEU DU MARIAGE	Jo Mo An	
		5 MARI	6 FEMME
7	NOM AVANT LE MARIAGE		
8	PRÉNOMS:		
9	DATE ET LIEU DE NAISSANCE	Jo Mo An	Jo Mo An
10	NOM APRÈS LE MARIAGE		
11	AUTRES ÉNONCIATIONS DE L'ACTE		
12	DATE DE DÉLIVRANCE, SIGNATURE, SCEAU	Jo Mo An	

SYMBOLES / ZEICHEN / SYMBOLS / SÍMBOLOS / ΣΥΜΒΟΛΑ / SIMBOLI / SYMBOLEN / SÍMBOLOS / ISARETLER / SIMBOLI

— Jo : Jour / Tag / Dày / Día / Ἡμέρα / Giorno / Dag / Dia / Gün / Den
— Mo : Mois / Monat / Month / Mes / Μήν / Mese / Maand / Mês / Ay / Mesec
— An : Année / Jahr / Year / Año / Ἔτος / Anno / Jaar / Ano / Yıl / Godina
— Sc : Séparation de corps / Trennung von Tisch und Bett / Legal separation / Separación personal / Χωρισμός ἀπό τραπέζης καί σεσίης / Separazione personale / Scheiding van tafel en bed / Separação de pessoas e bens / Ayrılık / Fizička rastava
— Div : Divorce / Scheidung / Divorce / Divorcio / Διαζύγιον / Divorzio / Echtscheiding / Divórcio / Boşanma / Razvod
— A : Annulation / Nichtigerklärung / Annulment / Anulación / Ἀκύρωσις / Annullamento / Nietigverklaring / Anulação / İptal / Poništenje
— Dm : Décès du mari / Tod des Ehemanns / Death of the husband / Defunción del marido / Θάνατος τοῦ συζύγου / Morte del marito / Overlijden van de man / Óbito do marido / Kocanın ölümü / Smrt muža
— Df : Décès de la femme / Tod der Ehefrau / Death of the wife / Defunción de la mujer / Θάνατος τῆς συζύγου / Morte della moglie / Overlijden van de vrouw / Óbito da mulher / Karının ölümü / Smrt žene

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C II.2.9-9

Figure 5.1 Example of a multilingual 'Certificate of Marriage' template.

The agreement on the described templates was decided on in Vienna on September 8, 1976. Between 1982 and 1994, twelve countries have signed it, which is a remarkable slow process.[28] Why does it take so long? Germany, for example, is not yet using it, although it was decided there to enter the agreement. However, it requires legal changes and this is generally a difficult process, as laws are interrelated, and changes in one law effects others. Therefore it was decided to include the agreement on the use of the template in a larger and more general revision of German laws, and this process is foreseen to start somewhere in 2004. Consequently, the agreement will not come into effect in Germany before the end of the decade.

The architecture of the FASME prototype follows the same 'template principle' as the paper-based system. National electronic forms will be translated into an electronic template, and the other way around. In the view of Riedl, one of the technical partners in the FASME project, it is not the intention of the FASME system to "impose any standards on the local processes themselves [but we] make them interoperable with the help of interfaces and an interconnecting communication medium" (Riedl, 2000). He stresses that the local systems know about formats and procedures and take care of the data procurement and translations. Local customs will be respected. An 'ontology' is needed to automate these translations (Riedl 2000, 2001b), but it will face similar problems as the paper-based versions.

5.5 CONCLUSIONS AND DISCUSSION

This paper concentrated on the contextual opportunities and constraints for complex cross-national administrative e-government applications. We described the objectives of the FASME research project which we conceptualised as a large technical system. As in all LTSs there are a lot of actors (people and institutions) involved in the system. The international character of the system adds further to the complexity. The differences in cultures, norms and believes between the users in the participating countries make the coupling of administrations very complicated. We demonstrated this by focusing on the concept of marriage.

We have seen that different meanings are given to marriage and that with the passing of time its meaning differs. The Netherlands took the liberty to introduce a new concept, in line with the present opinion in society. As far as the public and legal recognition of the relation of a man and a woman, or of two men or of two women, there are now in this country, two forms between which a choice can be made; marriage and registered partnership. The differences in legal consequences between marriage and registered partnership are especially of importance to persons of the same sex. By marrying they get a wider package of legal consequences than when they enter into a registered partnership. During the different phases in the discussions on the bill, it was repeatedly held that the Netherlands couldn't impose its new understanding of the concept

[28] Austria (1983), Bosnia-Herzegovina (1995), Croatia (1993), Italy (1983), Luxembourg (1983), Macedonia (1994), The Netherlands (1987), Portugal (1983), Spain (1983), Switzerland (1990), Turkey (1985) and Yugoslavia (1990).

marriage on countries abroad (Cohen, 2000). And as we noted in our paper, this leads to distinct complications in an international context.

The only way to really solve something like the same-sex marriage issue would be a complete harmonisation of the different European legislations and rules, something which seems to be an impassable road and which is probably not even desirable. In our opinion and based on interviews with experts, we conclude that the best way to solve the differences in concepts and to enable cross-national e-governments to communicate with each other seems to be the design of international templates. Nevertheless, the template (Figure 1) that we used in this paper as an example took years to be developed and has only been adopted by a small number of European countries. Thus, we have to be aware that the transition to e-government solutions, especially on the European level, is expected to go very slow. This can be conceived as an advantage, as it gives us time to learn carefully about the *good* solutions.

ACKNOWLEDGMENTS

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6
Internet Voting Technologies and Civic Participation: The User's Perspective[29]

ABSTRACT

In many places e-voting technologies are under development, and an intensive theoretical and normative debate is taking place about the pros and cons. We investigate the opinions of the users of this type of technologies, as this is crucial for the shaping and acceptance of the technology. We did not use a survey, but held 14 intensive discussion sessions in different countries with voters and organisers of ballots, using the focus groups methodology. We found consensus that e-voting will not influence turnout. The motivation to start with e-voting therefore seems mainly financial, aiming at reducing costs. This suggests that in the future e-voting will replace traditional ways of voting, and therefore the digital divide can be expected to influence the participation in and the outcome of ballots. Finally, although most respondents expect that e-voting may improve (especially local) democracy through a combination of voting technologies with technologies for supporting deliberation and information dissemination, it remains unclear how this should be done. More detailed studies into political participation and the subtle roles of ICTs herein are needed, as this can inform the design of adequate technologies for e-democracy.

6.1 INTRODUCTION

Internet voting is a hot topic. Governments in many countries are eager to speed up its implementation for a variety of reasons. It fits general e-government developments, it may reduce costs, and, more specifically, there is the hope that it may increase turnout, especially among young people. Outside government, internet voting may find its way into a much wider realm of organisational opinion polling and of participation in organisational decision-making.

The development of the technology is in its infancy, but many technology development initiatives are undertaken, supported by public R&D programs. As is well known but hardly practiced, involving the different categories of users in the early phases of design and implementation of technologies is crucial for the innovation process (Greenbaum and Kyng, 1991; Schuler and Namioka 1993; Cherkasky, Greenbaum, Mambrey and Pors, 2000). In this way the technology developers may learn about the crucial 'softer' issues, which encompass a variety of technical, organisational, social and human factors

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and their interactions (Kling, 1999), and users may learn about the opportunities and risks of the technology. A process of mutual social learning may take place, which is even more important in the case of complex and heterogeneous infrastructural technologies, such as internet voting systems (Oostveen et al., 2002). From this perspective, and as part of a technology development project, we investigate the opinions and needs of the *users* (voters as well as organisers of ballots) of internet voting technologies. In this way, our research may contribute to a more reflective technology development, and at the same time contribute to the emerging body of knowledge about effects, possibilities and risks of using information and communication technologies (ICT) for civic participation.

The structure of the paper is as follows. We start with an introduction of internet voting as it stands, and then we review the technological and socio-political opportunities and risks as they dominate the theoretical and normative debate about Internet voting. In the next section we introduce our case, the focus groups method we used, and the five field settings in Finland, France, Italy, and the UK. After that we present the findings of the study, the views and opinions of the voters and organisers of the ballots. In the concluding section we discuss the implications of the findings for the design and use of Internet voting systems for civic participation.

6.2 INTERNET VOTING

In the debate on e-democracy, one generally distinguishes between the use of ICT for the provision of information, for political deliberation, and for decision-making (Hacker and Van Dijk, 2000; Hague and Loader, 1999). Internet voting (or online voting, electronic voting, e-voting) is primarily intended to support decision making, but it can of course also be used for gathering information (opinion polling) and for deliberation. Internet voting is an election system that uses encryption to allow a voter to transmit his or her secure and secret ballot over the internet. It is essential to recognize that internet voting is only one part of the full e-democracy agenda and we should not limit our view of online democracy to just voting and elections only (Clift, 2000). It is also important to acknowledge that new voting technologies alone will not bring about major changes to our democracies. The use of referenda, deliberative polls and a more direct democracy will have to be justified by more than just the possibilities created by ICT. But ICT does bring about new opportunities.

Until the eighteenth century, the standard view (though not the practice) was that democratic government meant rule by the people through assembling on a central place to vote on laws and policies. By implication, democracy could actually only exist in small units, such as towns. As modern political communities exceed this size by orders of magnitude, the idea of representative democracy replaced the original democratic ideal. In such a democracy, citizens transfer the legislative power to representatives who are held accountable by re-electing or dismissing them in subsequent elections (Dahl, 2000: 93-95). Although forms of direct democracy have survived in some places, and experimentally and informally returned on the local level in other places as a means for strengthening the public participation (Coleman and Gøtze, 2002), representative democracy is the dominant form. One of the strongest appeals of e-voting is that with

today's technology, direct forms of democracy involving entire populations become possible on a regular basis. Apart from replacing representative democracy with direct democracy, ICT could also – and according to many critics even better – help to make representative democracy more responsive (Van de Donk and Tops, 1992; Coleman and Gøtze, 2002). The introduction of internet voting may be one of the tools to accomplish this, apart from ICT applications for improving political deliberation, for example[30]. In this paper, however, we focus on internet voting.

6.3 INTERNET VOTING CATEGORIES

Internet voting systems can be grouped into three general categories. First of all there is the *poll site* internet voting option. This option refers to the casting of ballots at public sites where election officials control the voting platform. The advantage to internet voting at poll sites is that voters can visit any polling place to cast their ballot. This means that the voter can choose from hundreds of polling places, including ones that may be closer to home, work or school. Secondly, there is the possibility of *kiosk* voting. Kiosks could be located in convenient public places like community centres, libraries, supermarkets, post-offices, train stations or schools. Thirdly, *remote* internet voting refers to the casting of ballots at private sites where the voter or a third party controls the voting client. Remote internet voting allows voters to cast their ballots from any computer connected to the Internet from anywhere in the world. Voting is not constrained by geography, that is, it is not limited to the area in which the election takes place. This means that voters who in the past had difficulties to vote may be able to do so, such as military personnel, and housebound, institutionalized or disabled persons. Also voters who know they will be out of town or unable to visit an election site on the day of the election, may use a remote internet voting system to cast their ballots. But for 'normal' voters too a remote voting system will facilitate the casting of their ballots, as they would be able to so from any location connected to the internet, including workplaces or their homes. This is what Lindsey Arent (1999) called: "Voting in your underwear".

Besides the distinction between different voting sites (poll site, kiosk, or remote), we should distinguish between public elections for citizens' representatives in local, regional, national and supranational legislative bodies, and private elections within unions, organisations or companies. Technologies for public elections generally have to meet more rigid and rigorous legal standards and technical tests than technologies for private elections.

6.4 INTERNET VOTING: OPPORTUNITIES

Critics of internet voting express concern about security and about the lack of equal access to the internet for all citizens. Advocates of e-voting cite the potential to increase civic participation by making the voting process more convenient, as well as the

[30] One can think of tools for information dissemination enabling voters to monitor politics, or tools for improving communication between citizens and politicians.

potential for reduced election costs (Dictson and Ray, 2000). But there are many more advantages and disadvantages to online voting, which we will now consider. Most proponents of internet voting argue that the adoption of such systems would increase voter participation, especially among young people, overseas personnel, business and holiday travellers, and institutionalized or housebound voters. Increasing voter participation is of interest because voter turnout has been low and declining in most countries. The ever-dwindling numbers of younger voters at the polls frustrates most public officials and interest groups. They argue that this internet savvy age group would show up at the polls in record numbers if they were allowed to vote online (Dictson and Ray, 2000). Because young people are already active on the internet they are expected to take up this method of voting.

A second advantage of internet voting is the possibility for increased voter access. Those in favour of internet voting say that the current voting system we use in democratic countries is not completely fair because many people have work schedules or other conflicts that prevent them from visiting their designated polling place on Election Day. Internet voting would offer these people an option that they did not previously have and would enable them to exercise their right to vote (Mohen and Glidden, 2001).

A third reason to favour internet voting is increased convenience. Convenience encourages participation, which should lead to a stronger electorate. Some surveys among non-voters indicate that one of their primary reasons for not voting is the inconvenience of having to travel to a voting booth, or thinking ahead about getting an absentee ballot. According to some scholars legalizing internet voting will allow people to do something online that they want to do anyway, but have been unable to do because they are too busy and the traditional process is too inconvenient, not because they are apathetic (Strassman, 1999).

Fourthly, some people also suggest that internet voting would, in the long run, substantially reduce the costs of elections. This has not been tested yet, and the (partly hidden) costs of complex technologies are generally high. The cost of online voting would vary enormously depending on the type of system employed and the type of security used such as passwords, software, or biometric identification (Coleman et al., 2002).

A last advantage is the possibility for more direct forms of democracy. Supporters of direct democracy believe in the influence of free individuals and are afraid that intermediary organisations misrepresent the preferences of the people[31]. Today's technology makes it perfectly possible and relatively easy to introduce computer-based voting into the political systems of Western countries at any moment, involving the whole population on a regular basis.

[31] The Movementof Direct Democracy (http://home.swipnet.se/~w-38823/jiri1.htm)

6.5 INTERNET VOTING: RISKS

The most extreme critique expects the electronic revolution to produce Orwellian forms of surveillance and control of citizens (Van de Donk and Tops, 1992). Although most critics do not take this extreme position, many of the elements are prominent in the discussion on the risks of e-voting. Among those, the technological threats to the security, integrity and secrecy of internet ballots are the most significant (California's Internet Task Force, 2000). Security is one of the biggest problems, as the internet has never been a very safe way to send any kind of information, let alone something as vital as a vote. With online financial transactions, customers can be issued with a receipt, which confirms exactly what happened and when. This is not possible with voting, as the identity of the voter must be separated from his or her 'transaction' to guarantee the secrecy of the vote.

With any form of remote voting, undue influence is difficult to address. Bribery and vote buying and selling are easier from remote sites than from supervised polling stations. When people cast a ballot away from the watchful eye of an election officer there are security risks. This applies equally to a home computer, a computer based in a workplace or an unsupervised kiosk in a public place. With internet voting via personal computers, attacks on voter's machines in the form of viruses form a significant risk, since these machines are unlikely to have the same levels of protection as the election site computers and will not be scrutinized by officials. Another security danger is the unauthorized interception or reading of ballots between the vote being cast and being received by the system. A potential weakness of internet voting is its vulnerability to a variety of hacker created problems (web site spoofing, denial of service attacks, etc.). Individual hackers, criminals, and foreign intelligence services are among those who might try to manipulate the vote or destroy the technology used to run the election.

Besides the technical dimension, vulnerability also has a social dimension. Voter participation is a very important reason to change the existing voting systems. However, previous reforms designed to make voting more convenient – simpler registration procedures, liberal absentee balloting, extended voting times, voting by mail, and satellite voting – have had very little (if any) effect on turnout levels and virtually none on the composition of the electorate (Internet Policy Institute, 2001). Also, the variety of voting technologies, such as paper ballots, mechanical lever machines, punch cards, optical scan devices and direct recording electronic devices have had little effect on turnout (Kitcat, 2002). Internet voting is now expected to change this, although it did not in the 2002 and 2003 UK local votes. Postal voting did show a higher turnout (BBC News, 2003). Research suggests that information, motivation and mobilization are much more powerful forces shaping voting participation (Internet Policy Institute, 2001). Internet voting could actually depress voter participation in the long run if it is perceived to undermine the legitimacy of the balloting process or feelings of civic participation (ibid., 2001). The fact of the matter is that the more votes the average citizen is expected to participate in, the more apathetic he becomes.

Access remains a problem for e-voting. Despite the narrowing of the 'digital divide', Internet connections are still not distributed evenly across racial, gender, age, regions and socio-economic lines. This is even stronger for the skills needed to use the

technology (Wellman and Haythornthwaite, 2002). Demographic groups with less access and less familiarity in using computers might find some types of electronic voting difficult or intimidating. Government may be making it easier for some people to vote, but not for others (Alvarez and Nagler, 2000). In the end, electronic elections may be even less representative than traditional ones.

The loss of the civic ritual is also commented upon in many academic articles about internet voting. Critics argue that it would make elections less of a community event, which might create a greater gap between citizens and government, thereby decreasing participation. What some people believe is that voting is more than the simple act of indicating one's political preference, it is a vital public ritual that increases social solidarity and binds citizens together (Mohen and Glidden, 2001).

Voter privacy and ballot secrecy has always been a fundamental requirement for elections. Secrecy should be provided during the voting process, while the vote is en route to the election official over the Internet, and after the ballot has been received. Casting votes online causes problems with secrecy, which are less of a concern in conventional voting systems. Also with remote voting (such as voting by mail) family members, colleagues, or employers may try to influence or control the voter's decision. However, with current voting systems, the effects of this are marginal. Internet voting is expected to substantially increase the scale of these problems. Finally, there is a trade off between including technical means for checking that votes have been counted correctly and to determine electoral fraud, and making the voting system secret. The first requires votes to be attributed to individual voters, and this means the secrecy of an individual's vote cannot be 100% assured. The risk is that in a less favourable political climate parties may be able to use such methods to identify opponents (Fairweather, 2002).

6.6 DATA AND METHODOLOGY

In our case study, we will investigate how (potential) users of e-voting technologies think of these risks and opportunities. At the European level, R&D policies stimulate the development of Internet voting technologies, for example, through the IST program. The TRUEVOTE project is one of these projects, and addresses technical issues, as well as implications of using the system in public and private elections, in referenda, opinion polls and surveys. Our research for this paper is based on our work within the TRUEVOTE project.

6.6.1 The case

The TRUEVOTE project aims at developing a safe, secret, and user-friendly system for e-voting, by integrating cryptography and smart card technologies. An important consideration is interoperability with Public Key Infrastructures for digital signatures. A detailed discussion of the technical aspects of the TRUEVOTE system is beyond the scope of this article. However, apart from technology development, the project aims at learning from users and other stakeholders for the design and implementation of the technology. Therefore, users were involved from the start of the project, firstly to

inform about user needs and requirements, and secondly to use the developed prototype in field experiments in five different sites.

6.6.2 Method: focus groups

There are many tools and techniques to involve users. Examples include scenario workshops, rapid prototyping, task analysis, focus groups, mock-ups, and ethnographic fieldwork. Using focus groups has become a key method for the collection of qualitative data. A focus group is a small group of individuals, usually between six and ten people, who meet together to express their views about a particular topic defined by the researcher. A facilitator moderates the sessions and guides the discussion between the participants. In general, focus groups last about one and half-hours and are tape-recorded. The tape-recording can be transcribed for analysis. The focus group enables the researcher to explore participants' views and experiences on a specific subject in depth, in our case the use of the internet for casting a vote. In the normal course of a discussion participants will raise issues relating to the subject that the researcher might not have previously considered and comment on each other's experiences and attitudes (Cronin, 2001: 168).

The focus group sessions were organised as follows. Two categories of users are considered: the *voter*, who will use the system to express his/her opinion on a given issue, and the *pollster*, who is in charge of collecting and elaborating the poll results, or who is otherwise involved with voting systems and processes. Both these categories have different expectations of how a polling system should perform. Moreover, they also have different opinions about the possible effects. In order to make the results comparable, we prepared various materials to be used in all of the sessions: questionnaires, power point presentations about technical, social and political issues around e-voting, and focussing exercises. The original material was written in English, and translated into Italian and Finnish. The moderators of the sessions were native speakers.

Every focus group started out with the participants filling in a short questionnaire. Some basic socio-demographic information was required for analysis purposes and this was collected immediately before the groups started. But the questionnaire involved the collection of more than just socio-demographic background data. We did not only want to establish the age profile of the group members but also their experiences with computers and the Internet, and their voting behaviour. After the questionnaire the facilitator gave a short presentation about Internet voting. A power point presentation and an accompanying text were prepared so that the different focus groups all received the same introduction.

Besides a list of issues that needed to be discussed, the facilitator also had the aid of a so-called 'focusing exercise'. A focusing exercise is an attempt to concentrate the group's attention and interaction on a particular topic (Bloor, 2001). The groups were required to perform a *ranking exercise* in which the participants were offered a list of statements about internet voting and were asked to agree among themselves on a ranking of the statements in order of importance. The discussions about the rankings serve to illustrate the tacit understandings of the participants.

We received oral and written reports from the sessions, including the outcomes of the exercises, and the completed questionnaires, which together form the empirical base for this paper. From the received documents we extracted the most important opinions and expectations in a project wide group session of the researchers involved.

6.6.3 The field research sites

Five partners of the project organised in total twelve focus groups and one online forum; see Table 6.1. We will briefly describe the five partners and focus group sessions they have organised.

Partner	Method	Participants
Abacus (I)	Focus group	Pollsters
CGIL (I)	Focus group	Voters trade union
CGIL (I)	Focus group	Pollsters (political, operating managers)
Glocal (Fi)	Focus group	Online users (voters) of community network
Glocal (Fi)	Focus group	Offline users (voters) of community network
Glocal (Fi)	Focus group	Pollsters
Newham (UK)	Focus group	Voters
Newham (UK)	Focus group	Voters
RCM (I)	Focus group	Registered users (voters) of community network
RCM (I)	Focus group	Non-registered users (voters) of community network
RCM (I)	Focus group	Pollsters from province of Milan
RCM (I)	Focus group	Pollsters from province of Milan
RCM (I)	Online forum	Registered users (voters) of community network

Table 6.1 Focus groups conducted during the first research phase

Abacus is an Italian full-service market research company. Abacus held one pollsters' focus group at their office in Milan.

CGIL Lombardia (Italy), with more than 800.000 members, is the most widespread trade union in Lombardia and one of the biggest in Europe: it counts fourteen regional and local structures, covering the territory with 100 provincial branches and more than 300 local offices. CGIL is mostly represented in medium- and large-sized enterprises in communication, public administration, transports, and chemical factories. CGIL organised two focus groups, one with people working for the trade union (pollsters) and one with workers who are also delegates of trade unions in big companies (voters).

Glocal Ltd. is a Finnish company established as a result of 'The Learning Upper North Karelia' project. Upper Karelia is a remote rural area located in the eastern forest periphery of Finland with a total area of 4500 km2 and a population of about 20,000 inhabitants. Glocal organised three focus groups: two focus groups were held with voters and one workshop with pollsters.

Newham Council is the local authority responsible for administering the area covered by the London Borough of Newham. Newham is situated to the East of London and has a population of around 230,000 people. The London Borough of Newham Carpenters Estate is an inner city housing estate (750 households) with a culturally and ethnically diverse population. Ethnic minority groups make up almost 80% of the total estate

population with more than 30 languages spoken by significant numbers of residents. The estate is among the most socially deprived areas in the UK. Newham organised two focus groups with voters at the Carpenters Estate Community Centre.

The '*Rete Civica di Milano*' (RCM) is the community network in Milan, which was founded in September 1994 at the Computer Science Department of the University of Milan. This network brings together private citizens, non-profit organisations, local government, and private companies. The university organised two focus groups with voters and two focus groups with pollsters. They also initiated an online forum about internet voting on the RCM community network.

There are vast differences in the socio-demographic makeup across the respondents in the different demonstrator groups, including ethnic diversity, migrant populations and income inequality. For instance, the respondents at the Carpenter Estate in Newham have very diverse cultural and ethnic backgrounds, whereas in Italy all participants are Italian. The participants of the Finnish workshops are mainly from a rural area with a high rate of unemployment, while the other participants are all from large cities. The underlying socio-economic status of communities is important as it may be reflected in differences between voting behaviour, computer literacy, and consequently in opinions about online voting.

6.7 RESULTS

6.7.1 Socio-demographic characteristics

The questionnaire for the participants consisted of twenty closed questions. The first category asked general demographic information about the respondent. From the total of 61 respondents, 31 group members were male and 30 were female. The results show that the mean age of the participants is 41. The youngest respondent was 15, while the oldest was 81. About two-third of the people involved were voters. The other participants were professionally involved with voting and polling. Within the 'pollsters' focus groups we tried to achieve a heterogeneous group of individuals with professional interests in Internet voting. The pollsters involved in the focus groups had different functions. First of all, members of the pollster groups were people who had worked as local election officials or as election officials in postal voting. Secondly, city council representatives and city council administration officials were invited. Also present were experts in market research and communication, researchers using social and political surveys, experts in political communication, experts in development of ICT as a means of user participation, and researchers involved in online surveys. The largest group of respondents is employed fulltime; twelve percent is employed part-time, while about a quarter of the respondents were students. In other words, the participants provide a broad representation in terms of age, gender, background and qualifications.

We also asked the respondents about voting behaviour and the results show that older people are more politically engaged. The results show that people over the age of 44 are far more likely to cast their vote. This is in line with the literature reporting that young people are becoming increasingly alienated from the political process (Coleman et al., 2002; Electoral Commission, 2002; Henn and Weinstein, 2001). We also found that our respondents vote 'always' more often at national elections than at local elections, but

the differences are not large. However, voting for European elections shows a significantly lower turnout than voting at local and national level. This also corresponds with the general findings in elections research.

Over half of our respondents *always* inform themselves extensively about the running candidates of an upcoming election. Thirty percent of the respondents do this *sometimes* and about 13 percent *never* inform themselves at all. The people who do inform themselves use different sources to look for political information. The most popular medium to gain knowledge about candidates is the newspaper, but television and conversations with friends and family also score high; see table 6.2.

Sources for political information	**%**
Newspaper	92
Television	87
Friends / Family	57
Radio	49
Internet	43
Flyers / Brochures	38
Political meetings	25

Table 6.2 Information Sources **(**N = 61)

Finally we asked some questions about computer and internet use. Out of the 61 participants, 28 men and 22 women have a computer at home. Thirty men and 25 women use the Internet. Most people use the internet at home or at work, although there are some differences between the different demonstrator areas. We found that using the internet at community centres and libraries was more popular in Newham than in the other areas, especially among UK respondents with an African cultural background. People who consider themselves to be computer literate are over-represented in our focus groups: 64 percent computer literates as compared to 8 percent computer illiterates. The rest of the people do not call themselves computer literate, but feel they know enough about computers to get around[32]. In general, the distribution over the relevant variables is large enough to expect that most relevant opinions about Internet voting may come up in the focus group sessions.

Location	**%**
Home	70
Work	59
School	21
Library	16
Friends/Family	13
Community centre	11
Internet café	7
Other	8

Table 6.3 Location of internet use (N = 61)

[32] The level of computer literacy may influence respondents' opinions about electronic voting in a positive way (familiarity with computer systems) as well as in a negative way (extra concerns about security and

6.7.2 The expectations of the users

Most of the participants in the focus groups were moderately positive about internet voting, in particular about the promised increased convenience. They would like to be able to vote 24 hours a day for more days and they feel that being able to vote at more locations or at home is very handy: “If you are ill or have a cold and just don’t want to go out it is good that you can vote from home”. Some people find it difficult to vote on certain days and feel that e-voting would be more convenient for them. Other advantages mentioned by the respondents were that e-voting might give people more confidence to use a computer; that it will help people without a car to go to vote; it can be taken round hospital wards; and if people cannot get out it can be brought to them (mobile units can go round the estates).

6.7.3 Security

The lack of security and secrecy of e-voting systems was mentioned as a major problem. Many of the participants believe that governments have a lot of information about citizens and are afraid that e-voting will only add to that information. Some respondents are afraid that the ballot is not secret: “This can always be used against you. It can be traced back to you. With the current system it can't be traced back to you”. There is fear that the vote is not anonymous since the operations would be registered on the computer. Because the system is not transparent, participants argue that you cannot see what happens to your vote and therefore cannot be sure it will be counted. The panels also expressed the fear that hackers can get into the system as easy as into other computer programs. People do not fear that hackers will obtain individual voting results, but mainly that they mess up the entire system. Security problems were considered rather important, but on the other hand the majority of the panellists were rather trustful for the possibilities to build a secure system, because banks have also been able to create network banking systems which they trust. Technical faults or possible breakdowns were not considered serious problems; they would be only temporary.

The greatest risk of e-voting, according to a majority of panellists, is the possibility that a voter can be forced by someone else to vote for a certain alternative. As an Italian voter expressed it: “At first I thought it was a good idea but now I fear about the influence and pressure that family members could do on voters”. We found some differences in trust, as overall the Finnish participants trust Internet voting more than the English and Italian. The Finnish believe that the use of a smart card and a separate personal pin code would make voting safer: “The use of a voting card can be compared to the use of the bank card. Most people are used to bank cards and that will in a way ease the use of voting cards”.

6.7.4 Turnout

The majority of the voters expect that internet voting will increase the turnout slightly among young people. They think that it may increase overall turnout at least in the beginning because of curiosity for new technologies and that the effect would not be lasting. Although most focus group respondents feel that Internet voting might have an

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privacy issues).

impact on turnout among the young, they also think that the impact will be rather marginal because they are aware of the general declining trends in political participation. They do not expect that voting methods or technologies make a difference. The voters appreciate the convenience that internet voting will bring them, but they do not think it will be a sufficient measure to encourage current non-voters to cast a ballot. One person argued: “People are disillusioned and that is why they don’t vote”. Other people think that internet voting will not increase turnout because “it complicates the ballots”.

Like the voters, the participants in the pollsters’ focus groups were not very optimistic about the ability of Internet voting to increase voter turnout. According to the pollsters electronic voting cannot solve voting turnout. As one Italian city council representative states: “About the participatory level or turnout we have to say that the electronic tools won’t give any improvement to the problem: electronic voting does not have an ‘educational effect’ to increase the access to vote but only provides a tool.”

The pollsters are very concerned about the loss of the ‘civic ritual’ of casting a ballot and consequently the loss of the importance and the value of voting. The fear is that the system could be considered ‘too cold’ by the voters. The loss of the civic ritual could decrease the significance related to voting and hence overall turnout. They go even further by pointing out the fact that to make the current voting procedures easier might produce an increase of ‘spread ignorance’, that is an increase of ‘superficial behaviour’ and/or a growing oversimplification of voting behaviour.

6.7.5 Digital divide

Although most of the voters involved in our research would be willing to use internet voting systems themselves, they are of the opinion that internet voting should be used only as one alternative voting possibility. According to the respondents such a system cannot be used exclusively because: “For elderly people traditional voting is often a kind of important tradition”. The voters also fear that Internet voting will discriminate against older voters because of their limited experience and knowledge of computers. It was said: “Yeah… the older you are the less willing you are to change and it will discourage elderly people to vote” and “Older people panic about computers and will be put off from voting”. However, the voters do think that the system can be designed in such a way that it will be easy to understand and use, even for those who have never used computers before. The voters from the ethnically very diverse Carpenters Estate in Newham did not think that e-voting would discriminate against ethnic minorities. They stated that a lot of ethnic minorities had a computer. As one respondent argues: “It’s financial rather than to do with ethnic origin. The middle class will be more likely to have a computer but the working class will not so it will enhance the vote of those middle class people”.

6.7.6 Political information

An issue that came up was the relation between e-voting and using ICT for informing the public about the candidates at the election. Although the Finnish respondents believe that the internet may increase the amount of information available, they do not see this as an effect of a diffusion of e-voting. Internet voting would not increase or improve the

availability of information about elections because in Finland “information availability is good enough”. Unlike the Finnish respondents, the English voters felt that e-voting would make it easier to give and obtain political information online about the candidates and that this is something they would very much appreciate. Some of the respondents considered themselves not well informed enough about politics to vote consciously for parties that reflect their own views in order to influence the policies that affect them.

6.7.7 Opportunities for local democracy

Governments actually do increasingly use online techniques as a means of gathering public opinion, ranging from online surveys and opinion polls to local referenda (Coleman and Gøtze, 2002). Participants expressed considerable trust in the possibilities of internet voting to promote the local democracy. Because internet voting promises to be cheaper and easier to set up than the traditional methods of voting it will be easier for local governments to include citizens in political decision making with the use of opinion polls and referendums. The voters feel that the possibilities are larger on the local level than on the national level.

The pollsters have no doubt that the internet is a very useful instrument to improve citizen participation and, maybe, awareness: Internet is spreading on a large scale, it is quite easy to use, it is less expensive than other means such as inviting people to take part in meetings, assemblies, and so on. Especially for local governments the internet may be a useful instrument to involve more people in the process, whereas until now few people have been able to actually exercise their right to take part in the decisions. According to the respondents the ’deliberative poll’ could be a good model: it is a step-by-step process, the first step is to ’launch’ a voting event on a particular issue, the second is to promote discussion by people involved, the third to invite them to actually vote on it. Polls like this and internet-based referenda create actual opportunities for interaction between citizens and institutions.

The pollsters are convinced of the positive impact that internet voting could have on local democracy. New technology allows new ways of engaging with the public about issues that affect them. The pollsters think that e-voting applications could be very useful for surveys, opinion polls and referendums. The community would be able to express its opinion more often. Polls can be quick and decisive and involve large numbers of people. People do respond in huge numbers to polls where they have an interest. For the local government it would be a possibility to have a direct check with their citizens on all sorts of issues. Surveys could be organised on ‘hot’ topics. Indeed, some local authorities have already started to use polls or referendums that give people a limited but clear range of choices (Triesman, 2002).

6.7.8 Voting Results

According to the pollsters the techniques used to cast a ballot do affect the voting results. This is an issue that did not come up during the voters’ discussions. The pollsters emphasized that with Internet voting the following aspects need to be considered: *Presentation*: How are the ballots presented online? Could the different layouts of electronic ballots and traditional paper ballots influence voting behaviour?

Randomization: With electronic ballots the ranking of political parties or candidates may be randomized. Is it legitimate to use such randomization? And, does this generate significant differences in the final results? *Correction*: In the traditional vote it is possible to correct a 'wrong' vote by asking the election officials for a new ballot. Will it be possible to correct an online vote? And if this is the case, how will it be done? Will this influence the voting behaviour? *Voting time*: How long can people stay online and vote? Could allowing more or less time influence the results? *Ranking*: Internet voting offers the opportunity of ranking the vote. In this case people should choose more than one party or candidate and rank them. Is it useful to think about the use of these opportunities? How could they influence the final result? In order to get more people to cast a vote, they need to trust the voting system. According to the pollsters, voters need to have confidence in the 'integrity' of the results. This means that it is important to find out in which ways the actual voting procedure will influence the voting results (Oostveen and Van den Besselaar, 2003).

6.8 CONCLUSION AND DISCUSSION

Our investigation of users' opinions, expectations and demands regarding internet voting leads to the following observations, and to new questions for research and design.

With respect to turnout, the participating voters did not think that internet voting would have an effect on overall turnout, and as far as it does, the effect is expected to be temporal and to disappear as soon as the curiosity is over. Our first observations in the field trials – in the same populations where we had our focus groups – seem to support this (Van den Besselaar et al., 2003). Although this curiosity argument may not apply to young voters, as they generally have substantial internet experience, the participants did expect a slightly positive impact on the turnout of youngsters, as the young are significantly more likely to use the internet than the elderly. The internet thus may represent an important venue for mobilizing younger voters, who have historically been underrepresented in the electorate (Tolbert and McNeal, 2001). However, the study on 'Youth and Voting Behaviour in Britain' (Henn and Weinstein, 2001) shows that to the question "would you be more likely to vote in the future if you could use Internet voting", young people are more responsive to issues of political substance than they are to the procedural mechanisms of voting. In other words, internet voting is not considered by young people to be a substantial reform within the political system and therefore will only marginally modify their behaviour. According to Henn and Weinstein's research, young people would be more likely to vote if they had more information about parties, if there was a party that they considered to represent their views, if there was evidence that their views would be seriously listened to by politicians and decision makers, or if there was a greater choice of political parties available. This debate relates to the results of our focus groups, where the role of civic engagement and political culture for voting participation was emphasized. We return to this issue below.

More striking is that the pollsters also did not expect e-voting to impact substantially on turnout, despite the fact that this is one of the major selling points, especially by

politicians. This suggests that this argument is merely ideological, covering the main reasons for introducing e-voting: financial savings and the larger e-government agenda, which is also motivated by financial arguments. This relates to the next point, the digital divide, which was put on the agenda by the voters, but interestingly enough not so much by the pollsters. Internet voting should not replace the traditional voting systems in the near future, as it may exclude from participating, groups who are able to use the traditional ways of voting. Now this may be a legitimate claim, and politicians in favour of e-voting do generally agree with it. However, if the aspect of saving money is dominant in the introduction of e-voting, the inclination to keep expensive parallel systems alive may in practice be low. Experiences in other sectors support this. Whereas the credit card started as an additional means for paying bills, increasingly transactions are becoming exclusively related to credit cards, such as reserving a hotel room.

There was also a big difference between the voters and pollsters in emphasis of technical issues. Pollsters were very sensitive to many of the technical details, the voters were more optimistic about solving existing technical problems. The end-users (the voters) are concerned about the security of Internet voting, but seem to be quite confident that these security problems can be solved in time. They were much more focused on the normative issues like turnout, digital divide, opportunities for improving local democracy, and the problems of preserving the secrecy and privacy of the vote. But these two issues were also more conceived as social issues than as technical problems (Is government trustworthy? Will voters be able to protect themselves against others trying to influence their vote?). Awareness of these risks results in opposition against e-voting as such, more than in thinking about technical alternatives.

The focus groups identified that e-voting only works if it is embedded in a participatory political culture of active information exchange, deliberation and participation in decision-making. This relates to the issue mentioned by several participants that the traditional voting procedures are also a ritual that should be preserved. As e-voting may destroy these rituals it can have a negative influence on the political culture and therefore is best avoided.

Voters as well as pollsters see internet voting as a means to improve local democracy, but only if it relates to better informing voters, to better supporting deliberation and to involving voters more in the decision-making process. The question remains as to whether this should be done by means of surveys, polls and referenda. However, two different positions can co-exist. More information can support citizen's participation, but also the control of citizens by the administrations that gather the information.

New internet voting systems should somehow be linked to the provision of more information to the voters (Coleman and Gøtze, 2002; Tsagarousianou, Tambini and Bryan, 1998; also Dahl, 1998). However, it is not yet clear how this should work. Should e-voting sites provide links to web sites of candidates or political parties or should there be an independent body, which provides an overview of the candidates or parties' policies? It is important to realize, however, that simply increasing the amount of information available to the voter will not help. The human mind can only encompass a limited amount of information. The quality and credibility of sources of voter information, and the relative 'costs' of accessing these resources are more important for

the quality of an individual's decision than the amount of information available. How Internet voting should be implemented to offer better access to high quality and balanced information needs to be further explored. Similar questions can be asked about systems for deliberation between voters and politicians. The existing experiences with internet-based discussion forums are not very promising. The use of referenda and deliberative polls seem to politicians to be useful tools to re-engage citizens. However, governments should be careful not to use too many referenda to gather people's opinions since evidence suggests that the more votes the average citizen is expected to participate in, the more apathetic he/she becomes (IPI, 2001). And although there is an undoubted advantage that local governments could eliminate the mediators between the people consulted and the people consulting, we have to be aware that by using internet voting systems for consulting citizens there is the risk of reducing the significance of the vote due to excessive use.

This leads to three conclusions. Firstly, the expectations that e-voting will positively effect political participation and turnout seem more a hope and a selling point than something the various stake holders believe in. Secondly, e-voting seems more a part of an e-government agenda to economize on government expenditures, than an agenda for extending democracy. This is cause for concern that e-voting may be soon the dominant mode of voting which may hamper the participation of specific social groups. Thirdly, although most arguments suggest that, in order for e-voting to become beneficial it should be part of a larger e-democracy agenda, we actually do not know enough about how this could work.

We are only beginning to understand how technologies may support democracy and, therefore, we need a better knowledge of the micro dynamics of political participation and communication, and how ICTs intervene in these processes. An agenda of social experimentation should be developed for this, accompanied with a research agenda of detailed observations in and comparison of many different cases. Only then may we understand the subtle effects of ICT based tools on the democratic process.

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7
Social Experiments with E-voting: a Social Informatics Approach

ABSTRACT

A system for e-voting and e-polling was developed and tested in fourteen field experiments. This enabled us to investigate the social and organisational issues when deploying this type of technology. We focused not only on the technical functionality, but also on organisational aspects and on individual and social usability. In this chapter we describe the set-up of the experiments, and use a social informatics perspective to discuss the main results. What do we learn about the organisational problems of organising electronic voting, about voting turnout, about usability and reliability of the system in practice, and about users' opinions about trust, privacy and reliability?

7.1 INTRODUCTION

Until recently, most existing e-voting systems and e-voting R&D projects focused primarily on technological aspects (for an overview: Oostveen and Van den Besselaar, 2002a). Several voting election schemes have been proposed in the last twenty years such as mail mixes, blind signatures, homomorphic functions and even hybrid protocols that combine the aforementioned techniques. But overall, the chosen technical solutions for internet voting seem rather similar. All of the protocols use cryptography and, so far, none of the protocols has managed to satisfy all of the properties (e.g. secrecy, verifiability, simplicity, integrity, uncoercability, etc) which should make e-voting as secure as traditional voting systems (Bruschi, Poletti and Rosti, 2002). Recent disasters with voting technologies (Harris, 2003) show once more that evaluating voting technologies is of utmost importance. Nevertheless, the promises of the e-voting 'computerization movement' (Davenport & Horton, 2005; Iacono & Kling, 1996) are large (Dicston and Ray, 2000; Mohen and Glidden, 2001, Strassman, 1999):

- Convenient and user-friendly voting process which is also available to people unable to go to polling stations thus resulting in higher turnout;
- Reduced election costs, and therefore usable in many decision making situations;
- Safe, secure, accountable, and therefore acceptable to voters and organisers of elections and polls.

It goes without saying that the technical solutions for new electronic voting systems are important for their success, but other issues might be just as decisive (Hague & Loader, 1999; Hacker &Van Dijk, 2000). However, many designers develop tacit scenarios of the ways that people will use systems that often differ from actual conditions and uses. Without user feedback and without studying real life experiments throughout the design process, a new system is unlikely to effectively handle exceptions, complexities and nuances. As is well known but hardly practiced, the organisational context of implementation and use of ICT-based systems will determine success or failure (Oostveen and Van den Besselaar, 2002b; Kling & Iacono, 1994; McLaughlin et al.,

1999). In this chapter, therefore, we emphasize socio-technical aspects of e-voting technologies in a variety of contexts, using a social informatics perspective.

Social Informatics is "the interdisciplinary study of the design, uses and consequences of information and communication technologies that takes into account their interaction with institutional and cultural contexts" (Kling, 2000). One of the core assumptions of Social Informatics is that "context matters". ICTs are seen as deeply embedded in social and organisational contexts in a relationship of mutual shaping (Kling 1996: 27). As Cornford and Klecun-Dabrowska (2003) state: "Precisely because technologies are part of complex networks, embedded in organisational structures and social relations, a successful (sustained, owned, habitual) manifestation in one site does not ensure viability in other localities". The authors emphasize the need for 'greater knowledge (in both policy and practice) of the contextuality of technology'. According to Lamb and Sawyer (2005): "[...] even common technical components cannot be understood apart from the social and organisational milieu in which they exist". Throughout the SI literature we find the notion that complex and technologically innovative systems involve a large number of different actors, spanning institutions and professions. These actors may perceive an innovation in different ways, seeking different things from it, make local decisions as to use, and thus judge its success or failure accordingly. Social Informatics acknowledges that there is a dialogue between actors and that the implementation of new systems depends on the local, situated context. So what constitutes context? Opinions on the definition of context differ, and we conceptualize context here in terms of interdependent and multi-level networks of socio-technical links (Castells, 1991; MacKenzie and Wajcman, 1999; Lamb and Sawyer, 2005). Because these links are primarily local, one needs case studies of local experiments to find out what the 'first order effects' and 'second order effects' are, and under which conditions they occur. By investigating the 'second order effects' of new socio-technical systems in an early phase in real life situations and in a variety of contexts, we may be able to learn about the risks in a variety of small scale and real life experiments, and this can serve as input for a redesign and implementation strategy of the system when required.

Social Informatics researchers have identified, as one major cause of system failures, the exclusion, from the design process, of the people who will be using the system. As we have shown in Chapter 4 and 6, participatory design is feasible and (potentially) useful, if organised appropriately. Nevertheless, proper user participation is scarcely practiced. In the case we study here, users did participate (Chapter 6) but their involvement hardly influenced the design and implementation, as the computer experts already had a very clear-cut idea of the system they wanted to develop.

Apart from user involvement, technology design and use also require careful contextual analysis, as this may indicate how the technology functions in specific situations, and to what extent the first order (intended) effects are attained, and second order (unintended and unwanted) effects occur. One way to do this is through small-scale real life experimentation, in a wide variety of contexts. Here, we study 14 field experiments in which an e-voting system was used in different contexts. In these electronic voting case studies, we had the opportunity to look at a broad range of issues, such as: political struggles within the participating organisations, logistics and organisational complexity, legislation, privacy, the usability of the system, and the role of digital divide. These

issues are partly the 'normal' questions social informatics would ask, and partly based on the results of fifteen focus groups on electronic voting technology we organised with a variety of users (Oostveen & van den Besselaar 2004a). More specifically, in this chapter we will address the following questions:

- What are the diverse organisational complexities, and how do they influence the implementation and use of e-voting technology? What organisational, logistical, technical, political, and legal problems occur and why?
- Are the various social and technical systems components interoperable?
- How is the technical and users support functioning?
- How do voters appreciate the e-voting technology and its usability?
- Does e-voting increase turnout?
- Do different social groups differ in using the technology, and in opinions about it? If so, which groups can be discerned? Does this point at a digital divide?

Other issues such as trust and security, and the effects of voting technology on voting behaviour will be addressed in more detail in Chapters 8 and 9. In the next section (7.2) we will describe the set-up of the field experiments, and the methods we used. We consider e-voting technology as potentially useful in a variety of settings, and not only for political voting. This is reflected in the diversity of the field experiments, which include two municipalities, but also a trade union, and two community networks. Section 7.3 focuses on the main findings. We will show that especially on issues of organisation and logistics many problems were encountered. Finally, in section 7.4, we will draw conclusions with respect to the use of e-voting and e-polling systems.

7.2 SET-UP OF THE RESEARCH

7.2.1 The field experiments: five environments

The experiments were organised in the five different geographical and socio-cultural locations: A small French town in the vicinity of Paris (Orsay), a borough in London (Newham), an Italian trade union (CGIL), and two community networks: one in Italy (RCM) and one in Finland (OYK). We used a variety of e-voting technologies, in order to be able to analyze the specific effects of the technology: a smart-card internet voting system (TRUEVOTE) which was used at home, work, and in school; a web-based voting system (CAWI); and voting computers at a polling booth. Finally, the possibility existed in some cases to use traditional paper voting at the polling booth. We used the experiments to study which factors influence the use of internet voting and e-polling in practice, with the emphasis on naturalistic conditions and generalizability.

7.2.2 Set up of the experiments

Each of the five test-sites organised two or three ballots each, which resulted in a total of 14 experiments.[33] The first and second voting sessions were on local issues, selected by the organising institution. This was quite critical, as the selected topic had to be relevant enough to encourage voter participation in the ballot. The third voting session took place in parallel in the five experimental sites. Organising a multiple-site voting

[33] Between December 2002 and March 2003.

session was important from a technical as well as from an organisational perspective. Technically, we used it to test the voting application in terms of concurrent access, and to check the interoperability of the French and the Italian Certification Authorities. From an organisational point of view multiple site voting increased the organisational and logistical complexity.

The voting sessions included both single choice (yes/no) and multiple-choice ballots. More precisely, the two local voting sessions in Newham asked residents about security issues at the estate. The residents of the Carpenters Estate in East London were asked if they would be willing to help set up and run a Neighbourhood Watch Scheme, to improve the safety of their estate. The second voting session asked the residents how much money they would be prepared to pay to secure a parking space and improve the security in the Estate Car Parks. At CGIL the ballot issues concerned the position the trade union should take on some political hot topics (such as the Italian laws about immigration, the relationships between CGIL and the European Social Forum, the war in Iraq). In Orsay the aim of the ballot was to find out the citizen's opinion about the extension of a regional administrative network with additional municipalities. The topic for the first ballot of RCM was defined, in collaboration with the Milan City Council, about priorities in organising activities during Christmas time, whereas the Province of Milan defined the second ballot about public transport in the Milan region. In the regional community network OYK, the voters were asked if they thought that Finnish welfare services (social, health, and educational services) and the amount of taxes paid are balanced. During the second vote in North Karelia, the citizens were asked if Finland should join NATO. The third and last ballot was on the same topic in all five sites. Taking place just after the start of the second Iraq war, the ballot was about the European dependency on oil, and measures to reduce this dependency.

Orsay, Newham and CGIL used only kiosks with e-voting and with traditional paper based voting, while in the two community networks the large majority of voters used internet voting from home or the office. Additionally, in the two latter cases, some kiosks were installed to enable the participation of groups of people, such as senior high school students and people in neighbourhood offices. During the second local ballot in OYK, the mayor of one of the municipalities, who strongly supported the experiment, asked to have a kiosk put in his office. Apart from the e-voting technology TRUEVOTE, we also used traditional paper ballots and CAWI technology, as this enabled us to compare the various media. In this chapter we focus on the experiences with the TRUEVOTE technology to determine the organisational and logistical issues pertaining to e-voting, and on the usability and user evaluation of the system.

	Partner	Orsay	Newham	CGIL	RCM	OYK	Total
Type of technology	Paper voting	X	X	X			3
	Kiosk e-voting	X	X	X	X	X	5
	Internet voting (TV)				X	X	2
	Internet voting (CAWI)				X	X	2
1st round Dec/Jan 03	Voting duration		2 days	2 days	7 days	22 days[4]	
	Registered voters		83	326	190	310	909
2nd round Feb 03	Voting duration	4 days	2 days	3 days	11 days	10 days	
	Registered voters	925	96	357	303	396	2077
3rd round March 03	Voting duration	4 days	2 days	12 days	12 days	12 days	
	Registered voters	925	96	357	303	396	2077

Table 7.1 Overview of the field experiments

7.2.3 Methods

We studied the 14 experiments using a variety of methods. First of all, the *organisers* of the ballots were questioned about their motives to experiment with e-voting technology. Secondly, the *organisers* of the ballots completed a survey with 44 open questions about a variety of organisational aspects and problems that occurred during the ballots. These questions concerned the set-up and the course of the voting session. Thirdly, we observed the voting process partly using log files and partly in real life. In the current analysis the log files were used to determine the types of breakdowns. Furthermore, data about the outcomes of the ballots was used, mainly to study turnout. Finally, we organised three surveys among the voters (see Appendix A3 for the questionnaires). The voters completed the first questionnaire when they were registering for the smart card. They were asked to provide personal information about their gender, age, occupation, computer literacy, way of using computers, previous voting behaviour, their opinion about e-voting, and about the role of ICTs in society. In the post-ballot surveys the users were asked specific questions about the usability of the TRUEVOTE system, the quality of the system in terms of secrecy (privacy) and safety (against fraud), and their viewpoints related to voting. Furthermore, we enquired as to where the voting took place (at home, work, school, kiosk, etc.) and in some cases what the participants had voted for. We used different questionnaires for the various voting situations (e-voting from home or work; e-voting from a kiosk; voting with CAWI; traditional paper-based voting) and the questionnaires were translated into the various relevant languages.

7.3 FINDINGS

7.3.1 Goals and the politics of e-voting

The motivations for participating in the experiments were different for each organisation. The city of Orsay is well known for its participation in e-government experiments and seems to have developed an identity as an e-town. Orsay had been

involved in previous e-voting pilots, with the main focus on the use of e-voting in elections and other political ballots. Through participation in TRUEVOTE, Orsay wanted to test e-voting technologies to a greater extent and hoped to learn more about the citizens' reactions. Participation was a formal decision of the city council, and seriously supported.

The London Borough of Newham was particularly interested in smart card implications, and had previously launched a smart card pilot project. Anything that could provide additionality, or improve the chances of a sustainable smart card in Newham was of interest to the municipality. Newham had also been involved in other e-voting pilots, and wanted to use its participation in TRUEVOTE for further testing the usefulness of e-voting systems and smart card technologies. The particular benefit Newham hoped to gain was in proof of concept in cross-border authentication. The head of ICT in Newham:

> *"It would be nice to learn that an authentication standard that we can adopt with confidence for our smart card in Newham was accelerated through the work in* TRUEVOTE*"*.

Decision-making about participation in this case was more on the level of the administration, and a few civil servants (supported by an external consultant) were involved in the organisation of the experiments. The experimental site was a housing estate in Newham. However, the leaders of the Tenants Association of the estate were not consulted and were hardly involved in the decision-making, or in the set-up of the specific polls. This led to a (political and power) conflict between the representatives of the municipality and the representatives of the Tenants Association, who did not want to cooperate.

RCM used the voting experiments to enhance local government's awareness of the possibilities of using e-voting applications for citizen consultation, and to increase collaboration with the municipality. For the two virtual communities (RCM, OYK) experimenting with e-voting is part of their efforts to provide citizens with ICT based support for communication and participation. Both community networks already use software for polling and voting. OYK consults the local community on hot topics on a frequent basis, whereas RCM organises an annual election of the members' representatives. As debates about e-voting issues (such as secrecy and accountability) already arose, both community networks were eager to test other systems. The implementation and use of the TRUEVOTE system received large support and commitment from all actors involved.

Trade union CGIL was interested in e-voting as a quick, simple and secure tool for internal elections and consultations. This was expected to increase the possibility of involving lower levels of the organisation in crucial decisions, such as accepting the results of negotiations with employers, or a new labour act proposed by government. The project became part of organisation politics after a change of leadership. The CGIL officials who originally made the commitment to involve the trade union in the test phase were no longer on board during the first voting session. The new leaders had the project thrown into their laps and were only weakly committed. This created internal tension. The situation affected all three voting sessions. As the new board was not convinced about the value of e-voting technologies for supporting internal discussions

and decision-making, the project became only marginal for the CGIL leaders. The project was not abolished, but the higher staff lost interest in it. Although the e-voting infrastructure was ready in the organisation, it did no longer fit in the organisational strategy and culture.

What do we learn from this? E-voting technology is not just a simple tool that improves participation in debate and decision-making. The deployment of the technology also influences power relations as the Newham case showed. Municipalities introducing e-voting may interfere with the existing forms of representation. The case of CGIL shows that the technology is also not neutral from a political culture perspective: what is considered as an appropriate way of communication between leaders and the constituency influences the willingness to deploy new technologies. This is also supported by the outcomes of the focus groups we organised around e-voting: those who value voting as a civic ritual emphasize that going to the polling station is an important aspects of voting, and are therefore opposed to internet based (remote) voting (see previous Chapter). Finally, commitment is needed when one wants to introduce a new technology successfully, as this is often complex, resource consuming, and needs social adaptation. Political and value conflicts in organisations reduce the support considerably, as again became clear when comparing CGIL and Newham with Orsay, OYK, and RCM.

None of the organisers mentioned as a goal that they wanted to make elections cheaper. There is a lot of debate about whether of not electronic voting is cheaper than other methods of voting. We could not investigate this in our case studies. However, from documents acquired through the Freedom of Information Act (FOIA) from Amsterdam City Council we have learned that e-voting from polling stations in Amsterdam is over a million euro more expensive than voting with paper ballots.[34]

7.3.2 Organisational issues

The survey, among the organisers of the field experiments, generated interesting information. The most important issue that came up is the logistics of organising an e-ballot. The process of registering, distributing hardware and software, organising helpdesks and other forms of support for voters proved to be a complex and difficult task. It requires planning of activities of various institutions and actors. In our case we had many actors involved; there was the institution organising the ballot, the certification authorities, and the 'supplier' (developer) of the e-voting service. Because this inter-organisational collaboration is the normal case in operating e-voting technologies, the issue of organising a ballot is of utmost importance.

The *number of actors* involved in the field experiments resulted in a high organisational complexity. In Newham for instance, many key actors were involved and this caused quite a few problems. An independent communications company was employed to liaise with the TRUEVOTE consortium. Staff within Newham Council managed the voting sessions. The estate Tenant Management Organisation was responsible for the relationships with the residents. Newham College provided the computers that were

[34] See for more detailed information:
http://www.wijvertrouwenstemcomputersniet.nl/images/5/56/Financieel_overzicht_tbv_Wob.pdf)

used in the voting kiosks. Carpenters Connect provided the internet connectivity for the two kiosks as the connection provided by the College would have been through a firewall, which would have prevented the voting. In the end the involvement of so many actors formed far too cumbersome an arrangement.

The fact that the large number of involved actors was also spread out over Europe did not help the coordination of the work either. The technical staff in Finland had some initial problems with firewall configurations and ran into problems trying to connect to the servers in Italy during the first voting session.

In addition to a change of personnel a *lack of personnel* was also encountered during the trials. At CGIL the task of providing technical support had been assigned to one person who, at the same time, had to carry out other tasks. So, in some cases he failed to provide the expected support. In Newham staffing problems arose during the last two voting sessions due to annual leave and sick leave of key actors.

In three out of the five participating organisations one of the most important organisational and logistical problems had to do with the *distribution of the system* and the related materials. This may not be important in the case of kiosk voting but it becomes a real issue in remote internet based voting. Changes in the planning (e.g. the need to transfer resources from the mailing of smart cards and readers to the production of smart cards) altered the approach to distributing these materials at the very last moment. In Finland at OYK, the delivery of the materials was the most critical part of the voting session set-up. Cards, readers, and instruction brochures arrived late from the Italian PKI certification authority (Postecom) resulting in a great rush to distribute them to the home users in the few days before the first ballot began. OYK had to use all the human resources they could muster to distribute the materials and had to call in some computer science students to help the on-site (home) voters to install and set up their voting application. The information material for the ballots arrived too late as well, which put a lot of strain on the translation of the brochures and the delivery to the users. At RCM, the delivery plan was also changed a few days before the beginning of the first voting session. The original plan called for RCM users to register online and then receive the readers, the CD-Rom, the brochure and the smart card by mail at home. Because of the mentioned changes in resources, the RCM TRUEVOTERs had to come to a central location to pick up the voting kit rather than receiving it at home, as initially promised. Newham also had problems with the distribution of materials. The organisation of the first session was very chaotic. Because of authentication problems, the voting session had to be postponed several times. It was not until two days before the actual voting session that the personalized smart cards were hand-delivered to the houses of those users who had registered. However, a lot of people never received their cards at all.

It would be tempting to assume that distributing materials to the voters can only be a problem in a pilot study as ours was. However, this type of problems also occurs in large experiments with e-voting, as two UK examples show. The first example is a trial with 16 e-voting pilots that took place in May 2002 and 18 more in May 2003 on a Local Authority level. These elections were in all cases legally binding. Xenakis and Macintosh (2004) have identified different organisational and technical issues based on an analysis of the evaluation reports provided and direct observation. They point out

that there were delays in the delivery of laptops and smart card readers. According to the researchers, the time and resources needed to set up polling stations were underestimated. They talk about inadequate logistical planning of the e-voting sessions. The second example is the election on the 10th of June 2004. The UK government embarked on the largest experiment in all-postal voting for the European and local elections in England. About 14 million voters in the East Midlands, North East, North West and Yorkshire and the Humber had to vote by post. There were no normal polling stations in those areas. Thousands of ballot papers were not delivered on time. In some cases printers missed the deadlines to get the papers to the Royal Mail. Other problems included misprinted ballot forms. Technical issues were blamed for delays by one of the 12 printing contractors, while the illness of a managing director has been blamed for delays at another company. Both examples illustrate that even at high-stake, well-financed elections, the distribution of materials and problems with personnel can have disastrous results with people being denied the opportunity to vote.

A final organisational problem encountered during the trials was an unexpected high *turnout* at the first voting session in one of the locations. In Orsay the organisers underestimated the number of voters that turned up on the actual election days and the three installed kiosks were not enough. The second session based on the European question, was better organised. Orsay increased the number of kiosks from 3 to 4 which significantly cut down on the time people had to wait before they could cast their ballot. An 'unexpected' high turnout at voting sessions seems to happen more often. In the Netherlands, there were major problems with a television program in which the *Dutchman of all Time* had to be elected by the public. Viewers could phone in to vote. Each voter was allowed 6 votes and a computer checked that they did not vote more than these 6 times. The winner was the recently killed populist politician Pim Fortuyn, and second came the ancestor of the Dutch royal family Willem van Oranje (who by the way was also assassinated but in the sixteenth century). The next days, however, it was announced that the order had to be reversed, as many ten thousands of votes were not processed in time due to overloaded communication lines. Obviously this caused quite a stir among Dutch citizens of whom a large majority had already regarded the choice of Pim Fortuyn to be absurd.

We see that with e-voting we can experience the same or even more problems as with traditional or postal voting systems. The problems that occur are not simple 'mistakes', but are structural problems. This teaches us that more experimentation with systems is needed before they are ready to be used in important elections or referendums.

7.3.3 Legal and privacy issues

The organisers had to adhere to the legal requirements of the different countries in relation to personal data management. In Newham the TRUEVOTE system had to be enrolled according to the UK Data protection Act. In accordance with Italian privacy legislation, RCM's lawyer drew up a legal document that voters had to accept. It described in detail both the data flow in the software application and the data management for research purposes. The same document was also used by CGIL. The touchstone in developing an internet voting system is represented by the necessity to meet the requirements of legal principles. All elections have to satisfy basic voting

principles which are formulated in constitutions and electoral laws (Volkamer and Hutter, 2004). It is obvious that the project had no influence on the legal basis underlying the real implementation of e-voting. Many countries are just starting to change their laws and to adapt their legal basis to accommodate e-voting. The Council of Europe is has written a document which outlines the legal, operational and technical standards and the procedural safeguards for e-enabled voting. The *legal standards* in this Recommendation of the Council follow the five basic principles of democratic elections and referenda: universal, equal, free, secret and direct suffrage (Council of Europe, 2004). These principles are equally applicable to e-voting as to traditional elections and referenda. The Recommendations should be integrated in future legislation on e-voting. Not only will it take time for governments to change their laws, but as Braun notices: "[…] the work on e-voting is an ongoing process. The legislation has to be continuously reviewed and adapted to developments in technology" (Braun, 2004). The *procedural safeguards* in the Recommendation describe the necessary transparency, verifiability, accountability, reliability and security of e-voting systems. Clearly, current voting computers do not fit these safeguards, as there is no possibility of a recount (see Chapter 8). Nevertheless, in many places these voting computers are used in real elections. For some reason, these systems were rushed upon voters without any public debate or assessment of the risks involved. However, more recently, public debate has become more intense about these issues (Xenakis and Macintosh, 2005; Dill and Rubin, 2004; McGaley and McCarthy, 2004; McGaley, 2004).

An important requirement for voting technology is that it should enable secret voting. Observing the voters and interviewing the organisers showed that many of the participants paid feeble attention to *privacy issues* during the voting sessions. A couple of voters asked to be left alone, just to simulate the secrecy of voting. Most of the voters said that any information on the screen is hard enough to read from a distance to ensure secrecy. Very few participants asked the organisers about security issues: speed was the real interesting element of TRUEVOTE. Observing the voting sessions also showed that many of the voters kept their smart card and their PIN code together in the same envelope, something most people would never do with their ATM card and PIN code. The voting smart card is obviously perceived as a different item than a conventional bank or credit card.

7.3.4 Turnout

In most countries, decreasing political participation and turnout in elections is a general tendency. One of the claims of the proponents of e-voting technology is that the use of new technologies will make voting easier and therefore may increase the turnout in elections. This is also a major argument behind much of the efforts to develop and deploy e-voting technology. What did we learn in this respect from the experiments?

First of all, there is the issue of recruiting participants for the ballots. If the appeal of new technology is as high as proponents believe, we would expect an easy *process of recruiting*. However, we experienced a large variation in the willingness of people to participate. Actually, the results of the questionnaire show that the participants are much more politically engaged than the average citizen. This was indicated by the voting behaviour of the participants: we asked how many times they voted in the last three

elections, and more than 80% voted in all, and about 12% voted two times during the last three elections. The medium apparently does not attract those citizens that are not already politically engaged. This could indicate that the appeal of a new voting system is in general not very high and that turnout is not based on the voting method, or that there are other more organisational issues that play a part.

Another obstacle was the *registration of voters*. In Orsay, the City Hall organised the voting session, and all residents received an official letter of invitation, which may have positively influenced the number of participants. Every citizen over the age of 18 was seen as an eligible voter and was therefore allowed to take part in the project. Each eligible voter received an official letter from the Municipality inviting him/her to participate in the experiment. In Newham eligible voters were the residents of the Carpenter's Estate. CGIL involved some groups of members and local officials in the experiments, but as described, the new board was against e-voting and therefore the participation remained low. In the two community networks all the registered members were invited to participate, while others, interested in the voting experiment, registered especially to RCM and OYK to be able to participate. However, organisational constraints such as problems with the distribution of the card readers lowered the number of participants. All ballot organisers did a further recruiting of voluntary voters between the first and the second ballot. No further recruiting was done after the second ballot, so the number of registered voters in the second and third round is the same (see table 7.2).

	Test site:	Orsay	Newham	CGIL	RCM	OYK	Total
1st round Dec/Jan 2003	Voting duration		2 days	2 days	7 days	22 days[4]	
	Registered voters[1]		83	326	190	310	909
	Voting attempts[2]		7	231	130	238	606
	Votes		6	221	125	215	567
	Turnout[3]		7%	68%	66%	69%	62%
2nd round Feb 2003	Voting duration	4 days	2 days	3 days	11 days	10 days	
	Registered voters[1]	925	96	357	303	396	2077
	Voting attempts[2]	N.A.	N.A.	155	207	224	586
	Votes	628	10	145	188	210	1181
	Turnout[3]	68%	10%	41%	62%	53%	57%
3rd round March 2003	Voting duration	4 days	2 days	12 days	12 days	12 days	
	Registered voters[1]	925	96	357	303	396	2077
	Voting attempts[2]	477	12	137	168	197	991
	Votes	462	12	135	158	187	954
	Turnout[3]	50%	13%	38%	52%	47%	47%

1. Number of people registering for the vote
2. Registered by the server
3. Votes as percentage of registered voters
4. Period was extended due to logistical problems

Table 7.2 Turnout

Voters, who voluntarily accepted the invitation to take part in the field experiments, received a personalized smart card carrying their digital signature. Votes could be cast either from a kiosk or from a PC (at home or at work) equipped with a smart card reader provided by the project for free. The difference between kiosk and PC voting is that in the second case it is the voter himself who installs the smart card reader and the software (the smart card reader drivers and the voting application) whereas in the case of kiosks the project staff took care of this. Since the voting application was still a prototype unable to support all hardware and software architectures, some eligible voters could not participate because their PC did not satisfy the requirements. Even though people were already registered as community members, they had to register again as voters. Also, as we shall see in section 3.5 hardware and software constraints caused a further reduction in the number of participants. CGIL's recruiting on the other hand was simple as they could use membership lists to select groups of participants that were easy to contact for distributing the smart cards and readers.

Secondly, registering is one thing; voting is another. We found that the turnout at the first voting session was quite high. However, after the first voting session the turnout went down in varying degrees in the various experimental sites, and this suggests that factors, other than using the new technology, are decisive. In Newham turnout was exceptionally low, despite the choice of topics for the ballot that were relevant for the residents of the Carpenters Estate, and despite the participation of the Tenant's Association in organising the ballot. Political participation and computer illiteracy may be explanatory factors apart from the conflict between the municipality and the tenants' representatives. As one of the organisers explained:

> *"Due to the amount of personal information required to register, not many voters registered. The test area is in a multi-cultural and cosmopolitan society, and therefore not all residents speak English. Due to limited resources and budget, a translation of the documents could not be organised"*.

Also for CGIL it proved to be difficult to get the registered members to vote, especially in the later ballots. This might be caused by the fact that the commitment of the (top of the) organisation had disappeared. In the case of RCM the participation remained relatively high and stable, possibly because of the strong identification of members with their community network (Casapulla, De Cindio and Ripamonti, 2001), and the strong interest of the staff of RCM in the e-voting technology.

However, the declining participation was a general tendency over the experiments, as is clear in table 7.2. So if an effect of the new technology on turnout exists, it seems that people quickly get used to the new technology, which then loses its special appeal.

7.3.5 Vulnerability of the system

Turnout is also related to the issue of getting the technology to work. In this section we will discuss the technical vulnerabilities of the system and its impact on voter turnout.

When investigating technical issues related to a new (prototype) system, it is important to distinguish between 'expected' technical problems and unforeseen technical

problems. Because of the experimental status of the system one cannot fail to encounter examples of technical glitches. We will first discuss the expected problems. *Hardware and software constraints* were part of the software prototype. It was not in the scope of the TRUEVOTE project to develop e-voting software which could run on all PCs with all the possible operating system versions. Therefore, we expected limits in recruitment as some potential voters were bound to encounter barriers in hardware (the need for a parallel port and a PS2 port, both being available to install the voting kit) and in software (only some versions of the Microsoft Windows operating system were supported). RCM tried to put this constraint in a positive light by asking excluded voters to participate in the control session, which, being based on standard web-based software (e.g. CAWI), had no special hardware or software constraints.

Another category of expected technical vulnerabilities concerns the issue of *interoperability*. One of the major goals of the TRUEVOTE software was to test software portability from one Certification Authority (Postecom in Italy) to another (Certinomis in France). Interoperability problems arose in terms of an inconsistency in the file structure of digital voter-registration records. This is why Newham had to postpone its first voting session. The smart cards used in Newham were issued by Certinomis. Because of the field inconsistency, the voter could not be authenticated by the UNIMI server, which used the Postecom file structure. It took a couple of weeks to fix the problem.

The second category concerns technical vulnerabilities that were not foreseen. We distinguish here between client-side and server-side problems. It must be borne in mind that the client-side problems affect turnout rate, while the server-side problems are the sole factor to determine the successful voting rates. RCM carried out an analysis after the first voting session to discover why registered voters did not cast a ballot. They phoned those people whose certificate number was not included in the list of valid votes at the end of the voting session and discovered that 42 people did not vote due to 'personal' or 'organisational' problems and 18 people because of a client-side problem with the voting application (see table 7.3). Not including the 25 "no show" voters, there were still 40 people out of a total of 165 who were not able to participate in the voting session. This means that a very high percentage, 25%, of the voters were unable to cast their ballot because of technical problems. The most frequent *client-side error* was due to a conflict between the smart-card reader drivers and the drivers of some version of the Microsoft operating system. An RCM organiser noticed:

> *"Some people agreed to install the reader without first checking whether their PCs satisfied the correct hardware requirements and were thus unable to hook up the reader"*.

Another quite frequent problem at CGIL, RCM and OYK was due to the configuration of the firewall. During the second vote, in which RCM had a ballot of no less than 10 questions, a runtime error 53 occurred due to a bug in some versions of Microsoft Internet Explorer 6, which interrupted the voting session of those users who clicked the 'back' button to review or modify their answers to an earlier question. Without a recovery procedure, these votes were lost. There were also some connection problems. During the first voting session in Finland, the UNIMI network was down for unforeseen Christmas maintenance. This is why this session had to be extended to 22 days.

Total number of registered voters	190
Total number of people who did not vote	65
Of which:	
No Show (forgot, ill, away, personal matters)	25
Failed voting attempts (see table 2)	5
Smart-card delivery problems	7
Not able to come and get reader	7
PC crash (not due to TRUEVOTE system)	73
Firewall / net settings	6
Technical problems with the reader (error 401)	12
Correct votes	125

Table 7.3: Problem analysis (RCM – first ballot)

The most important *server-side problem* concerned a bug in the closing of the voting session SSL connection (voting from kiosk caused the saturation of the maximum of allowed concurrent sessions and the crash of the application). The problem was fixed but some of the votes were lost due to the lack of a resume procedure (not implemented in the prototype). The system had breakdowns at other moments as well. For example, on several occasions the voters were not able to cast the vote because of technical problems at the server site, and therefore not all voting attempts resulted in a counted vote. The number of missed votes was in average 6.3%, 7.4% and 1.6% in the three waves respectively. Although these are substantial percentages, the good thing is that the figures show a decline, suggesting a learning process in operating the technology. If we look at the failed votes in the experimental sites individually, we see a similar pattern. However, on top of this we have to count the large number of technical breakdowns of the system at the voters' site, indicating that users of the technology may need quite some support to have proper elections.

In the previous section, we saw that turnout is partly related to the recruiting and registering of voters, political participation and computer illiteracy. But turnout is also related to the issue of getting the technology working. During the first voting session at CGIL the server went down several times early in the morning. The computers were restarted and the connection re-established without too many problems. After that the voting session ran flawlessly:

> *"We did notice some network slowdowns, but given the complexity of our network and internet connection architecture, it is quite difficult to spot which part of the connection - the voting network vs. our own network - was faulty".*

In Newham the system did not immediately connect on the first day of the first voting session. After 45 minutes the system was fixed, but could not be tested because there were no test cards at the premises. The person responsible had left these cards in his office. Therefore the staff had to wait until the first official voter arrived to discover whether the system really worked properly. This proved to be the case. At the second voting session in Newham the server was down for 5 hours, which of course is very inconvenient for voters.

As the user's survey showed, installing the hardware and software by the users themselves was not unproblematic. Both in RCM and in Finland we observed that the large majority of requests for help came from home voters in need of assistance with installing the hardware and software. This is confirmed by a comparison of turnout of TRUEVOTE users with turnout of voters registered for using the CAWI technology. The latter technology is much easier to use (most people have no problem going to a WWW page, and clicking a button to vote), requires hardly any registration or no registration at all, and no installing of hardware and software. Whereas the average turnout of voters using TRUEVOTE went back from 63% to 51%, the CAWI voters remained on a turnout level of 80%.

The lesson seems obvious. Much more attention should be given to usability when designing and implementing applications for the general public. If we don't want technology to be a barrier, we have to design it as a tool, which can be used without being aware of it, such as a hammer (Casapulla et al., 2001). In other words, ICT applications should become 'invisible' (Norman, 1998; Winograd and Flores, 1996). This was clearly not the case with the TRUEVOTE system as a Newham organiser points out:

> *"It was found that computers were not widely used by the residents, hence some of them had problems navigating through the voting session, and others had to be helped inserting their smart card, selecting buttons, or using the mouse"*.

The implication is that even if the technology is not the most relevant factor in increasing voting turnout, it obviously may be an important factor that can reduce turnout, if not well designed or not well embedded in the existing socio-technical infrastructure. Hardware and software constraints can cause a reduction of the number of participants.

7.3.6 Usability

As a next step, we investigate whether reactions of the users of the electronic voting system are systematically related to their characteristics. If that is the case, e-voting technology may be more accessible for some social groups than for others. This may affect the demography of the turnout, and as a consequence the outcome of the vote. To study the possible demographical effect, we investigated the relation between several personal characteristics (gender, computer literacy, the opinion about the safety and secrecy of e-voting systems), and the evaluation of the various dimensions of the TRUEVOTE system.

The issues discussed in the previous sections can all be seen as dimensions of *usability* in a broad social sense. In this section we will focus on usability in the traditional sense, that is, for the end users, i.e. the voters. As Quesenbery emphasises on her voting and usability website: "Usability - the ability of everyone to use the voting systems easily and effectively - is a key to free and fair elections"[35]. To investigate the usability of the TRUEVOTE system, we observed the use of the system during the experiments. For a systematic evaluation of quality of the system by the users, we distributed a questionnaire after each ballot. These questionnaires consisted of 60 items, and we used them to measure several characteristics of the users; characteristics that we expected would influence their assessment of the e-voting system: apart from age and gender, we looked at computer literacy, trust in e-voting technology, political interest in terms of voting participation, and opinions about the role of ICT in society. Later in this section we will relate the users' evaluation to these characteristics of the voters.

	CGIL	Orsay	RCM	OYK
Female voters (%)	30%	48%	34%	48%
Voters above 65 years old	2.6%	18%	1%	2.2%
Between 50 and 65	3%	36%	12%	17%
Active voters (voted 3 out of 3 times)	93%	83%	73%	66%
ICT is important	80%	87%	84%	89%
ICT is unavoidable	87%	82%	86%	80%
Votes always (almost always)	91%	85%	78%	68%
Votes almost always	9%	12%	12%	11%
N	154	620	379	179

Table 7.4 Characteristics of the voters[36]

Usability of remote voting

Let us first focus on usability and trust in the system by remote voters. Factor analyzing (orthogonal rotation, varimax) the matrix with the item scores shown after the first ballot resulted in several latent variables.[37] Three variables measure levels of trust in e-voting systems: trust in safety, trust in privacy, and trust in accountability of the system. Four other variables represent various dimensions of usability of the TRUEVOTE system, such as ease of use and experienced vulnerability.

First of all, the questionnaires showed that a large section (60%) of the users did trust the safety of e-voting systems against internal fraud and external hackers, whereas some 23% did not trust the security of the system. The remaining 17% were more or less neutral. The level of trust in the secrecy of the vote, that is trust in the privacy

[35] http://www.wqusability.com/articles/voting-intro.html

[36] Based on questionnaire 1

[37] We found some seventeen new variables, of which we use nine in the analysis presented in this chapter (table 7.5).

protection, was much lower. A large majority (84%) did not trust this, and only 5% were confident about the secrecy of the vote, and the other 11% were neutral. The effects of this are analyzed in Chapter 9. Many users think that they can easily verify their vote and correct mistakes. Although verification was included in the specifications, it was not implemented in the prototype used in the experiments. So here we only measure the image that respondents have of the application (see for a further discussion and analysis Chapter 8).[38]

	Yes	Neutral	No	N
Intensive computer use almost every day from home	58%		42%	428
Intensive computer use almost every day from work/school	64%		36%	393
Trust in security (against fraud and hackers)	60%	17%	23%	431
Trust in secrecy (privacy)	5%	11%	84%	433
Trust in accountability (verify the vote)	62%	16%	22%	279
TRUEVOTE is easy to use	92%	4%	4%	281
TRUEVOTE is fast	77%	13%	10%	279
TRUEVOTE is easy to install	65%	15%	20%	260
TRUEVOTE is robust (not vulnerable for pincode/pincard loss)	52%	21%	27%	280

Table 7.5 Opinions about usability of the system: the remote voters (OYK, RCM)[39]

As far as the usability is concerned, the factor analysis results in four variables representing different dimensions of usability. It is interesting to note that the users clearly assess the usability dimensions differently. Most users (92%) find it easy to use, and slightly fewer users (77%) think that the system is fast. The more complex aspects of usability are clearly less well developed: installing the system is considered easy by 65% of the respondents, and also the loss of smart cards or PIN codes turned out to be a specific user issue. About 50% considers the system to be robust, and losing the smart card or PIN code is perceived as a (big) problem by 27% of the respondents. At the first voting session only a couple of people forgot to bring their personalized smart card. Some had already lost their card or forgotten their PIN code. At the second and third session this number increased significantly. Since the project did not support smart card re-issuing, these voters were excluded from the voting sessions. This partially explains the decrease of voting from one session to the next one. OYK, the Finnish community network participating in the project, had little problems with users' support. There were no problems with lost PIN codes or cards, and no problems in understanding how the system worked. Even at the kiosks the users understood how the application worked and did not have to call on staff for help casting their vote.

[38] We do not pursue the issue of accountability further, but this is a central issue in the discussion of e-voting. The main critique on e-voting is that – in case of doubt about the correctness of the outcome - a recount of the ballots is impossible. Critics therefore want to abandon internet voting, and demand a paper trail in case of kiosk based e-voting.

[39] Based on questionnaire 2, after the first voting session.

Summarizing, we can state that the opinions of the remote voters about the usability of the TRUEVOTE system are relatively positive, given that we were testing a prototype. But the more difficult issue of installing the application is considered rather difficult by quite some voters, and trust in privacy is absent. Within this context it is important to remember that the data analyzed here are from two community networks, with probably a higher computer literacy than can be expected in average.

Usability of e-voting in kiosks

Besides the group of remote voters we also had a large group of kiosk voters in the project. How did these French and Italian voters who primarily used the e-voting kiosk judge the different aspects of the TRUEVOTE system? In table 6 we present an overview of the same issues as in table 5, but now based on the questionnaires of the kiosk voters from Orsay and CGIL. We see some interesting similarities, but also some striking differences. As expected, the online communities show a more intensive computer use from home as well as from work. The answers from the kiosk voters show that only a third of them trusts the safety of e-voting systems against fraud and hackers, while 50% does not trust the security of the system. This is in stark contrast with the remote voters group, where the trust in security is much higher. Unlike the security variable, the variables 'trust in privacy' and 'trust in accountability' show comparable outcomes as those of the remote voters, with trust in privacy being very low and trust in accountability being quite high.

	Yes	Neutral	No	N
Intensive computer use almost every day from home	37%		63%	498
Intensive computer use almost every day from work/school	47%		53%	449
Trust in security (against fraud and hackers)	33%	17%	50%	506
Trust in secrecy (privacy)	4%	10%	86%	327
Trust in accountability (verify the vote)	75%	13%	12%	277
TRUEVOTE is easy to use	91%	7%	2%	277
TRUEVOTE is fast	39%	46%	15%	277
TRUEVOTE is easy to install	N/A	N/A	N/A	0
TRUEVOTE is robust (not vulnerable for pincode/pincard loss	23%	36%	41%	274

Table 7.6 Opinions about the usability of the system: the kiosk voters (CGIL, Orsay)[40]

It is interesting to see that even though the kiosk voters have less experience with computers, they still rate the usability of the system as positive as the remote voters. Apparently the system was built in such a way that it is also easy to use for people who don't use computers very often. But although the kiosk voters had no problems with the use of the system, they did not rate it as very fast. Interviews with the kiosk voters revealed that the reason for this was to be found in the comparison they made between electronic voting and using traditional paper ballots. The respondents pointed out that it

[40] Based on questionnaire 3, after the third voting session.

was faster for them to mark their ballot papers with a cross (X) beside their favourite candidate before folding it or putting it into an envelope and then into the ballot box, than to insert a smart card, type in a PIN code, scroll through a number of computer screens, tick a choice, and finally confirm their vote.

Finally, the kiosk voters are more concerned about the vulnerability of the TRUEVOTE system with regards to PIN code and PIN card loss: this is perceived as a problem by 41% of the respondents. Only 23 % finds the system robust.

Summarizing, we can state that the opinions of the kiosk voters about the usability of the TRUEVOTE system are less positive than the opinions of the remote voters. The fact that the kiosk voters less trusted the security of the system, and found it more vulnerable could be related to their level of computer literacy. Testing this, our analysis showed that there is a significant (but not very strong) correlation between the opinions about security and vulnerability, and the level of computer literacy of the respondents.

The analysis shows that the opinions of the voters correlate with characteristics of the voters. Firstly in all experimental sites, women tend to be more positive about the usability (navigation, number of screens, readability of screens) of TRUEVOTE than men. This applies to the remote voters as well as to the kiosk voters. Secondly, we find national differences between the voters' opinions. Finnish remote voters are more positive about TRUEVOTE than Italian remote voters, and whereas Finnish voters tend to become more positive over time, the opposite is the case for Italian voters. In the group of kiosk voters we see that the Italian voters are in general more positive about the TRUEVOTE system than the French voters. The French see more risks in losing their PIN code or smart card; have less trust in the privacy of the system, and far less trust in the security. Thirdly, the age of the voter correlates moderately with the evaluation of the various usability and trust dimensions. The older people are the more negative they score on usability and on trust. This by the way does not relate to the opinion about e-voting in general, which does not correlate with age. The setup of the experiments did not enable us to have representative samples of participants in all the five locations. As consequence, it is difficult to separate the effects of various independent variables on the opinion about the system, such as nationality and computer literacy. More research is needed here.

Finally, the more frequently respondents use a PC and the internet, the fewer problems they have with installing the application. This implies that the digital divide remains important, but not in terms of access but in terms of experience and skills. Development work to make installation easier is probably needed, but also a good support system to help voters with installing. Finally, trust in the security of the system influences the voters' opinions about the TRUEVOTE system considerably. Voters who trust the security of the system have a higher trust in the accountability of the system, a more positive assessment of its speed, find it easier to use, and find the application less vulnerable. As we discuss in chapter 8, this shows that the *trust* in the security of the system – and in its institutional and legal aspects – may be more important for success than the nature of technical characteristics of the e-voting system. Trust in the secrecy (privacy) of the system is not related to the users' evaluation of the quality of the system. Obviously, users see privacy as an issue independent from all the other usability and trust issues.

7.3.7 The digital divide, and the need for support

On average, casting the ballot took less than 5 minutes per participant. Every kiosk voting session had a tutor side by side with the participant, who could, if necessary, help with each and every step. However, only very basic help was needed, since the on-screen instructions were both simple and clear (see figure 7.1). As a CGIL organiser remarked:

> *"Some of the early users were amazed about the ease and speed of the voting system and literally stared at the screen at the end of the voting process wondering "is this all?" Maybe, there's a common place about weird technology and strange voting procedures associated with e-voting. Some participants asked specific questions about the future use of smart cards and some speculated about the future use of the smart card they were holding".*

Figure 7.1 The voting application interface (screen 1)

At RCM a number of voters analyzed the user-interface and gave feedback on improving the usability. Overall, we saw that users were enthusiastic about the system and found it easy to use (table 7.5). The users also trusted the system to work properly and not to mess up their vote. At CGIL voters were happy to participate the first time because they were curious about a new technology, but after the novelty wore off, their interest rapidly decreased.

Analyzing the organisers' feedback, voters can be grouped in three distinct categories – based on their computer literacy and the kind of voting experiment they are involved in. First, there are the *computer literate home voters*: not necessarily computer experts, but with quite a good confidence and frequency in the use of computers. Voters from RCM and OYK mainly belong to this category. Second, there is the group of *computer literate kiosk voters*: this is a separate category because kiosk voters, differently from home voters, do not need to install the voting kit themselves. Part of the voters in Orsay and most CGIL voters belong to this category. Finally, we have a group of *(computer) illiterate kiosk voters*: part of the voters in Orsay and most voters in Newham belonged to this category; the meaning of the parenthesis is that the illiterate voters in Newham were also people with difficulties with the English language.

The reaction of these different user categories to the voting experiment can be summarized as follows. Computer literate home voters and computer literate kiosk voters were both quite satisfied with the ease and speed of the voting procedure. Remarkably enough, people that were less computer literate (many of the participants in Orsay and Newham) also rated the ease of use of the system very high. They seemed even less critical than the computer literate participants. Some of the kiosk voters in Orsay (especially elderly citizens) and CGIL requested support to help them insert the smart card. An organiser from the city of Orsay said:

> *"We were happy and surprised to see a lot of old people! The voters are not only young and involved with the internet revolution. For some of the people it was their very first experiment with a computer. So this test was also a pedagogical lesson"*.

The voting sessions, besides having some technical problems, ran smoothly in most cases, requiring only a few minutes for the logging process associated with the smart card, a quick reading of the on-screen instruction and ballot page, and the voting part itself: the voting decision was the quickest part of it all.

Computer illiterate kiosk voters in Newham had very basic problems. First of all, the user did not understand where, when and how the smart card had to be used. A general problem was associated with the perception of the PC accessing the smart card: although several on-screen signals are given, users often tended to remove the smart card before they were told to. Organisers from CGIL worried whether this could lead to electrical shocks or a malfunction of the on-board chip in the long term. The older voters in Newham found the use of the mouse to be very difficult. Touch screens would have been a far better option for this category of users. The voters also had difficulties with the amount of screens. We did not encounter this problem at any of the other sites and can assume that it is related to the difficulties a lot of the voters had with the English language. These computer illiterate voters were helped by the staff and once they had completed the voting successfully, they were excited and positive about the system. At the kiosks, no questions were asked about the voting procedure, privacy and security issues.

A main problem field is the organisation of the users' support, especially for the e-voters from home. We observed that the large majority of requests for help came from home voters in need of assistance with installing the hardware and software. At RCM many voters used the online helpdesk. Users sent 1016 private emails addressed to the

TRUEVOTE RCM staff, another 427 questions and answers were handled in a dedicated public forum in the community network. Questions mainly concerned technical issues, but in the public forum people also asked questions about more general issues concerning e-voting. A specific user issue has been the loss of the smart-card or of the PIN code.

Further work on similar data is needed for a better understanding of the factors underlying the users' opinions. This may teach us to what extent the voting technology is equally accessible for different social groups. However, we can summarize our findings with respect to usability and the digital divide. From our analysis we have learned that the opinions of the voters are related to characteristics of the voters. We made a distinction between the usability of remote voting and of kiosk voting. We saw that in both situations the users found the TRUEVOTE system very easy to use, independent of how computer literate they were. The main difference between the remote voters and the kiosk voters was that the less computer savvy kiosk voters have a significantly lower trust in the security of the TRUEVOTE system than the remote voters. Overall, women are more positive about the systems usability. The opinions about the system are also related to the country people came from and to the general trust they have in the security of the system.

7.4 CONCLUSIONS

Social Informatics researchers examine ICTs from multiple perspectives. They look at the various people who use ICTs in different contexts, but also at the people who design, implement or maintain them (Lamb, Sawyer, Kling, 2000). The 14 field experiments with the TRUEVOTE system provided an opportunity for ballot organisers, as well as voters, to practice e-voting. A number of practical problems arose and the experience gained in the experiments has to be taken into account when organising future computer-based elections. This chapter has shown that when designing and introducing e-voting technologies, issues, other than technical, have to be considered. As Lamb et al. (2000) point out: "ICTs do not exist in social or technical isolation". We identified some of the important technical but especially non-technical problems of the e-voting application.

Firstly, the experiments show that the discussion about e-voting should be extended from general elections to the larger field of consultation and participation of citizens in a variety of organisational contexts.

Secondly, the expectation that e-voting will increase participation is not supported by our experiments, and we find indications for the opposite effect, when the technology is not well designed and properly embedded. If the usability of the new technology is insufficient, it may result in lowering participation. On the other hand, trust in the system seems to be more important than the technical characteristics themselves (this will be further elaborated in Chapter 8). In other words, the legal and institutional context of the deployment of e-voting technology is rather decisive.

Thirdly, introducing an e-voting system or any other major change (especially those involving new technologies) into an organisation is a resource-consuming activity (capital, time, energy, attention, etc). However, resources are often scarce in many

organisations. The experiments show that limited resources and budget have an impact on the success of organising a ballot and increasing turnout. PR materials, translation of documents, and support, all require a substantive amount of money. Because we think that e-voting systems have particularly great potential in local organisations, trade unions, community networks, and other contexts where it is more difficult to devote resources to voting and polling than in traditional elections, special attention to the issue of resources is required. Many potential users of e-voting technology will have to use it with relatively low resources.

Fourthly, various actors play a role (such as the organiser of the ballot, the certification authority and the e-voting service provider), and the resulting complexity of organising e-voting is an issue that needs further attention. When organising and implementing a new e-voting system a planned approach is essential. The plan does not have to be complex, but it does need to be organised. Within each organisation or local government one person should be allocated responsibility for system implementation management. Staff needs to develop skills to ensure successful implementation of technological changes. All of the actors involved in the project should participate to ensure that all aspects are considered. Technical support should be obtained as required, while making sure that illness or change of staff will not influence the whole project. A plan should be developed covering equipment, testing, training and implementation. Training needs to be provided to the people present at the kiosks and enough initial support should be available in the first few days. It is also important to prepare and provide user-friendly documentation to those involved. A planned approach is well worth the effort: many problems can be avoided this way.

Finally, we established that there were quite a few user-related problems. People had difficulty installing the hardware and software. Other users had difficulties understanding the new technology (How do I insert the smart card? How do I use the mouse?). This problem could be solved by increasing the usability of e-voting systems by making the ‘technology invisible’ (Norman, 1998). However, voting technology should also be transparent, and this may be incompatible with ‘invisibility’. Norman points out to us that the device should fit the task and the person who uses it, rather than requiring that the person adapt to the technology. Another solution is to make sure that there is enough support available for the users, and that they have easy access to this support. When technology is not well designed and properly embedded or if the usability of the new technology is insufficient, it may result in lowering participation. The usability of the technology also relates to the issue of the digital divide. Although in terms of access to ICT the digital divide seems to be closing (Wellmann and Haythornthwaite, 1998), we saw considerable differences in computer literacy and this is related to the amount of difficulties with installing and using the system. We, therefore, cannot assume that every citizen has similar access to e-voting possibilities. Technical and organisational solutions should be investigated, in order to overcome these barriers.

All these issues open the debate about the benefits of e-voting. Given the complexity and the implied costs to organise e-voting in a reliable way, one may argue that the traditional paper-based vote may be the better option: cheaper, transparent, and accountable: as it allows for recounting (for the last issue see Chapter 8).

8

Security as Belief: User Perceptions on the Security of Electronic Voting Systems[41]

ABSTRACT

In this paper a pilot e-voting system is being studied in order to gain insight into the complexity of IT security issues. The current debate about whether or not electronic voting systems need to have a verifiable paper audit trail provides the context of the paper. Contrary to public perception, there is a long history of technical "glitches" and irregularities involving voting machines. According to many researchers a voter-verified paper audit trail is the only way voters can have confidence that their vote has been recorded correctly each time, and that recounts and spot checks are possible. However, more and more well-known technologists acknowledge that security mechanisms are fundamental social mechanisms. In all of this the issue of trust is of great importance; people no longer have a blind faith in scientific objectivity and do no longer trust the "experts". In this paper we will examine the opinions of users involved in the testing of the TRUEVOTE electronic voting system, in particular concerning issues like security, verifiability and trust. The results do indeed suggest that IT security is more than just a technological issue.

8.1 INTRODUCTION

In an attempt to modernize our election process by moving from paper ballots towards the world of digital computers, governments might be jeopardizing our democracy. Many politicians and legislators are in favour of electronic voting. They see many possibilities in this new technology. Most proponents of electronic voting argue that the adoption of such systems would increase voter participation, especially among youths, overseas personnel, business and holiday travellers, and institutionalised or house-bound voters. Increasing voter participation is of interest because voter turnout has been low and declining in most countries. Election directors are also quick to pick up on the argument that electronic voting may be the cheapest and most efficient way to administer elections and count votes. Tedious duties such as counting every ballot twice

[41] A shorter version of this chapter has been published as: A. Oostveen and P. van den Besselaar (2004) Security as Belief. User's Perceptions on the Security of Electronic Voting Systems. In: *Electronic Voting in Europe: Technology, Law, Politics and Society*. Edited by A. Prosser and R. Krimmer. Lecture Notes in Informatics. Volume P-47, p73-82. Bonn: Gesellschaft für Informatik. ISBN 3-88579-376-8.

and double-checking the process to avoid human errors cost millions. However, the cost of online voting would vary enormously depending on the type of system employed and the type of security used such as passwords, software, and biometric identification (Coleman et al., 2002). Electronic voting will also be the quickest way to count votes. If votes are cast online the results will be known within minutes after the election.

But from the first trials with e-voting onwards, there has been a lot of concern about the security of computer-based voting systems. Online voting systems have a lot of technical vulnerabilities. Already in 2000 the California's Internet Task Force concluded that the 'technological threats to the security, integrity and secrecy of Internet ballots are significant'. The general feeling was that although electronic voting is nice in theory, the security is still not sufficient. The British Independent Commission on Alternative Voting Methods also published a report recommending a delay of Internet voting until suitable security criteria are in place (Coleman et al, 2002).

Computer-based voting systems have to satisfy a number of criteria in order to guarantee a democratic election which is free, equal and secret. Broadly speaking, each election involves four distinct stages. First of all there is the registration of the voter. Prior to the election the voters prove their identity and eligibility. An electoral roll is then created. The second step is the validation. During the election, voters are authenticated before casting their vote. Only one vote per voter is authorized. After that the voters are allowed to cast their vote. Finally, there is the tallying stage. At the end of the voting period, all votes are counted. Each of the above stages can take place by using physical or electronic procedures. As said before, to design an e-voting system that can be used for large-scale elections, it is important to identify a set of publicly acceptable and technologically neutral criteria (IPI, 2001). Firstly, the election has to be democratic. Only authorized voters should be able to vote. A voter registration system should verify the voters eligibility (i.e. determine citizenship, age, legal residence, and that the person is still alive), and no voter can cast more than one vote. Secondly, the election needs to be accurate. Votes may not be altered, duplicated, or removed undetectable, nor should invalid votes be tabulated in a final tally. Election systems should record votes correctly. Thirdly, the election needs to be private. All votes remain secret while the voting takes place, and each individual vote cannot be linked to the voter who cast it. The fourth criterion is non-coercibility. No one should be able to determine how any individual voted, and voters should not be able to prove how they voted (which would facilitate vote selling or coercion). Finally, the public confidence in the election process depends on the verifiability and auditability of an election. There must be assurance that all votes cast are indeed counted and attributed correctly. As each vote is cast, an unalterable record must be created ensuring a verifiable audit trial (reliable and demonstrably authentic election records).

In this paper we focus on the criterion of verifiability. Public confidence in the manner in which ballots are counted is fundamental to the legitimacy of the electoral process. Electronic voting is likely to lead to changes in how the public maintains confidence in the integrity of elections. Internet systems pose a problem in that the tallying process is not transparent. With electronic voting systems, public confidence in the election relies on trust in technical experts instead of a transparent process (IPI, 2001). Media stories about various security threats to the internet have an immediate impact on public

confidence and past failures have made people distrustful. Electronic voting may not achieve the goal of increasing turnout if voters do not trust it. There are many ways to make electronic voting more secure. Mechanisms that form the structure of security are for instance Personal Identification Numbers (PIN) or passwords, encryption, digital signature, smart cards or biometric identifiers. It is important to make the voting and counting processes as transparent as possible. Because of this transparency there will be a greater confidence in the process and the result. Trust in an electronic voting system means having confidence in the machinery and infrastructure, rather than simply in the physical and administrative processes. All non-free software is secret by nature and there is virtually no way to be sure that the software does not include a trick to change the results of the vote. As McGaley and Gibson point out: "apart from the obvious requirement that the votes are tabulated correctly, it is vital that the votes are seen to be tabulated correctly. A voting system is only as good as the public believes it to be" (2003: 4). A relatively simple way to provide a voter-verified physical audit trial was proposed by Mercuri. Her method requires that 'the voting system prints a paper ballot containing the selections made on the computer. This ballot is then examined for correctness by the voter through a glass or screen, and deposited mechanically into a ballot box, eliminating the chance of accidental removal from the premises. If, for some reason, the paper does not match the intended choices on the computer, a poll worker can be shown the problem, the ballot can be voided, and another opportunity to vote provided' (Mercuri, 2001).

Unfortunately, most of the electronic voting machines presently used in different countries do not provide a paper trail that can be compared to the machine count. So a recount is as good as impossible. Harris's research shows that there have been numerous voting machine errors. All these errors came to light by accident when voters' rolls were compared with voter tallies and the numbers didn't add up, i.e. the number of votes cast did not match the number of voters who had signed in. Harris says: "Because hardly anyone audits by comparing actual ballot counts with machine tallies, we are not likely to catch other kinds of errors unless something bizarre shows up" (Harris, 2003: 33). She continues to point out how frightening it is that for every machine miscount discovered, there must be a hundred that go unnoticed. This impossibility to find out whether a machine counted the votes accurately is a major security issue.

No matter how undisputable the importance of technological security solutions (like voter-verifiable audit trails) are for gaining the trust of users, we think it is also indispensable to look at the more sociological issues that are at play. It goes without saying that a voter-verifiable audit will improve the trust of people in electronic voting systems, but history has shown us that trust in a new technology an sich is not sufficient for its success and adaptation. Neither can we state that trust in technology is always based on the actual state of the technology itself. In this paper we will show that the opinion of users about the security of systems is often based on perception and not so much on actual facts. In other words, people will use insecure systems if the feel or think they are secure. They base this perception of security on things like: the reputation of the organising institution, the attitude of the mass media, the opinions of friends and family and the convenience it will bring them. This paper tries to point out the importance of the socio-political context. Software may reduce the amount of trust you need in human beings, but as one moves about in the world, the sense of security,

privacy and autonomy turns out to be “a function of social structures” (Ullman, 2000). This is an explorative study and it is not our goal to explain the opinions of users about the verifiability of the TRUEVOTE system. We try to show that the belief in verifiability is not based on the technology itself but is more an issue of trust and opinions about new technology.

8.2 VOTER-VERIFIABLE ELECTRONIC VOTING

> “*Providing a voter-verifiable audit trail should be one of the essential requirements for certification of new voting systems."*
>
> David L. Dill, 2003

People should not just be able to vote, they should also have a voting system that can be trusted. If citizens don’t trust that the elections they participate in are fair and the machines count right than they will never accept that those votes represent their voice. It is therefore that most computer scientists, social researchers and engineers are promoting a hybrid system. They favour touch screen machines with a voter-verified paper ballot, with an audit that compares the two against each other. With electronic voting systems there is always the risk that a program flaw or tampering with the software could change votes and even change the outcome of elections. And these changes may not be detected because of the secrecy of the vote. Since ballots are secret, once the voter has cast his ballot and left the polling booth, no one will be able to detect or correct possible errors that the machine made in recording the votes. Computer scientists say that the solution is relatively simple; all voting equipment should require a voter verifiable audit trail which provides a permanent record of each vote. This way the voter can check to ensure that it represents their intent. The free e-democracy project describes the way e-voting should be run in the future. The first step is that a voter casts his vote through a computer and clicks to send it. At this point the vote he wishes to cast is printed and checked by the voter. If the vote on the computer and that on the slip of paper matches than the voter continues. Otherwise he discards both and contacts an official. The paper votes are then deposited in a secure place such as a ballot box. It is vital that the voter doesn’t keep the paper so that he can’t prove to someone that he has voted a certain way and get paid for it (Kitcat, 2003). When there is any doubt about the results of the election, there is the possibility of a manual recount. Without this requirement it would be impossible to have the confidence that our elections reflect the true will of the voters.

There are three reasons why the discussion about the security of electronic voting systems seems to have focused lately on the necessity of a voter-verifiable audit trail. First of all, the discussion about the need for voter-verified systems got a great impulse after the Florida election debacle, when the Institute of Electrical and Electronics Engineers (IEEE) took up the question of standards for voting equipment. The IEEE created a working group, called Project P1583. Unfortunately, instead of using this opportunity to create a good national standard, which would set benchmarks for the security, reliability, accessibility and accuracy of these machines, P1583 created a weak

standard that would have led to unsafe electronic voting machines (Manjoo, 2003b). Even more problematic, the standard failed to require or even recommend that voting machines be truly voter verified or verifiable, a security measure that has broad support within the computer security community. A number of respected scientists involved in electronic voting were so appalled by the proposed new standard that they urged IEEE members and others to write to IEEE to express concern about their draft electronic voting machine standard. They warned that the future of democratic systems in the U.S. and around the world would be implicated by this standard. They stated: "We also support the idea of modernizing our election processes using digital technology, as long as we maintain, or better yet, increase the trustworthiness of the election processes along the way. But this standard does not do this, and it must be reworked." (Manjoo, 2003b). The main thing that has to change about the proposal according to these experts is that it should provide voter-verification. The point of the verified voting systems is that they preserve anonymity while providing two benefits: voter verification, and an ability to create a check on the machine. If the machine count and a count of the verification printouts don't match, then something is amiss. Without a form of voter-verification this would not come to light.

A second reason why more and more scientists started to worry about electronic voting systems without voter-verification was the uproar about the Diebold voting system. Numerous reports have found Diebold machines and other computer voting systems vulnerable to error and tampering (Kohno et al, 2003; Harris, 2003; Konrad, 2003, Manjoo, 2003a, 2003c). In general, no one is allowed to see the code used by electronic voting machines. Computer scientist David Dill says that when he started asking questions about voting machines, he received answers that made no sense. "It is frustrating because claims are made about these systems, how they are designed, how they work, that, frankly, I don't believe. In some cases, I don't believe it because the claims they are making are impossible" (Harris, 2003: 120). Dr. Dill is limited in his ability to refute the impossible claims because of the secrecy of the data; machines can't be examined and manuals can't be looked at. Computer technician David Allen says: "These things are so secret we're supposed to just guess whether we can trust them" (ibid.). But lo and behold! More or less by mistake Diebold, the major manufacturer of e-voting systems published the source code of their system on a public internet site. Harris discovered that Diebold's voting software is so flawed that anyone with access to the system's computer (the election supervisor, their assistants, the IT people, the janitor) can change the votes and overwrite the audit trail without leaving any record (Manjoo, 2003c). But someone could also get in to the system by hacking the telephone system or by going backwards in through the Internet (ibid.). This security flaw was already brought to light in October 2001 by Ciber Labs but Diebold did nothing to fix it. Even worse, a memo written by Ken Clark, an engineer at Diebold, says that they decided not to put a password on this system's 'backdoor' because it was proving useful. They were using the backdoor to do end runs around the voting program. After the election Diebold had "scrubbed clean the flash memory and gotten rid of the small cards that store the results from each touch-screen machine" instead of hanging on to the data for 22 months which is customary with paper ballots (Manjoo, 2003c). Scientists at John Hopkins and Rice also found that the security in Diebold's voting software was "far below even the most minimal security standards applicable in other contexts" (Kohno et al., 2003). Their report shows that worries about insider threats are

not the only concern, but that outsiders can also do the damage (ibid). To summarize, by investigating the Diebold source code, the researchers found that voters can easily program their own smart cards to simulate the behaviour of valid smart cards used in the election. Also, undesirable modifications could be made by malevolent poll workers or maintenance staff before the start of the election. Furthermore, because of the lack of cryptographic techniques in the protocols, even unsophisticated attackers can perform untraceable "man-in-the-middle" attacks. Finally, a developer could easily make changes to the code (by inserting arbitrary patches) that would create vulnerabilities to be later exploited on Election Day (Kohno et al., 2003: 4). In reaction to the security issues identified by computer scientists, Diebold claims that the John Hopkins team is not very familiar with the election processes, makes false technical assumptions, has an inadequate research methodology and makes insufficient use of input from election experts (Diebold Election Systems, 2003, Kohno et al., 2003). The voting machine vendors furthermore state that researchers should have reviewed all the different layers of security in voting systems together. Sequoia Voting Systems for instance believes that: "Election security must be viewed as a combination of numerous layers of security that, taken individually may be insufficient, but taken as a whole, provide accurate, secure and accessible elections. […] The key to election security is in the people and policies that govern the use of voting equipment as much as it is in the design of each voting system. The review of any voting system must take all those factors into consideration." (Sequoia Voting Systems, 2003). However, public concern was so great that Maryland's' Governor Ehrlich commissioned a special report by a national computer software company, SAIC, on the security of Diebold's system. The 200-page SAIC report confirmed numerous failings, including the lack of tampering and fraud protection and the lack of capacity for recount[42].

The third reason why computer scientists doubt the trustworthiness of electronic voting machines without paper backups is the fact that computerized voting gives the power to whoever controls the computer (Collier & Collier, 1992). Lynn Landers writes: "Only a few companies dominate the market for computer voting machines. Alarmingly, under U.S. federal law, no background checks are required on these companies or their employees. Felons and foreigners can, and do, own computer voting machine companies" (Landes, 2002). Computer scientists and journalists question the political affiliations of the leading voting companies. Harris found that just before the 1996 election Senator Chuck Hagel, a Nebraska Republican, used to run the voting company that provided most of the voting machines that count votes in his state. And he still owns a stake in the firm (Harris, 2003; Manjoo, 2003). Hagel failed to disclose his ties to the company whose machines counted his votes. When he was asked to describe every position he had held, paid or unpaid, he mentioned all sorts of jobs but not the fact that he had been the chairman of his own voting machine company. Harris points out: "This is not a grey area. This is lying" (Harris, 2003: 110). Conflicts of interest are seen everywhere. Ohio's largest daily newspaper, the Cleveland Plain Dealer reported that Walden O'Dell, the CEO of Diebold, is a major fundraiser of President Bush. Manjoo (2003a) notes: "In a letter to fellow Republicans, O'Dell said that he was 'committed to helping Ohio deliver its electoral votes to the president next year'. Even the people

[42] http://www.truevotemd.org/

involved in the aforementioned Project P1583 who had to design the new standard for electronic voting machines were not beyond suspicion. It was implied that the committee leadership of Project P1583 is largely controlled by representatives of electronic voting machine vendor companies and others with vested interests. The problem is that when counties, states or countries consider purchasing electronic machines they usually base their choice of machine solely on the information from the vendors (Manjoo, 2003c). The opinion of unbiased technologists with no stakes in the voting system companies is often not taken into account and the decisions are made by people who don't understand the issues and don't understand much about how computer programs work.

8.3 SECURITY IN THE TRUEVOTE SYSTEM

The TRUEVOTE system is designed to realise an Internet based voting service. The EU project TRUEVOTE aimed to contribute to the technological development and the increase of the community users' trust in information society technology tools to offer services, such as voting, by experimenting the potential of secure electronic voting integrated in the framework of a public key infrastructure. The objective of the project was to design and implement a secure Internet based voting system integrated with existing Public Key Infrastructures (PKI) and to demonstrate the advantages and the possibilities offered by secure electronic voting by means of voting sessions organised for Internet enabled users (community networks) and traditional users. The sociological analysis of the voting session results allowed us to understand the level of confidence and trust of the users ICT tools, the degree of acceptance of such tools in different socio-cultural areas and with respect to different users' technological skills, but also the media effects of the voting technology.

In a large number of field studies the use and effects of internet voting were investigated. The field studies took place in five different locations: in three local situations (Newham, a neighbourhood in London; Orsay, a small town in France; CGIL, the Milanese department of an Italian trade union) and in two virtual communities (RCM - Rete Civica de Milano and OYK, a rural community network in Finland[43]). Due to legal constraints, the system could not be tested in national elections. Nevertheless, in all test sites, two or three real voting events were organised by e.g., the local authorities, or the trade union board, about official issues. For our analysis, we combined several methods and tools like questionnaires, direct observation, log files, voter interviews, analyses of the ballots and interviews with the ballot organisers. In this paper we will use the questionnaire data from 276 internet enabled users from the participating community networks RCM and OYK[44]. RCM (Rete Civica di Milano), is an urban community network in Milan and OYK (Learning Upper North Karelia)[45], is a rural community network in the eastern periphery of Finland, consisting of three neighbouring municipalities with a total area of 4500 km^2 km and a population of about 20,000 inhabitants.

[43] For a description of the demonstrators see Oostveen & Van den Besselaar (2002), *The implications of Internet voting on elections and civic participation*. Euricom Colloquium 2002.
[44] We will report about the results of the three local communities Newham, Orsay and CGIL on another occassion.
[45] The Finnish name of the community network is Oppiva Ylä-Karjala (OYK)

During the design phase of the TRUEVOTE system the project team had a lot of discussions about the verifiability of the vote. Although at the time we did not know of any other electronic voting systems that provided a voter-verifiable paper trail, we decided that in order to gain the trust of the users it would be wise to implement this requirement into the new system. Unfortunately, due to delays that are so common in large scale projects, the technicians were not able to realize the voter-verifiable audit trail for the pilots. The only form of verifiability provided took place within the system itself. The voter ticks the box of his choice, but the vote is not actually cast until it is confirmed. When "Confirm" is selected, the system will display all the operations required to actually cast the vote.

The voting application performs additional operations and controls before sending the vote to the ballot box to guarantee the voter's anonymity and the vote secrecy. The Voting Application connects to the 'Validator' for the vote validation and then to the 'Forwarder' to cast the vote. The 'Authenticator' receives the vote messages and decrypts them. After the Authenticator publishes the results, all the application modules send some information to a Trusted Third Party (TTP) in order to allow it to verify the systems integrity. The TTP verified that only valid voters submitted a vote and that the number of identifiers is at least equal to the number of votes cast. The Authenticator can also send to the TTP all the vote messages received from the Forwarder and a decrypted version of them. This way the digital signatures on each vote may be verified and the final tally recomputed to make sure that only legitimate votes were taken into consideration and the published tally is correct (Lanzi et al., 2003).

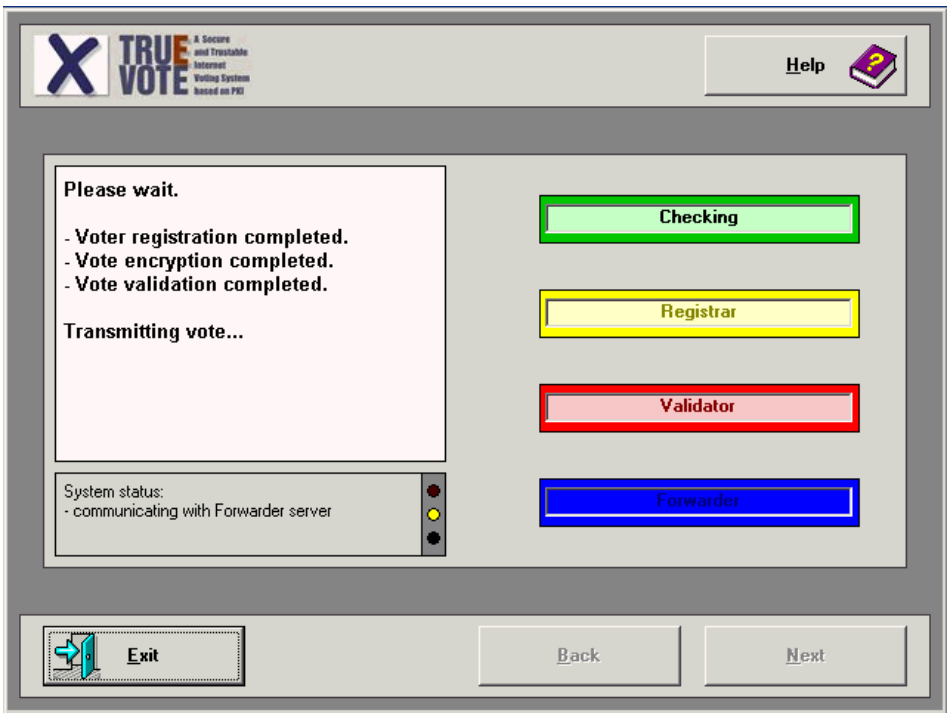

Figure 1 Screenshot of the TRUEVOTE system

As described above, all of the verification takes place in the black box of the system. The users have no way of telling whether their votes were really cast the way they wanted them to be cast. The only thing that the system provides after the user has entered a vote into the computer is a screen which offers a digital representation of the vote. The TRUEVOTE system then asks the voter to confirm the choice they have made. However, you cannot see your vote actually being recorded. As Harris puts it: "Asking you to 'verify' your vote by saying yes to a computer screen is exactly the same, in terms of data integrity, as asking you to tell an election official your vote, which she then asks you to repeat while never letting you see what she wrote down. That procedure is absurd and would be trusted by no one" (Harris, 2003: 60). So, in the end a paper trail was not offered by the system. However, the questionnaires that were to be distributed among the people participating in the field studies were already designed based on the idea that the system would also have a voter-verifiable paper trail. Since the field studies took place in different countries, the English questionnaires had to be translated into Finnish, French and Italian. Time constraints made it impossible to change the questionnaires at the last moment and therefore the respondents were asked to respond to three statements about the verifiability of the system:

1. I could easily check that my vote has been counted.
2. It is difficult to verify the vote.
3. It is quick to verify the vote.

The answers were measured on a six-point scale, ranging from "Strongly Agree" to "Strongly Disagree". The three questions that were asked about verifiability were answered consistently.

We were amazed to find that the majority of the respondents agreed mildly to strongly that it was easy for them to check that their votes had been counted (61 per cent), while in fact the system does not provide this functionality. Only 5.8 percent disagreed strongly with this statement. In table 1 we present an overview of the opinions of the respondents related to their location, gender, trust in security and trust in new technologies.

Table 8.1 I could easily check that my vote had been counted

	Location		Sex		Trust in Security*		Trust in New Technology*		Total
%	RCM	OYK	Male	Female	No trust	trust	No trust	Trust	
Strongly Agree	17.6	9.2	16	11.5	7.8	17.8	11.6	15.3	14.6
Agree	22.2	20.4	18.2	28.7	15.6	24.4	23.2	21.3	21.5
Mildly Agree	24.4	25.5	23.5	27.6	23.3	25.6	24.6	24.8	24.8
Mildly Disagree	15.3	29.6	21.4	18.4	30.0	15.6	14.5	22.3	20.4
Disagree	14.2	9.2	13.9	9.2	12.2	12.8	17.4	10.9	12.4
Strongly Disagree	6.3	5.1	7.0	3.4	11.1	3.3	8.7	5.0	5.8
Total (N)	176	98	187	87	90	180	69	202	274

* Dichotomized variables

The other two statements about the verifiability of the system showed similar results. Sixty-eight per cent of the respondents disagreed mildly to strongly with the statement that it was difficult to verify their vote. In other words, they found it easy to verify their vote. Only 5.2 percent agreed strongly that it was difficult to verify their vote. Finally,

in answer to the question whether it was quick to verify the vote 68 percent of the respondents said yes. Only 4.9 percent disagreed strongly. The next step was to test for correlations between a constructed variable named the "verifiability" variable, in which we combined the three verifiability questions. We created this new variable by taking the mean of the scores on the three items. This variable measures the perceived level of verifiability of the TRUEVOTE system. The neutral value is 3,5 with 1 and 6 as very much trust in verifiability and no trust at all, respectively. The average is 2.9, indicating a moderate trust, and the distribution is almost normal. We were surprised that the respondents were positive about the possibility to verify their vote and wanted to find out whether this opinion is related to background variables (for this we compare means using Anova) or context variables (Pearson correlations). We related the verifiability with other variables such as country, gender, usability, computer use, opinions about ICT, etc. Table 8.2 will summarize the results.

verifiability of	average	sign	N
men / women	3.05 / 2,71	0.034	188 / 88
Italia / Finland	3.03 / 2.77	0.09	177 / 99
verifiability by	correlation	sign	N
trust in security	0.323	0.000	275
trust in new voting technology	0.181	0.003	273
voting is public duty	0.132	0.029	273
careless about privacy	0.128	0.034	272

Table 8.2 Trust in verifiability

Using ANOVA we found that there is no relation between the place of voting and the users' opinion on the verifiability of the system. Whether respondents voted from home, work, school or a kiosk, they all gave similar answers to the three questions about the count of the vote. All of them were equally positive about the ease and speed of the verifying procedure.

Secondly, we found that there is a correlation with the variable gender. There were differences between the answers from men and women. The women seemed to agree slightly more with the statements than the men, but the differences weren't very large. This corresponds with women's overall higher trust in the security of the system. From previous analysis of our data (which we have reported in a paper on e-democracy, trust and social identity), we found that the participants from the community networks have less trust in the privacy of the system than in the security (Oostveen & van den Besselaar, 2003). We had measured both aspects of trust on a six-point scale and it was interesting to see that the respondents were in average moderately positive about the security of the systems, but negative about the privacy of the systems. What this means is that the respondents do not really fear attacks from hackers or from within, but they are concerned about their personal data. When people signed up for the field experiments, they had to provide a large amount of personalized data to be put on the smart cards for identification purposes. From their answers to the questionnaires and from the e-mails they have sent us, it became clear that they worried that their personal data would be used for other purposes, or that their data would be linked to their vote. Women seemed to have a slightly higher trust in the security and in the privacy

protection of the systems than men did. Almost no difference existed between very frequent ICT users and the others.

There is also a correlation between the location (country) of the respondents and their trust in the verifiability of the system. We see that the respondents from Italy have a lower trust in the verifiability of the system than the Finnish respondents.

Using Pearson correlations we found no indication that the level of computer skills and experience influenced the opinion on the verifiability of the TRUEVOTE system. We find it very surprising that there is no relation between the computer use of the respondents and their opinion on the verifiability of the system. We would have expected that frequent computer users would have been far more critical about the security and verifiability of the system. We also expected that users with little computer experience would think that the system is verifiable but that it is their lack of knowledge which makes that they can't see it. However, people who use the computer and the internet more frequent seem to judge the verifiability of the system in the same way as people who use the computer less. Also, users who judged themselves to be very expert with computers had the same opinion as people who saw themselves as hardly computer savvy.

People with a low trust in the security of TRUEVOTE show that they are more concerned about the verifiability of the voting system than the people who do trust the security. This is what you would expect. We find the same for trust in new technology. People with a lower trust in new technologies believe less in the ability to audit the election for verifiability. For trust in privacy we did not find a correlation with the variable of verifiability. Users who feel that new ICTs can not be avoided in the future have more trust in the verifiability of the system.

The last variables we look at are those related to the usability of the system. We see that there is a relation between the usability and the opinion about verifiability (Pearson 0.531). People who find the TRUEVOTE system easy to use (fast, easy to install, easy to connect, easy to correct mistakes, etc) also trust the verifiability more than people who rated the usability more negatively.

Summing up, we can say that the more careless voters are about the security of ICT based systems, and the more they believe that the TRUEVOTE system is secure, the more they also believe that the TRUEVOTE system is verifiable. The same holds for the belief that new voting technologies are a form of progress, the opinion that increasing use of ICT is unavoidable, and the general opinion about the usability of the TRUEVOTE system. Finally, the opinion about voting in general has some effect: the stronger one finds voting a public duty, the better one evaluates the verifiability of the system.

So what do these results tell us? We have a system that does not really show people that their votes are properly counted. Everything happens within the machine and is not visible for the users, but this does not seem to bother them too much. What is it that they actually trust? Is it the system? Or is it the authority of the organisers? The majority of the respondents say that they could easily check that their vote was counted. They said it was easy and quick to do this. Therefore, we have to conclude that their

opinion is more based on *perception* than on facts. Does this mean that it is not important how secure a system is, as long as people trust it to be secure? Does this mean that as long as we tell the users a bunch of lies about the security, privacy or verifiability of the system they will believe it and act accordingly?

From the data we see that the trust of the users in relation to the verifiability of the system is related to the system itself, as well as to things that have nothing to do with the technology. On the technology side of the system we saw that the trust in the security and the usability of the system plays a large role. People do base part of their opinion on these issues. The more people trust in the security and the better the usability of the system, the less they will doubt about the ability to verify the count of the vote. From this we learn that improving the security and the usability will have an impact on gaining or restoring pubic confidence and trust in electronic voting systems.

However, a lot of the variables that correlate with the trust in verifiability have nothing to do with the technology itself, but more with the social context in which the new technology is embedded. We saw that both the location and the gender of the participants play a role. Also their trust in new technologies and the unavoidability of ICT influences their opinion. Users with a more positive view on technology will be more willing to believe that the system is verifiable, even if this is not really the case. We have seen in this paper that people will use insecure systems or black box technologies if they think of them as being secure. But how do people form their opinion about the security and privacy of new technologies and existing ICTs? First of all, we think that the reputation and professionalism of the organising institution might have an influence on the perception of people. If a local or national government is fully trusted by citizens then they are more likely to also trust the security of the system. This might also explain the differences in opinion we saw between the Finnish and the Italian respondents. Secondly, we think that the attitude of the mass media also influences the opinion of the users. When newspapers or TV programs cover negative stories about certain technologies (rightfully or not), then people will be influenced by this accordingly. Thirdly, the views of friends, family and colleagues play an important part in forming an opinion. Finally, one could assume that the convenience which a new technology might bring people will also influence their opinion about it. We will take the mobile phone as an example of this argument. Ever since people started using mobile phones the issue of electromagnetic field radiation from cell phones has been controversial. Most experts believe that it is insignificant. However, there is a significant body of evidence to suggest that cell phone radiation can indeed cause health problems (Hardell et al, 2002; Rense, 2002). The debate about the risk of mobile phones for the health of the users is still ongoing and users receive mixed information about the risks of mobile phones. Nonetheless, the majority of people decided to trust the safety of the phones and use them despite the concerns because they bring them so much convenience. From this it is obvious that users of technology pay more attention to first-order effects than to second-order effects. Therefore it is likely that if citizens see e-voting as a convenient way to cast their votes, they might be less concerned about its security issues. This could also work the other way around. A system could be one hundred percent safe and secure, but if users don't trust it they will not use it.

8.4 CONCLUSIONS

This paper dealt with the social issues of IT security, focusing on e-voting systems in particular. With current (paper-based) voting systems, errors are likely to be on a relative small scale. Electronic voting, on the other hand, substantially increases the scale of potential problems. This has its impact on public confidence. The complex technical questions with regard to security and other issues of electronic voting systems should be answered before these systems are to be used at parliamentary and other governmental elections on any level. At the moment the topic of voter-verifiability is very much in the limelight. In order to guarantee a true democracy it is important to have as secure a voting system as possible. Requiring a voter-verifiable paper trail is, as we have seen, one important step in that direction.

Many technologists think that the solutions for security and trust issues lie in adjusting and improving the technology. Dill says: “Instead of trying to convince people the machines are safe, the industry should fix the technology and restore public confidence by making the voting process transparent, improving certification standards for the equipment and (ensuring) there is some way to do a recount if there is a question about an election" (Zetter, 2003). But is this the best solution? Will users trust the system more when it is more secure? Will offering voter-verifiable paper trails work to gain trust from people or are there other non-technological issues that are of equal or more importance? Some well-known technologists like Diffie, Zimmermann, Stephenson, all known for their work on cryptography and Berners-Lee, creator of the World Wide Web, start to acknowledge the limitations of a techno centric approach to the complicated questions of privacy, security and freedom. They are moving towards recognition of social and political realities. True techno-believers are sure that they can guarantee the privacy and security of people with physics and mathematics. But after thirty years of working on perfecting cryptography some of the techno-believers are changing their views on privacy and security issues and admit that you have to trust ‘social structures’. It is a rejection of the ideal of trust in physics and mathematics (Ullman, 2000).

From our research within the TRUEVOTE project we have seen how important the social context is for the trust people have in a system. People should not just have to trust in the integrity of a voting system or the people who designed, developed and implemented it. With a system so crucial to the existence of our democracy trust in technology alone is not sufficient. In order to fully understand citizens’ willingness to use electronic voting systems we need to look as much into the socio-political issues as into the technological issues. Both need to be taken into account to make electronic voting a secure and successful new voting method.

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9
The Effects of Voting Technologies on Voting Behaviour: Issues of Trust and Social Identity[46]

ABSTRACT

Remote Electronic Voting enables citizens to vote from different places on various moments, and this is generally seen as one of the advantages that may positively influence voting turnout. However, social psychological theory suggests that social identity is dependent on the situation a person is in, and the voting decision (as well as other behaviour) may be different depending on these identities. If this is true, the outcome of a vote may be influenced by the deployment of Internet based media. Voters may also have different levels of trust in the various voting media, and this too may influence voting behaviour. After an initial and partial test, this chapter discusses directions for further research.

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9.1 INTRODUCTION

Developing and introducing new technological applications is always a complex undertaking, and relates to and depends on many technical, social, political, organisational, legal, and behavioural factors. This is also the case for information and communication technologies, and we see the study of these dimensions in various disciplines. In most cases, the research then aims to bring forward practical knowledge about design, development and implementation of ICTs, and at the same time to contribute to the theoretical knowledge of the discipline involved. As a consequence, multidisciplinary research is the characterisation of the social research related to technological change, and our study is no different.

One of the aims of our research is to inform practical development and use of ICTs for politics. In this chapter we focus on one of the important dimensions, namely the role of social and socio-psychological factors. Experiments with internet technology in real life situations may inform us about various things, all studied by different disciplines. However, taking the design, the development, the implementation and the use of new technologies as point of departure, all these disciplinary approaches in studying internet voting should inform the designer and politicians. This is what we call ‘design oriented research’, in which we try to produce results that inform the scholarly debates as well as

[46] A shorter version of this chapter has been published as: A. Oostveen and P. van den Besselaar (2005) ‘The Effects of Voting Technologies on Voting Behaviour: Issues of Trust and Social Identity. In: *Social Science Computer Review*.

the practical discourse. In the research project on which this chapter is based, these many things are in fact done: first of all designing and building an electronic voting prototype. Secondly, testing the technology in real situations; experimenting with the prototype in order to find out political, organisational, administrative, legal constraints and possibilities. And finally, experimenting with the prototype in order to learn about the acceptance, use, usability, evaluation, trust by the individual voter, and the implications for the vote and the turnout. The working of the system can be tested. But also the scale and scope of possible application fields becomes clearer, influencing the thinking of the possible markets the system is suited for.

The introduction of electronic media in government and public services results in changing relations between citizens, politicians and government. In this chapter we address the question to which extent electronic voting influences the articulation of political preferences and opinions by citizens, and how this effect is mediated by sociological and social psychological variables.

The study is theoretically relevant, as it validates results of experimental studies in a more 'real life' environment. That is, we will try to answer the question to what extent social-psychological mechanisms have an influence in real environments. Apart from that, the study may inform technological development and decision-making about the design and use of internet technologies for political processes. Without data from large-scale internet voting experiments it is difficult to clarify the influence this new voting method may have on the turnout of voters and on the way different contexts could affect voting. With our research we hope to be able to gain some more insight in these issues. Furthermore, the field studies should provide us with knowledge about the political implications of new voting technologies for overall political participation and the quality of representation.

The chapter is organised as follows: in section 9.2 we shall describe the variables 'trust' and 'social identity'. We hope to illustrate the importance of these variables and the possible effects they may have on voting results. In the section 9.3 we describe the design of longitudinal and comparative experimental field studies, in order to examine the aforementioned effects. After that we will present some of the initial empirical results based on one of the field studies. Finally, in the conclusion, we summarize the analysis, draw out the implications of the study for the use of e-voting systems, and reflect on the possibilities for further research.

9.2 THEORETICAL BACKGROUND

Internet voting has become a hot topic in recent years and most governments in Europe and elsewhere are planning to experiment with it, and to implement it. Many technology development projects have been undertaken in recent years, and the technological standards are being established. At the same time, a lot of legal and philosophical issues are at stake, as the system, and technologies for voting do have normative implications. This makes the politico-technical arena in which e-democracy systems in general and e-voting systems in particular are developed and implemented so difficult and complex. In this paper we focus on the social and social-psychological aspects of voting media, in

particularly internet voting. Put in a more general way, internet technology may change the social setting in which people decide whether and what to vote, and as a consequence, the voting itself.

Electronic voting (and polling) has been discussed for quite some years, but recently the development of electronic voting systems is becoming a major activity. Within the EU funded IST program, some 15 systems are currently under development and being prototyped. Official government policies in many countries aim at introducing e-voting in a fast pace. In the UK, experiments have been done with elections on the local level in the years 2000, 2002 and 2003.

The development and introduction of new voting technologies is generally lacking serious evaluation. From a social and from a scientific point of view, there is a need for testing the functioning of voting technologies and the effects on participation and outcomes of the democratic process.

In our review of the state of e-voting (Oostveen & Van den Besselaar, 2002) we found a lot of projects aiming at the development of e-voting systems. The differences between the various systems are not very large, and technological trajectories with respect to most of the essential technical components are already emerging. Most of these projects include some testing, but from a technical perspective only. Social and behavioural issues are generally neglected or studied rather superficially. If we do not correct the tendency to neglect social and behavioural issues, the result may be an uncritical introduction of new voting technologies, without any fundamental reflection about the technical, but more importantly, about the political, social, and organisational modalities of the systems introduced. The aim of our research is to provide fundamental and applied knowledge about the effects of different media on voting behaviour and opinion articulation, to improve social choice in designing and implementing electronic voting technologies. The context of technology can have an impact on issues such as trust and social identity. We will look at how these two mechanisms influence voting preference in more detail.

9.2.1 Trust

Trust is a critical issue that must be dealt with electronically. Empirical evidence relating to the precise impact of the Internet and other ICTs on trust is still sparse and sometimes contradictory (Guerra et al., 2003). Trust has been studied in numerous different disciplines but there are still many uncertainties in how to define trust in relation to the use of ICTs such as the internet. No consensus has emerged on what trust means. The Oxford English Dictionary defines trust as “a firm belief in the reliability or truth or strength of a person or thing, also “a confident expectation” and “reliance on the truth of a statement etc. without examination.” According to Novak, Hoffman and Peralta (1998) trust is a measure of confidence. Grandison and Sloman (2000; 2002) define trust as “a qualified belief by a trustor [in our case the voter] with respect to the competence, honesty, security and dependability of a trustee [i.e. the ballot organisers using an e-voting system] within a specific context. Distrust is a quantified belief by a trustor that a trustee is incompetent, dishonest, not secure or not dependable within a specified context” (Grandison and Sloman, 2002: 2). The authors state that trust is not

symmetric. And indeed, with e-voting trust seems to be a far more problematic issue for the voter than for the organisers of the ballot. After all, the organisers can implement a system that will ask enough personal information of an individual to make sure that this person is authorised to cast a vote. Voter authentication and security needs can be implemented into e-voting systems. However, voters must simply *trust* that their vote will be counted, that their vote stays anonymous and that no private (registration) information will be disclosed. With regard to e-commerce, Ben-Ner and Putterman (2002: 32) argue that the question of trust may seem reducible to a set of technical issues such as encryption, but that to do business online, parties still need to trust, that is to say to gamble on the reliability of their partners. This also holds for electronic voting. In contrast to the traditional paper based vote, the process and procedures in e-voting are less transparent for the user, and the various steps in the processing of the information are less observable for the voter. Nonetheless, an evaluation of Maryland's (USA) new touch screen voting machines by the Center for American Politics and Citizenship (2002) shows that the voters expressed higher levels of trust in the new touch screen voting machines over the older punch card voting machines and mechanical lever systems they had been using in previous years. This looks like a good result. However, the researchers also point out that one in ten voters was not confident their vote was accurately recorded. This should alarm the election officials and make clear that there is significant room for improvement. With electronic voting systems, public confidence in the election relies on trust in technical experts instead of a transparent process (IPI, 2001). Trust in the competence and honesty of the organisers of the ballot will influence the voter's decision as to whether or not they want to use online voting systems. Trust is a vital component for e-voting to be successful.

In general, the following requirements can be formulated for electronic voting media.

- secure (accurate; only legitimate voters participate - and only once; protected against fraud and mistakes);
- protect privacy (the voter should remain anonymously);
- enable accountability (it should be possible to proof that the outcomes are correct; process is transparent; results have to be repeatable – 'recounting'), and;
- economic (cheaper voting and polling than currently with paper based media, including postal voting).

In traditional voting procedures (paper based) these above-mentioned requirements are implemented, and citizens are used to those media, and trust the procedures – at least in democratic countries. With the introduction of new media in voting, this might change. Public confidence in the manner in which ballots are counted is fundamental to the legitimacy of the electoral process. Internet voting is likely to lead to changes in how the public maintains confidence in the integrity of elections. Internet systems pose a problem in that the tallying process is not transparent.

Media stories about various security threats to the Internet have an immediate impact on public confidence. Online voting may, as a result, not achieve the goal of increasing turnout if voters do not trust it. Therefore, it is important to make the voting and counting processes as transparent as possible. Because of this transparency there will be a greater confidence in the process and the result. Trust in an online voting system

means having confidence in the machinery and infrastructure, rather than simply in the physical and administrative processes. However, all non-free software is secret by nature and there is virtually no way to be sure that the software does not include a trick to change the results of the vote. Only Free Software can ensure transparency (open source code).

There are many ways to make Internet voting more secure. Mechanisms that form the structure of security are: Personal Identification Number (PIN) or password, encryption, digital signature, smart cards, biometric identifiers (like fingerprints), or casting more than one vote where only the last one counts. Baseline integrity checks are for instance registration, authentication, privacy, and verifiable results (a voter-verifiable paper trail). To mention the most prominent problem as an example, technical experts agree that there is a trade off between the requirement of voting anonymously, and the requirement of accountability of the voting system. If a system is 100% privacy protecting, the accountability becomes low, as the transparent reconstruction of the vote becomes impossible, and the other way around.

9.2.2 Social identity

The main difference between e-voting compared to standard voting is that it can be done in the privacy and security of one's own home rather than at the polling station in the community. The social psychological implications of this have been paid little attention hitherto. One important implication of e-voting is that when one votes at home, isolated behind the computer terminal, a more individual level of identity (and more individual self-interests) are likely to become salient compared to when one votes in the community hall, surrounded by other people from different groups and backgrounds or at work surrounded by colleagues. In the latter two cases collectivist and even multicultural concerns may be more salient.

In this chapter we will take a closer look at the social identity approach, including both social identity theory and self-categorization theory, to explain the influence of different voting technologies on the ballot outcome. The Social Identity Theory was developed by Henri Tajfel and John Turner in the late 70's. Social identity refers to "that part of an individual's self-concept which derives from his knowledge of his membership in a social group (or groups) together with the value and emotional significance attached to that membership" (Tajfel, 1978: 63). The theory involves three central ideas. The first is categorization. This idea explains that we categorize objects to understand them, and in a very similar way we categorize people in order to understand the social environment. We use social categories such as student, professor, bus driver, black, white, Muslim, Christian, Dutch and European. The second central idea is identification. We identify with groups we perceive ourselves to belong to. Sometimes we perceive ourselves to be part of a group (social identity), while sometimes we see ourselves more as a unique individual (personal identity). This varies according to the situation and context we are in. The third idea in the Social Identity Theory is that of comparison. We compare ourselves to others who are similar and in this way evaluate ourselves. Research shows that people's social identities have a very powerful impact on their perceptions, emotions and behaviour (Ellemers, 2002). As Andrew Brader points out: "people act in ways specific to their situation" (2001).

Self-categorization Theory is a social psychological theory developed by John Turner in 1985. According to this theory, people do not only have single, individual identities. Rather, the self may be defined at different levels of abstraction (Hopkins, 2000: 38). It states that at different times we perceive ourselves as unique individuals and at other times as members of groups and that these two are equally valid expressions of self. Turner suggests that self-concept is the cognitive representation of the "self", comprising several concepts that are activated in specific situations (Fortin and Baxter, 1992). Ellemers (2002) states: "The basic assumption here is that the relevant social context determines which categorization of social stimuli, and hence which identity aspects become salient as guidelines for the perceptions and behaviour of those who operate within that context". The central departure in the social identity approach is that the impact of social groups on the way people see themselves and others around them cannot be understood without taking into consideration the broader social context in which they function (Ellemers, 2002).

There are many examples of situations in which the social context has had a major influence on the behaviour of people, depending on which identity is most salient. For instance, Lohman and Reitzes' research on racial behaviour showed that employees answered the same questions about racism differently at home and work (1954). The research took place among white members of an interracial labour union who lived in a racially segregated neighbourhood. They were given a questionnaire that measured their racial attitudes. "When the union members answered the questions at work they were as racially tolerant as their union membership suggested; when they answered it at home, they were as racially bigoted as their neighbours" (Becker, 1998). Lohman and Reitzes observe that "the majority of the individuals studied were consistent in exhibiting what appeared to be an ambiguous and contradictory pattern in their identification with both the community and the union with regard to the race relations pattern" (Lohman and Reitzes, 1954: 342). Another example of contextual influence is a study described by Postmes, Spears and Lea (1999: 171). They mention an experiment by Johnson and Downing (1979) in which participants were made anonymous by means of Ku-Klux-Klan masks and overalls, or nurses uniforms. The participants were asked to deliver electric shocks to a person. When dressed in Ku-Klux-Klan uniforms they shocked more than the control group of participants, while they shocked less when they were dressed as nurses. The researchers conclude that this finding is in line with a normative explanation, because participants appeared to be sensitive to normative cues associated with their clothing. So here we see again that the context does influence the behaviour of people. Not just the surroundings have an influence, but even the way people are dressed. People dress differently at home, work or school and this might have an impact on how they behave, think or, in our case, vote in that particular situation.

Different voting contexts not only influence which identities and interests are made salient, they can influence behaviour relating to these identities and interests for *strategic* reasons. For example, being confronted with different groups of people at the polling station (or on the way to it) may make one feel more accountable to these audiences (e.g. ethnic minorities, the poor) than when at home on one's own, or surrounded by one's family. When group members define themselves in terms of their collective identity they focus on the similarities between themselves and fellow in-

group members with reference to experiences, needs, interests, or goals. As a result "my" and "your" experiences, needs, and so forth are transformed into "our" experiences and needs (Stürmer, 2000: 107). This is particularly likely to affect voting behaviour when this is identifiable (and thus accountable) to audience that might disapprove. For example, many polls underestimate self-interested or right wing preferences (as demonstrated recently in France), because they failed to take into account that people might not want to admit to such preferences in public. Contexts in which people perceive there is scrutiny of their choice may therefore affect voting for strategic or self-presentational reasons. Examples of a high accountability context are votes that are conducted in public (e.g. in mass meetings with a show of hands), rather than by private ballot. Although e-voting may seem private, one of the concerns associated with this technology is whether it is indeed secure, or open to "surveillance" by those administering the system. The perception of surveillance may moderate voting preferences perceived to be critical of such authorities.

Another factor that may well cause features of e-voting to influence voting preference is the degree of social interaction and discussion around political topics prior to voting. Voting from the home increases the likelihood that choices will be discussed within a limited and homogeneous group context, whereas voting in the community may open the voter up to disparate social influence from others, especially those relating to more pro-social or collectivist concerns. This process of validating views through discussion has been called group consensualisation (Haslam, 1997). Because discussion is likely to polarise in line with group norms and identities (Spears, Lea, & Lee, 1990) the parties to discussion can be highly influential.

Of course we are not claiming that political preferences will be entirely determined by the voting context. However these contextual effects may be especially important in the case of "floating" voters who often decide elections.

9.3 METHODOLOGY AND MODEL

To study e-voting and e-polling in practice, a series of tests were organised that enabled us to study which factors influence the way voters use (or do not use) e-voting systems, with the emphasis on naturalistic conditions and a variety of geographical and socio-cultural contexts. Due to legal constraints, the system could not be tested in 'real' elections. Nevertheless, 14 polling events were organised by local authorities. The field studies took place in five different geographical and socio-cultural locations throughout Europe. First of all, polling and voting sessions were organised for internet enabled users at the Community Network of 'Rete Civica di Milano' in Italy and at the Community Network of Upper North Karelia in Finland. Secondly, sessions were also organised with traditional users at the CGIL trade union in Lombardia (Italy), at the Carpenters Estate in the London Borough of Newham and in the city of Orsay in France[47]. Questions were asked about real issues such as urban traffic, car parking, a neighbourhood watch scheme, welfare services, and citizenship rights of immigrants (Van den Besselaar & Oostveen 2003). For example, the users of RCM had to answer a

[47] For a description of the demonstrators see Oostveen & Van den Besselaar (2002), *The implications of Internet voting on elections and civic participation*. Euricom Colloquium 2002.

question about the public transport in Milan (focusing on extra bus lines). The residents of North Karelia (Finland) answered to the question whether they thought that Finnish welfare services (social, health, and educational services) and the amount of the taxes paid are balanced. During the second vote in North Karelia, the citizens were asked whether Finland should join the NATO. The residents of the Carpenters Estate in East London were asked whether they would be willing to help set up and run a Neighbourhood Watch Scheme, to improve the safety of their estate. The second voting session asked how much the residents would be prepared to pay, in order to secure a parking space and improve the security in the Estate Car Parks. Finally, the Italian trade union employees were posed a question about the citizenship rights of immigrants. They had to vote 'yes' or 'no' (or abstain) to the question: 'Are you in favour of granting administrative voting rights to immigrants who have lived for the last 5 years in our country?' The last voting session had a ballot on the same topic in all five different sites. After some discussion on the phrasing the project decided to ask the respondents the following question: "What measures should Europe take to reduce its dependency on oil?' The voters had four possible answers: reduce oil consumption by raising the price of oil, invest more in nuclear power, invest in research on renewable sources of energy such as wind and solar energy, or do nothing.

We aimed at three ballots in each site, resulting in 15 field studies. Unfortunately, due to its late involvement in the project the city of Orsay was only able to organise two ballots. Therefore, the research is based on 14 field studies instead. The system used is based on identification and authentication of the voter by means of smart cards. The number of cards and of card readers restricted the number of users per e-vote to about 200. A problem, which had to be solved, was the distribution of the readers and cards to the voters. In some cases the Certfication Authority directly sent them to the final users. In other cases the local organisers of the ballots distributed the cards and readers. The local organisers of the voting sessions had to do quite some propaganda to get enough participants interested and some of the organisers found it very hard to attract enough voters. Therefore the number of participants varied considerably among the locations. For instance, Orsay was able to attract nearly a thousand participants, RCM about 375, while Newham hardly managed to get anyone involved.

	'**Real Communities**'			'**Virtual Communities**'	
Voting media:	CGIL	Newham	Orsay	North Karelia	RCM
Traditional	X	X	X		
Kiosk	X	X	X	X	
Online	X			X	X
CAWI				X	X

Table 9. 1 The TRUEVOTE test sites

We compare three voting technologies: Paper, CAWI (Computer Aided Web Interviews) and TRUEVOTE. A first main difference between CAWI and TRUEVOTE is that to use the CAWI system only minor registration is needed for participating (real name and address). On the other hand, PKI based voting systems like TRUEVOTE require an extensive registration in which one has to give much personal information to the institution which issues the smart card. Consequently, exercising the vote involves a

much stronger identification. A second main difference is that TRUEVOTE requires special hardware and software for the voting, and this was provided by the organiser of the vote. Both differences may result in different levels of trust in the privacy and security of the system. Using TRUEVOTE for home voting requires installing the system, and consequently some skills, an internet connection and a PC which is not too old. Here (but also related to trust), the digital divide may have effects.

Data collection was done by a variety of methods: pre-voting and post-voting questionnaires, observation, log file analysis, analysis of the ballot outcomes, and interviews with ballot organisers and voters. Through this we measured the relevant variables that influence the use of e-voting technologies on individual and organisational level. The questionnaires were designed to measure some theoretical constructs we expected to influence voting turnout and voting behaviour. Therefore, we created blocks of items to measure 'trust in privacy of the system', 'trust in security of the system', 'social identity', and so on. As a first step we used factor analysis to check whether the items indeed measure what they were expected to measure, and this proved to be the case. The analysis resulted in factors representing the theoretical constructs. In the next step we used the items loading on the same factor to make a scale for the theoretical construct represented by the factor. A simple procedure was adopted for this: we take the average of the scores on the items. To test the internal consistency of the so obtained scales, we calculated Cronbach's alfa for every scale, and this resulted generally in reasonable values above 0.8. As we had a relatively small population size, we decided to dichotomize several variables. In those cases where the variable has a normal distribution or a flat distribution, we combined the three positive values (agree a little, agree, agree completely), and we did the same for the three negative values. In case of a bimodal distribution, we divided the scores accordingly. Table 9.2 summarizes the variables used.

Table 9.2 Variables

Independent variables:	
1. Characteristics of the voter:	Age, gender, income, nationality, education, attitude, experience with new technologies.
2.Voting technology/medium	Paper; CAWI, TRUEVOTE
3. Voting place	Kiosk, home, school, work
4. Characteristics technology	Personal information needed for the smart card; availability of tools for audit and verification.
5. Organisation of the ballot	Who 'owns' and organises the ballot.
6. Experience with e-voting	Three subsequent ballots.
7. Topic of the ballot	Level of sensitivity of the topic.
Intermediate variables	
8. Trust in system	Opinion about privacy, surveillance, behaviour (participation).
9. Social identity	Collective versus individual / social versus individual.
Dependent (effect) variables	
10. Participation in the ballot	Differences in participation between the various media – turnout and demography.
11. Result of the ballot	Different outcomes for the various media.
12. Opinion about e-voting	Acceptance, unavoidable, good or bad.
13. Usability	Is it easy, quick, transparent, in the various dimensions: use in general, access, vote, correct mistakes, send the vote, verify the vote, and so on.

Elsewhere we analyzed privacy and surveillance concerns, trust issues, learning effects, usability and organisational aspects. Here we analyze *media effects of the voting technology on voting behaviour and on the outcome of the vote*. Based on the theoretical discussion in section two, we formulate the following model: Technology enables a variety in the place of voting. Place is related to social identity, and to the presence of others, and both may influence the decision to vote and the vote itself. Additionally, trust in the technology, and fear for surveillance may influence the decision to vote and the vote itself. Finally, the digital divide may influence the participation in an election, and therefore the outcome. The model is presented in the figure below. In the remainder of the chapter we do not use the complete model and exclude for the moment the 'dashed' relations and 'italic' variables.

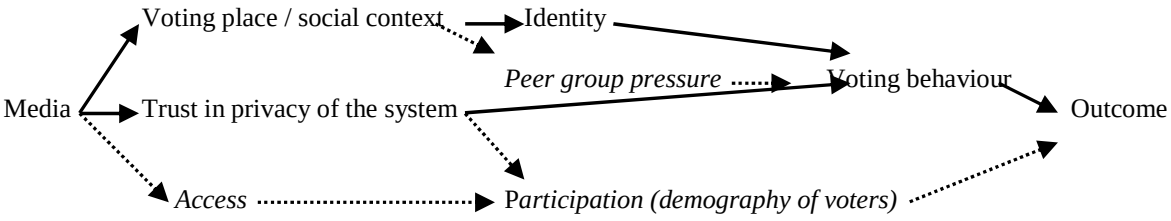


Figure 9.1 The model

9.3.1 A small-scale field experiment

We present our findings in two steps: first we will describe the virtual community in more detail and look at the general socio-demographic profile of the users. Second, we will investigate whether the collected data from this field study indicates any effects of the used voting media on trust and social identity and their implications for the vote and the turnout.

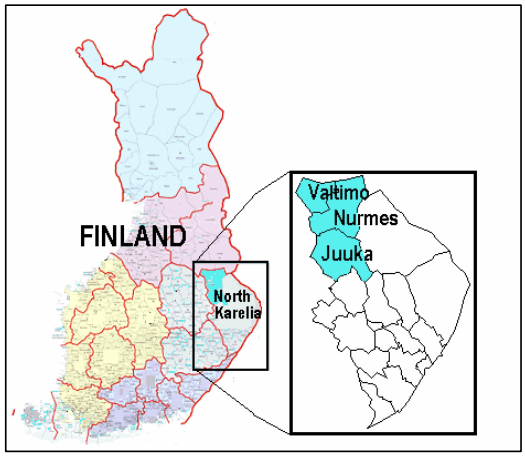
We did a preliminary test of a part of the model in a small scale experiment organised by OYK (Learning Upper North Karelia), a community network serving a remote rural area in rural Finland. OYK has on a regular basis opinion polling, and our field experiment was one of these. A total of 179 people between the ages of 15 and 72 registered as voters for the experiment. The question asked was "Should Finland become member of the NATO?" It was a topical question, as it was asked at the beginning of the Gulf war, and in general the majority of the Finnish population is against NATO membership (Yhdyskuntatutkimus, 2002). In order to investigate the effect of media on voting behaviour, we divided the participants into four groups based on two voting media (CAWI versus TRUEVOTE voting) and two voting places (home voting versus voting in public spaces – work, school, voting booth).

Upper North Karelia

Upper Karelia is a remote rural area located in the eastern forest periphery of Finland. The name Upper Karelia refers to three neighbouring municipalities with a total area of 4500 km2 and a population of about 20,000 inhabitants. Nurmes is a small town of

10,000 people, Juuka a middle-sized rural municipality of 7000 people and Valtimo is a small rural municipality of about 3000 inhabitants. The area has suffered the typical troubles of remote rural areas: a persistent high rate of unemployment, declining incomes of households in agriculture and forestry, out-migration of young people, cuts in public spending in rural services and infrastructure (Oksa and Turunen, 2000).

The community network



Learning Upper Karelia is a rural and local information society project seeking to achieve social objectives: preventing social exclusion, supporting social innovations, improving services and living conditions. The main tool used in attaining these objectives was the construction of a regional community information network across three North Karelian municipalities. The project started in early 1998. During the two years of its implementation the project was able to create a local community network in which about 30 percent of the total population aged 7-74 was registered as users. The number of registered users has constantly increased, reaching 2500 by the end of the 1998 and 3100 in April 1999, after twelve months of operation. By the end of the second year of operation the number of users reached 5300 (Koskikallio, 2000). Anyone could use the net and its equipment cost-free at the 32 kiosks that were made available in public spaces, such as libraries, youth centres, local banks, pubs and shops. People could also log on to the network from home or work. The training and support of users was free and easily accessible. Training and advice was available at village meetings, local computer classes, kiosk access points, and at home (Oksa and Turunen, 2000).

From home only	35%
From work/school only	14%
From kiosks only	8%
From home & work/school	14%
From home & kiosks	11%
From work/school & kiosks	9%
From all three places	9%

Table 9.3 The place of use of internet and community network among the registered users of the Learning Upper North Karelia Network

At the beginning of the project the kiosks were mostly used for surfing the internet, but during the second year the use of the community network increased steadily. Some schools built internal message zones of their own. Municipalities made more information available, the agendas and minutes of all three municipal councils became available. An electronic register of local enterprises was constructed and some space was sold for commercial advertisements. The project also uses a CAWI (Computer Aided Web Interviews) system to poll the opinions of the users on different topics.

The voters' profile

The infrastructure of the Learning Upper North Karelia project is still being used and served as an excellent demonstration location for the TRUEVOTE project. A total of 179 people between the ages of 15 and 72 registered as voters for the pilot in Finland. Of these registered voters 52 per cent is male and 48 percent female. The average age of the respondents is 40 years. Most of the respondents have a full-time job (47.7%), fifteen percent is student, ten percent is unemployed and 8.4 percent is retired. Computer literacy is high as we already expected. Nearly all respondents have a PC at home (98.3%) of which 93.2 percent also have an Internet connection. About half of the people involved in the project have access to a computer with Internet access at work (55.9%). The computer (including internet) is foremost used to gather information (97%), send e-mail (92%) and write documents (82.7%). The majority of the respondents never chats, downloads music or takes part in an online discussion. Of the voters involved in the field study in Finland 10.5 percent consider themselves to be very expert as a computer user. Nearly 44 percent thinks they are fairly expert and 15 percent says not to be expert at all.

9.3.2 The analysis

As described above, we have asked the voters to complete a pre-ballot questionnaire, and two post-ballot questionnaires, after two of the three voting experiments. In the analysis we present here, we use the pre-ballot questionnaire and the first post-ballot electronic questionnaire. The current data set consists of 127 voters. The Finnish ballot asked the voters whether Finland should become member of the NATO.

	Upper North Karelia	
	CAWI	TRUEVOTE
Male	12 10%	52 41%
Female	15 12%	48 38%

Table 9.4 The systems used by the voters

As explained in the methodological section, the questionnaires were designed to measure some theoretical constructs we expected to influence voting turnout and voting behaviour. Therefore, we created blocks of items to measure to 'trust in privacy of the system', 'trust in security of the system', 'social identity', and so on. As a first step we used factor analysis to check whether the items indeed measure what they were expected to measure, and this proved to be the case. The analysis resulted in factors representing the theoretical constructs.[48] In the next step we used the items loading on the same factor to make a scale for the theoretical construct represented by the factor. A simple procedure was adopted for this: we take the average of the scores on the items. To test the internal consistency of the so obtained scales, we calculated Cronbach's alfa for every scale, and this resulted generally in good values above 0.9.[49]

[48] In some cases the factor analysis added detail. For example, we used a set of items to measure the user friendliness of the system, and these items loaded on three factors, all representing another dimension of user friendliness.

[49] Details about the scales and the quality will be reported elsewhere.

As we have a relatively small population size, we decided to dichotomize most variables. In those cases where the variable has a normal distribution or a flat distribution, we combined the three positive values (agree a little, agree, agree completely), and we did the same for the three negative values. In case of a bimodal distribution, we divided the scores accordingly.

The participants in the various ballots are self-selected groups, and cannot be considered as random samples. In this stage of the analysis we therefore consider them as *populations.* The analysis in the next section is therefore descriptive. We will try to find out whether the opinions and voting behaviours are in line with the theory discussed in the previous sections. In other words, we do not claim representativity whatsoever. In a later phase we will investigate to what extent the samples have similar characteristics as the larger populations they belong to.[50]

9.4 FINDINGS

We do not consider the technology as such having direct effects on voting turnout, and on the outcome of the vote. But voters may have different levels of trust in different voting technologies, and this may influence the participation and results of the voting. The different technology may also enable that voting takes place in different social contexts, and also this is expected to have effects. So, we do expect that the various voting media give different outcomes. The two hypotheses we test here are:

- Hypothesis 1: the voting medium may influence the trust in the system, and through this the voting decision
- Hypothesis 2: the medium influences the place and social context of the voting, and through this the voting decision

The data enable us to compare the outcomes of two voting media: CAWI with the TRUEVOTE system (hypothesis 1), and we will investigate whether trust in privacy and security does influence the vote. The Finnish data also enable us to compare the various places and therefore social environments in which the e-voting system has been used. We will compare voting behaviour of 'home-voters' with the voting behaviour of those voting in public places (at work, school, or kiosks). The question is to what extent the possible differences can be explained in terms of identity-related variables (hypothesis 2).

1. Do differences in trust in voting media influence the outcome of the vote?

The two media we compare here are CAWI and TRUEVOTE. The main difference is that if one uses the CAWI system, the voter can go to a web site and vote without much registration. The Learning Upper North Karelia community only requests from the users that they register with their real name and address. Pseudonyms are not allowed. On the other hand, PKI based voting systems like TRUEVOTE require an extensive registration

[50] We will report sometimes levels of significance, which only mean something if the samples would be representative – and that has to be checked later.

in which one has to give much personal information to the institution which issues the smart card. In e-voting systems one votes using a personalized chip card. Consequently, exercising the vote involves a much stronger identification. This difference in registration requirements may result in different perceptions of the privacy and security of the system.

How would the perception of the security and privacy influence the voting? If a system is not secure (that means if the voter expects that the system is easy to attack by hackers from outside the polling organisation, and that it is easy to falsify the outcome), the voter may be inclined to use – if available – another medium he of she expects to be more secure. Or the voter may decide to abstain from participating. It is less probable that an insecure system will influence the vote itself. The mistrust in the security of the system may probably result in not using it, and therefore lower the turnout.

This may be different in case the voter thinks that the system is not protecting his/her privacy. In that case, the voter may fear that others may be able to observe his/her vote, and therefore abstain from voting or vote differently. In case the voter mistrusts in the privacy protection capabilities of the technology, the voting decision may be changed in such a way that the voter may be inclined to vote more often vote *politically correct*, or *socially acceptable*, or may more often adjust to (large) *majority opinions*. The more sensitive the topic of the vote is, the stronger this effect is expected to be. In this paper we look at one voting session where Finnish people from the North Karelia district were asked whether Finland should join the NATO. In general the majority of the Finnish population is against this. The Finnish EU Attitudes Survey 2001 shows us that from the population aged 18-70 only eleven percent is in favour of Finland joining the NATO. Men are more often in favour (14.4%) than women with 7.8 percent (Finnish Social Science Data Archive, 2002). This leads to our first hypothesis: The higher the trust in the secrecy (privacy) of the voting technology, the larger the probability that someone expresses her minority opinion, which means in this specific case voting *for* NATO membership.

Table 9.5 Trust

Trust in		TRUEVOTE	CAWI	Male	Female	Use every day	Use less
Mean	Security* Privacy*	4.0 2.1	3.9 2.2	3.9 2.1	4.0 2.2	4.0 2.1	4.0 2.1
Stdev.	Security Privacy	0.85 0.73	1.29 0.74	1.15 0.68	1.12 0.68	.92 ,75	.99 .72
%	Security** Privacy**	83% 35%	69% 31%	77% 34%	83% 34%	82% 35%	80% 33%
N		97	26	64	62	66	59

*Measured on a six points scale 1= weak trust, 6= strong trust;
** Percentage of voters trusting the system (variables dichotomized)

We measured both aspects of trust on a six-point scale. In table 5, we give the averages and standard deviations for the two media: CAWI and TRUEVOTE. It is interesting to see that the respondents are in average moderately positive about the security of the systems, but negative about the privacy of the systems. The average trust in privacy is 2.1 (low trust) and the average trust in security is 3.95 (moderate trust). The TRUEVOTE

technology scores slightly better on security than the CAWI technology. Table 5 also shows the dichotomized variables, and there we see that considerable more voters trust the security of TRUEVOTE (83%) than of CAWI (69%).

Women seem to have a slightly higher trust in the security and in the privacy protection of the systems than men do. Almost no difference exists between the very frequent ICT users and the others. When dichotomized, we see that 2% more of the experienced users trust the security and privacy of the voting technologies. Finally 'trust in privacy' and 'trust in security' are really different dimensions of trust, and the correlation between the two is small (Pearson's r = 0.134).

After analyzing the trust in the voting media, the question is whether we can find a relation between voting media and voting result. In this chapter we use the data on media used and outcomes from the first voting session in the Finnish community network Upper North Karelia. In this case CAWI and the TRUEVOTE system were used. So the question is whether there exists a correlation between the use of the two voting media, and the outcome of the polls, and whether this effect is caused by differences in trust in the systems. Of course, we have to control for other variables, like nationality, sex, and internet experience of the voters. In a next version, we will also use other characteristics of the voters, like age, educational level, occupation, and so on. As the number of cases in this phase is too low to include all variables in a single analysis, we restrict ourselves to bivariate relations and to controlling for the effect of introducing various third variables.

Above we formulated the hypothesis that that lower trust in privacy may result in minorities (here pro-NATO) adopting the majority opinion when they use a less trusted medium to cast their. Given the higher level of pro-NATO votes in the TRUEVOTE system, we expect to find a higher level of trust in the privacy protection in TRUEVOTE than in CAWI. This is indeed the case, as 35% of the Finnish voters trust in the privacy protection of TRUEVOTE, and for the CAWI system this is only 31%.

Table 9.6: Vote BY Media (BY Trust in privacy)

				Trust in privacy			NO Trust in privacy		
	Media	E vote	CAWI	E vote	CAWI	Total	E vote	CAWI	Total
Vote	Pro Nato	13%	10%	15%	0%	13%	13%	16%	13%
	No Nato	87%	90%	85%	100%	87%	87%	84%	87%
	Total (N)	92	20	33	6	39	56	13	69

Further, if the 'trust in privacy of the voting media' is the main factor, one would expect that the differences between the two technologies would disappear if one controls for the trust in privacy. The next table shows that this indeed seems to be the case (table 6). The column percentages become rather similar, indicating that *within* the two groups with different trust in the system, the vote is not anymore depending on the medium used. And this is exactly what we formulated as a hypothesis.

A complicating factor for this analysis is of course the combination of a relatively low number of voters, and a very skewed outcome of the vote. This creates difficulties as expected values in cross tables become quickly too low. Therefore the analysis has to be interpreted with care, but suggests that further research in this line needed.

2. *Do differences in the social context of the vote (identity) influence the outcome of the vote?*

The second hypothesis relates the used technology to identity. Internet based voting enables us to vote from many places, and consequently in different social contexts. If the context influences someone's identity, than one would expect to find different voting outcomes for the different voting locations. Also here we study an effect of voting technology mediated by the social dimensions of the possibilities and use of the technology. The questionnaire enables us to compare people who voted from home with those who voted from elsewhere. Because of the small population we do not distinguish here further between voting places like school, work, and kiosk.

What would one expect? One would expect that when voting from home, the voter may tend to perceive the world from a more 'private identity', whereas people being in a voting booth, at work or at school may tend to perceive the world from a more 'social or collective perspective'. This implies firstly that home voters are expected to resist the majority perspective more strongly, as they find themselves protected from peer pressure, and therefore we expect that within the group of home voters the share of pro-NATO opinions is higher than average. Secondly, being home may stimulate a private 'family' identity, focusing on safety and protection, and this may influence people to vote for joining the NATO, while a more collectivist identity may focus more on the political aspects of joining the NATO. This leads to the second hypothesis: Voters from home will more often be in favour of Finland joining the NATO.

We will first analyze the identity-related variables. As people complete the questionnaire immediately after the vote, we now investigate whether home voters score higher on especially the items 'I prefer voting from home through the internet, because I think voting is a completely private issue' (item 1) and 'My vote reflects my personal interests more than collective interests' (item 2), and possibly lower on variables like, 'I share my political opinion with many of my colleagues' (item 73) 'As voting is a civic duty, I prefer to vote in a public space' (item 4), and 'Voting from work is a good thing, as I can discuss my political views with colleagues' (item 5). The results are summarized in table 9.7.

Table 9.7: Identity

item		Place of voting: Home*	Out*
1	Voting is private activity	***87%***	57%
2	Voting reflects own interests**	85%	91%
3	Share opinions with colleagues	15%	***41%***
4	Voting as civic duty	26%	***35%***
5	Discuss with colleagues	35%	***44%***
	'Collective identity' based on 1,2,3,4,5:	38% N=74	***61%*** N=23

* Positive score on dichotomized variable

** The only item which is counter intuitive, you would expect the home voters to score higher on this item

Interestingly, our expectations are to a large extent confirmed by the data. So we may conclude that the home voters have taken up (temporary) a more private identity. Furthermore, we want to check whether the variable 'sex' influences these findings, as the social identity may especially relate with gender. Therefore we analyzed the same relations for man and women separately, and then we find similar distributions in both sub-groups, as the following table 8 shows for the variable 'voting is private'. Still the home voters (male and female) score much higher on this variable than the men and women who voted elsewhere.

Table 9. 8: voting is private BY voting place (BY sex)

				Male			Female		
		Home	Out	Home	Out	Total	Home	Out	Total
Voting is private	Yes	87%	57%	85%	72%	83%	88%	42%	76%
	No	13%	43%	15%	27%	17%	12%	58%	24%
Total		74	23	41	11	52	33	12	45

Finally, we test whether home voters vote differently compared to those who voted elsewhere and table 9.9 shows that this is the case for the current sample. Some 15% home voters are in favour of joining the NATO, whereas 8% of the people who voted from elsewhere do so.

Table 9.9: Vote BY voting place (BY sex)

				Male			Female		
		Home	Out	Home	Out	Total	Home	Out	Total
Vote	Pro Nato	15%	8%	12%	9%	11%	18%	7%	15%
	No Nato	85%	92%	88%	91%	89%	82%	93%	85%
	Total	67	25	34	11	45	33	14	47

Controlling for 'sex' shows that male (12%) as well as female (18%) home voters more often vote in favour of joining the NATO than male (9%) and female (7 %) voters from elsewhere. The effect is stronger for women than for men. Of course the same warning about the low number of observations should be given here.

Table 9.10: Summary of findings

Expected relation	Expected effect	Finding
1. Trust in technology -> voting behaviour	Less trusted technology -> Less radical voters	Yes – small effect
1a. Controlling for trust in privacy	Effect 1 disappears	Yes
2. Place of voting -> social identity	Home voters have more 'private identity'	Yes – strong effect
2a. Controlling for gender	Effect 2 remains	Yes
2b. Identity is not fixed	- Not a high correlation between 'non-vote scores' and 'vote scores' on identity over time	Yes
	- High correlation between 'vote scores' on identity over time (constant voting place)	Yes
3. Place -> outcome vote	Home voters vote more private	Yes – small effect
3a. Control for gender	Effect 3 remains	Yes

9.5 DISCUSSION

In this explorative study, we presented a model for studying the effects of voting technologies on the turnout and outcome of ballots, as part of a larger study of the social aspects of e-voting technologies. We also conducted a preliminary test of two hypotheses about how trust and social identity mediate the effects of voting technologies – through their *social* dimensions – on voting behaviour. The aim is to test whether we can find the social-psychological effects of voting technology through trust and identity on voting behaviour.

We used a small and self selected sample. The findings therefore should be taken for what they are: preliminary. On the other hand, the study is a field experiment and aims to find first indications of whether specific social-psychological effects may occur in the use of e-voting technologies. So we do not aim at generalizing to a larger population. To do this would not only require a larger sample but also a representative one – and our respondents are self-selected. Does this invalidate the effects we have found? In order to check this, we did some tests, such as controlling the stability over time of the identity scores of the respondents, and we found low correlations. This suggests that the choice of the voting place was not based on the opinions of the voter that also determine the vote. The effect of self-selection may be not that serious.

As all hypotheses are supported by the data, we think that it is worthwhile to continue research in the direction outlined in this chapter. A few things seem obvious to do. Firstly, more large-scale field experiments are needed to study the effects of voting media on voting behaviour, as this would enable a serious multivariate analysis. Secondly, psychological laboratory experiments may inform us more precisely about the psychological mechanisms underlying the effects we think we have identified in this paper. Finally, even if the media effects on voting behaviour and participation do exist, it needs to be investigated what the aggregate effect on the outcomes of ballots would be. The effects we found are small, but this does not make them less important. Small effects may become decisive in situations where parties, persons or opinions have about the same support. Small effects are also important in cases with large majorities, as the indicated effects may make small minorities even less visible.

To our knowledge, this is one of the first studies in which data from real deployment of e-voting technologies could be gathered and analyzed. We suggested how voting technology may influence voting behaviour, and through this the outcomes of ballots. At the same time, the approach shows how technologies have social effects, without taking a technological determinist point of view. Finally, the chapter also shows how real life experimentation can be used to assess the possibilities and risks of new technologies, even in an early stage of technology development.

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10
Conclusions and Discussion

10.1 INTRODUCTION

The goal of this dissertation is to contribute to a more reflective technology development and to add to the emerging body of knowledge about effects, possibilities and risks of using information and communication technologies. Four main research questions guided this study (and each had subsidiary questions that were introduced and discussed in chapters 4 to 9). Once again, the main research questions were:

- *How can users participate in large-scale systems' design and development?*
- *What are the intended, unintended and second-order social effects of e-government (in particular e-voting) technologies and their applications?*
- *Can we investigate second-order order effects at an early phase of designing a new system through small real life experiments?*
- *Does a Social Informatics approach provide a useful framework for understanding the social implications of technical change?*

In this chapter we summarize our findings and conclusions, and compare those with other (recent) research. We also reflect on the methodology, and on our theoretical approach. The chapter ends with ideas for future research.

10.2 PARTICIPATION IN LARGE TECHNICAL SYSTEMS

Our first research question asked how users can participate in large-scale systems' design and development. The findings described in this thesis show that a combination of participatory design and technology assessment in large-scale and complex systems is very useful to get to grips with the needs, expectations and perceptions of end-users and other stakeholders. Participatory design, which borrows a variety of research techniques such as focus groups, observation, and case studies from the social sciences, helps designers to understand how people use technologies and systems in real life, and how to design new useful socio-technical systems.

Participatory Design is the approach towards computer systems design in which the people who use the system play a critical role in designing it. In other words, the users become the experts. As Schuler and Namioka (2003) argue: "People who are affected by a decision or event should have an opportunity to influence it". However, it is becoming increasingly more difficult with today's large-scale and complex networked systems to define who the users are. And because of the heterogeneity of user groups it has become a challenge to involve the prospective users of a technology in a constructive way. As Suchman (2003) already warned, in practice "it is often persons other than those who actually do the work who speak on their behalf".

Until recently, most experiments with participatory design were small scale, stand alone and not very strategic applications of ICT in organisations. However, modern ICT applications are increasingly based on network technologies, and are therefore complex

and large-scale. What user issues come up in these types of projects? And what methods can be used for user participation?

Initially, in the two projects we studied, little emphasis was placed on the participation of the end-users (e.g. the citizens). However, some groups of users (such as civil servants) were involved directly, through the participation of their organisations in the project. During the design phase of both projects it became clear that end user involvement was essential to discover the needs, wants and expectations of the end-users. User engagement in e-government applications is especially important because of the unavoidability of these systems for citizens.

As we already stated, it is not always immediately obvious who the different user categories are. In our two cases, the users came from different countries with different cultural backgrounds, legal and organisational settings, and had varying opinions, norms and values, which influenced the requirements, expectations, evaluation and acceptance of the proposed systems. After we identified the users, we used a variety of methods to involve them in the system requirements analysis, design, implementation, evaluation, and usability testing.[51] Our participation approach deploys a variety of research methods such as interviewing, observing, focus groups, scenario based evaluation workshops, real life experiments, and surveys. Additionally, we analysed the social environment in which the systems were to be embedded to get an idea of the possibilities and constraints for the proposed solutions.

This variety of research methods gave the different involved user-groups the opportunity to suggest, develop, influence, and test possible solutions. However, as Suchman (2003) already pointed out, this leads to participation by representation – something, she argues, one should avoid. In the case of large scale infrastructures, however, it is unclear how one could involve all users directly. Therefore, in our approach the users participated both directly in design team and indirectly through our research activities.

In our view, this was effective, but in a different way for the two projects. The technical development and the user phase ran parallel in both projects. However, in the TRUEVOTE project there was a relatively fixed idea about the e-voting model from the start. This had large consequences for the design of the voting system; the user needs and requirements that resulted from the participatory design phase were not really taken into account. Whereas in the FASME project the results from the user involvement were fed into the design of the system, altering the final application, the PD methods used in TRUEVOTE provided more social issues, theoretical and normative insights, than a practical input for the design.

Participatory design also requires an interdisciplinary collaboration, which remains a complex problem that needs to be solved, in order to attain and use a shared understanding of the problems involved and the possible solutions.

Concluding, in both of our case-studies we showed how user participation can be organised in complex processes, even if it is hindered by problems of interdisciplinary

[51] See Chapter 4 (FASME) and Chapter 6 (TRUEVOTE).

collaboration. We also showed how user involvement results in awareness about possibilities, limits, and implications of the technology involved. The combination of social research (technology assessment) with PD methods can be successful. This resulted in crucial input for the design of the system, and in an understanding of the fundamental social dimensions of international e-government systems, directly related to design options, and to the context of use.

10.3 SOCIAL EFFECTS OF E-GOVERNMENT TECHNOLOGIES

The results of our second research question can be classified into two categories: first, the general findings concerned with social, organisational and usability issues of e-government systems, and secondly, specific findings related to e-voting systems.

10.3.1 Social and organisational effects of e-government

It is well-known that social and organisational issues are very important when ICT systems are being developed and implemented. Organisational complexity was experienced in both the FASME case and the TRUEVOTE case. In both projects a complex system was developed, in which many different social groups were involved. Until recently, the issue of e-government systems has been primarily a technological issue – one involving computer security, reliability and efficiency. However, it becomes increasingly clear that key issues with new technologies relate to people and the way they communicate and organise themselves. This dissertation shows that in large-scale innovative projects technology is often not the main problem. We found that the social and organisational issues are frequently far more difficult to solve, as shown in chapter 4, 5, and 7. Many of the issues that played a role in the two cases are known from the literature about socio-technical systems[52]. However, the problem of social interoperability is a rather new finding with potentially broad implications. Therefore we will emphasise this particular issue here instead of repeating the more common findings.

Our research showed that in international e-government systems such as FASME, the main problem is interoperability (Chapter 5). However, the intensive involvement of users resulted - rather early in the project - in solutions for *technical interoperability*. This meant that the technical interoperability is not the principal problem as is generally thought. The main issue turned out to be the *social interoperability.* The introduction of a card like FASME reinforces the necessity to harmonise, formalise and standardise the data in order to improve the provision of services. When one wants to couple the administrations of different countries it may put pressure on the existing diversity. Through the interviews held with different actors we discovered that there is diversity on three different levels. First of all, there is the diversity of political and public administration systems in the participating countries. Important differences also exist in the way European Law has been implemented in the various member states. Mobile citizens have to cope with different rules, regulations, requirements and forms. This

[52] Interestingly, these issues seem persistent, especially when relevant user groups are not involved in the design and development. In other words, innovation is a learning process with recurrent mistakes and failures (Hooijen et al., in preparation).

diversity in the public administration systems and the national implementation of European Law had to be reflected in the design and functionality of the FASME card. Secondly, there is a diversity of citizen's attitudes, norms and beliefs which influences their acceptance of a new system. Thirdly, and most fundamentally, there is the diversity of administrative classifications which reflect socio-cultural differences among European countries. It is likely that in post-modern societies the variations in the contexts and behaviours of people will increase further, leading to even greater complications for designing e-government systems for administrative support. We concluded from our research that although it would be easier (from an international e-government perspective) to completely harmonise the different European legislations and rules, it is not desirable. International e-government systems should value the cultural diversity within and among countries and should not try to impose uniformity and standardisation. Instead, to respect local customs and normative systems an ontology is needed that will 'translate' different concepts onto an international template without eliminating required local diversity and autonomy. This, however, is not a technical problem but a regulatory one, as described in Chapter 5.

10.3.2 Social effects of e-voting

Many important social issues are related to the introduction of (remote) electronic voting systems. Twelve focus groups were organised at the beginning of our study to elicit the most important social issues related to voting electronically. The end-users and pollsters involved in the focus groups discussed many different aspects of e-voting systems and emphasised the issues of turnout, civic ritual, digital divide, trust, secrecy and voting behaviour. We have therefore concentrated on these specific topics in our research. In this section we will discuss our empirical findings and compare them to other research. Nevertheless, we have to bear in mind that remote e-voting systems are relatively new and that researchers have only recently started to pay more attention to the social aspects of this new technology. Therefore, research about the social consequences of e-voting systems which is based on empirical data is scarce.

Turnout

Governments actively want to influence citizens' participation rates at elections. From most governmental policies it is clear that there is a set of common assumptions underlying these policies that express the general belief that participation can be positively influenced through new ICT tools. For instance, e-voting tools are expected to make voting easier and more accessible. No matter where voters are – at home, at work, abroad or in hospital – they are always able to cast their ballot online. This should in return lead to higher turnout. However, our literature review showed that most of these assumptions have hardly been tested empirically (Oostveen & van den Besselaar, 2002). The focus groups which we organised taught us that both the users and pollsters do not believe that remote e-voting will positively affect political participation and turnout (Chapter 6). The majority of the focus group respondents expected that e-voting would only slightly increase the turnout among young people, but they did not think that an increase in the overall turnout would have a lasting effect. E-voting was not seen as a sufficient measure to encourage non-voters to cast a ballot. So the question which interested us after the focus group discussions was to what extent empirical proof could be found for increased participation (voter turnout), particularly through the use of remote voting over the internet. We organised three consecutive e-voting tests to find

evidence which would show whether turnout increased, decreased or remained unchanged.

The results from these field experiments (Chapter 7) supported the expectation of the various users that e-voting does not increase turnout at elections. Even more strongly, our subsequent experiments showed that the turnout declined. This declining participation was a general tendency over the experiments. So if an effect of the new technology on turnout exists, it seems that people quickly get used to the new technology, which then loses its special appeal. From the focus groups and the experiments we can state that government policy to increase public participation by e-voting is grounded on too simplistic assumptions.

Serious doubts with respect to increased voter turnout as a result of the introduction of electronic voting were also raised by Philips and Spakovsky (2002). Both they and the Internet Policy Institute (2001) concluded that previous reforms designed to make the voting process more convenient had hardly any effect on voter turnout. Research has shown which individual characteristics influence voting behaviour: "On average, being poor, young, and less educated increases the likelihood that an individual will not show up at the polls on Election Day" (Plümper, 2005: 348).

Nonetheless, some research does show a positive effect of e-voting on turnout. Kenski (2005) mentions two examples of American elections where e-voting did have a positive effect on the turnout. She shows that Doyle and Hamburger (2000) found that the turnout in the Arizona Democratic primary in 2000 was higher than in the years before. The Arizona Democratic Party primary election was the first binding internet election in the world. In March 2000, 86.907 voters cast ballots compared to the 32.000 voters in 1998 and 12.844 who cast ballots in 1996. A similar incline in turnout was shown by Harrington (2004) for the Michigan election. In Kenski's opinion two elections do not make a trend, noting that: "Until other state parties and/or state and local governments adopt internet voting, assessments of internet voting's impact will be anecdotal at best" (Kenski, 2005: 295). She also points out that some of this increase may be attributed to the increased media coverage stimulated by the novelty of the election. However, the increase in turnout is that high – it almost triples every election – that this can hardly be the effect of the change in voting technology.

Increased voter turnout is one of the main reasons governments want to implement the new voting technology. And although it has often been argued, it is less often demonstrated, that electronic voting would indeed increase the turnout at elections. We have seen that our research does not indicate that voting turnout will increase because of e-voting systems. Similarly, electronic voting failed to make much of an impact on the turnout in the local 2003 elections in the UK (BBC News).

In her paper "E-voting as the magic bullet? The impact of internet voting in European parliamentary elections", Norris is also very sceptical about any potential revolutionary benefits from e-voting on turnout. She compares levels of turnout in seventy national parliamentary or presidential elections held during the 1990s in twenty-five established democracies (Norris, 2002). Her analysis shows that only polling on a rest day provided a significant boost to turnout. Proxy voting (when a person is authorized to act for

someone else) and the number of days that the polling stations were open were negatively associated with turnout. More important to our argument – that e-voting will most likely not improve turnout at elections – is her finding that: "Other special voting facilities, such as the availability of postal or advance voting, as well as the use of automatic or voluntary registration procedures, proved to be unrelated to levels of electoral turnout". Norris notes that e-voting at home or at work can be seen as analogous to the use of postal ballots, and she points out that the evidence suggests that the use of such facilities has had no or very little effect on turnout. "If European elections are widely regarded as largely irrelevant to the policy outcome, or if people do not feel that they are presented with choices which represent their interests, then no matter if casting a ballot becomes as easy as clicking a mouse, participation levels will, unfortunately, probably remain miserably low" (Norris, 2002: 12). Other research supports this. Poor levels of turnout are a reflection of wider attitudes in society and therefore solutions to the underlying problem are unlikely to be found through changes in procedures and voting systems (Henn & Weinstein, 2001).

Summarizing, our finding that e-voting systems will not increase public participation is supported by most other research. Policy makers should therefore be aware of the more complex interrelations and interactions between technology and society.

Civic ritual

Another issue, which comes into play when people do not vote from a polling station, is the erosion of the 'civic ritual' of physically casting a vote in a location where members of the community gather together (Dictson and Ray, 2000). The loss of the civic ritual is commented upon in many scholarly articles about e-voting. Critics argue that it would make elections less of a community event, which might create a greater gap between citizens and government, thereby decreasing participation. This goes against the more common belief that electronic voting will increase civic participation.

Some people believe that voting is more than the simple act of indicating one's political preference; it is a vital public ritual that increases social solidarity and binds citizens together (Mohen and Glidden 2001). Of course, as is often argued, modern society shows a tendency towards individualization, and remote electronic voting is said to fit into this tendency. However, it is a normative issue whether one wants to reinforce or counteract this by selecting appropriate technologies.

The results of the focus group discussions indicated that the loss of the actual ritual of voting is indeed something to consider (Chapter 6). The pollsters are very concerned about the loss of the civic ritual of casting a ballot and consequently the loss of the importance and the value of voting. Their fear is that the system could be considered 'too cold' by the voters. The pollsters voiced their concern that the trivialization of the voting act could decrease the significance related to voting and hence overall turnout. They went even further by pointing out that making the current voting procedures easier might produce an increase of 'spread ignorance', that is, an increase of 'superficial behaviour' and/or a growing oversimplification of voting behaviour. As e-voting may destroy the civic rituals it can have a negative influence on the political culture and therefore is best avoided. The voters' focus groups also identified traditional voting procedures as a ritual that should be preserved. The representatives of a trade union that piloted the system articulated that the use of remote e-voting would negatively influence

the internal communication and formation of opinions within the trade union organisation.

There are other scholars who have recognized the importance of the civic ritual of voting. Valelly (1999), a political scientist who studies elections and public policy, says the growing enthusiasm for e-voting unfortunately discounts the value of the civic ritual that takes place under the current system. The history of voting in America clearly shows that the *physical* mechanics of voting have a huge impact on the quality of public life. E-voting would isolate citizens, essentially turning everyone into an absentee voter. While the absentee ballot has been available for a long time for people who can't make it to a polling station on Election Day, the new e-voting systems are designed for everyone. He states that the problem is that e-voting will transform voting from an inherently public activity into a private one. "Even with a secret ballot, the mechanics of voting are still explicitly designed to remind us that, in principle, we are all equal members of a political community. On Election Day, we must leave our homes and offices, travel to a polling place, and physically mingle with people who are plainly our equals that day, no matter what other differences we have. Voting, as we currently do it, is a civic ritual, however brief it may be. [….] Our current system has the virtue of reminding us of our fundamental political equality" (Valelly 1999). He warns that a move to e-voting will change how we think of ourselves as citizens

Kersting, Leenes and Svensson (2004) also acknowledge that electronic voting may lead to fundamental change in the social conditions under which the vote is cast. Their main concern is that with e-voting, elections may lose their visible, public and symbolic character (ibid.: 284). The authors refer to a German research by Kersting (2002) which shows that the duty to vote is very important among the older generation: "In this group voting behaviour is highly ritualized and important for personal identity and social cohesion". However, the authors claim that the symbolic and social threats may be somewhat overstated, because "the idea of a diminishing symbolic importance of the electronic vote is debatable", especially when it comes to the younger generation.

In France there is an even stronger and more widespread resistance against remote electronic voting. Although French Law authorized electronic voting in 1977, this only applies to electronic ballot boxes at the polling station. Voting from a distance is only authorised in a few exceptional circumstances. Toporkoff (2002) addresses some of the concerns that French politicians have about remote e-voting. First of all, most politicians find the security risks too important. Secondly, the politicians point out that online voting could call the concepts of privacy and non-coercion of individual votes into question. But, as the author emphasises: "The main restraint in France is that the vote is personal and secret and should be done in the famous sacred 'isoloir' i.e. voting booth (existing since the 19th century) which has no electronic equivalent" (Toporkoff, 2002).

The Commission Nationale Informatique et Liberté (CNIL), the French Data Protection Authority, has almost always been opposed against e-voting. Their main argument being that citizens who vote from home or the office do not have complete freedom. The 'isoloir' is a French cultural and historical particularism and is very firmly fixed in citizens' minds. The Internet Rights Forum (2003) published the recommendation

"What is the future of electronic voting in France?" in which they describe voting as "a symbolic act, a ritual which lays the foundations for belonging to a social and political community".

> *Going to the polling station also marks a voluntary action on the part of the individual, demonstrating his/her involvement in the life of the society and the City and a solemn and public affirmation of his/her entitlement as a citizen. The existence of a polling station is not neutral. It brings together the electoral body at polling time.*

This view leads them to conclude that they "do not recommend electronic distance voting for political elections" (2003: 26). In France, it will only be acceptable to have electronic voting for political elections from a voting kiosk in a polling station. However, they do not dismiss e-voting completely beforehand:

> *Nevertheless, a questioning, in part, of the tradition of the cubicle, cannot be rejected 'a priori' in the name of the intangible nature of physical election procedures. For some elections, passing before the urn does not represent a strong symbolic moment and, in addition, for a whole section of the population who have deserted the urns, it is precisely this ritual that is being questioned.*

The loss of the old civic ritual of going to a polling station on a set day will be strongly felt by the older generation. This is also the group already most disadvantaged by the digital divide. Younger voters don't seem to be enticed by the existing civic ritual and have been a traditionally underrepresented group with the lowest turnout at elections. Going to a polling booth seems to have a diminished value for the younger generation and they are willing to embrace the convenience of voting via the internet. Yet throughout history we have seen that where old rituals disappear, new rituals emerge. Society is not static and even ancient rituals change over time. We think that there will still be a function for civic rituals related to voting, but they will take on a new shape. Rituals will still help people to maintain a sense of community and citizenship. Maybe remote voting will establish new rituals which will focus more on forms of deliberation than on the actual physical act of casting a ballot.

Digital divide

According to many observers, the digital divide is declining. Although the 'digital divide' might seem to narrow, internet connections are still not distributed evenly across racial, gender, age, regional and socio-economic lines. Furthermore, the narrowing of the digital divide is generally measured in terms of *access* to the internet. However, divides may be much more subtle and related to skills required to install the software and hardware, learning, social networks that provide help, ownership of advanced versus older types of computers, insights into the security and risks, and so on (Wellman and Haythornthwaite, 2002).

Our research showed that electronic voting systems might reinforce the already existing the digital divide (see Chapter 7). Electronic voting may soon be the dominant mode of voting which could hamper the participation of specific social groups. Demographic groups with less access and less familiarity in using computers might find some types of (remote) electronic voting difficult or intimidating. In the field studies we saw considerable differences in the frequency of use of ICT. This frequency of using ICT is

related to the amount of difficulties with installing and using the system. Therefore, we cannot assume that every citizen has equal access to remote e-voting possibilities.

Although most of the voters involved in our research would be willing to use electronic voting systems themselves, they are of the opinion that remote electronic voting should only be used as one alternative voting method. Both the organisers of the ballots and the voters emphasised that electronic voting should not replace the traditional voting systems in the near future, as it may exclude from participating, groups who are able to use the traditional ways of voting. There is a serious risk that if e-voting systems replace the traditional voting systems in the future, it may have the unintended effect that it will exclude large groups from participating in the democratic process, thereby strengthening the already large digital divide. However, the prospect of saving money (or of being 'modern') is often dominant in the introduction of e-voting, and the inclination to keep expensive parallel systems alive may therefore in practice be low. Experiences in other sectors support this. Whereas, for instance, the credit card was introduced as an additional means for paying bills, transactions have increasingly become exclusively related to credit cards, such as reserving a hotel room or renting a car. And, electronic voting in the polling booth has replaced paper voting completely in countries like Brazil (Brunazo Filho, 2005) and the Netherlands: so there is a clear tendency of new voting technologies replacing older technologies. This may also be the case in the future with remote electronic voting.

How do our results compare to other studies? The fears of digital division were substantiated in the 2000 Arizona primary (Philips and von Spakovsky 2002). In the counties with a largely white voter population, the use of electronic voting was far more popular than in the rural counties with a large population of minority voters. Kenski (2005) has used data collected in Arizona during the 2000 general election campaign to examine the opinions of registered voters toward internet voting. Her study was unique in that it examined attitudes from citizens living in a state that had already used internet voting in a binding primary election. Her reserach suggests that e-voting could change the socio-demographic and ideological composition of the voting electorate. Younger voters preferred internet voting more than older voters. Liberals were more likely to report willingness to cast their ballots online than were conservatives. Interestingly, 50% of Independents, 40.8 % of Democrats and only 30 % of Republicans said that they would cast their ballot over the internet. Education was also positively associated with e-voting. Furthermore, individuals with access to the internet were much more in favour of e-voting than those without access. However, unlike it is suggested by many other studies, gender and income were not significantly associated with favourability towards internet voting. Summing-up, this study shows that adoption of e-voting would increase the number of younger, well-educated and liberal citizens in the political system.

Norris argues that electronic voting could further skew electoral participation towards more affluent and wired socio-economic groups, especially if e-voting is available from any home or work-place terminal (Norris, 2002; 2003). Internet diffusion in the European Union is extremely uneven among and within member states (Norris, 2002). The evidence from the distribution of internet access in the European member states confirms that, at least in the short-term, the impact of introducing e-voting in elections for the European parliament could probably deepen and worsen the socio-economic 'voting gap'. "If e-voting via computer terminals in the home or workplace were to be

introduced into European elections within the next few years, thereby increasing the convenience for those with internet access, and reducing the barriers to participation, then the unequal patterns of internet access could be expected to widen many of the familiar socioeconomic disparities in electoral participation that already exist, including those of social class, education, gender, and income" (Norris, 2002: 7).

In Chapter 1 we discussed whether Computerization Movements like e-government and e-democracy would only advance the interests of elite groups, creating a larger digital divide, or whether CMs could also advance the interests of the poorer groups in society (Iacono and Kling 1996). Based on Kenski's and other studies (Solop, 2001; Gibson, 2001; Alvarez and Hall, 2004) we can conclude that online voting may have a large impact on the composition of the electorate reinforcing the digital divide. As Alvarez and Hall point out: "If internet voting affected who voted, then it clearly would affect who was elected" (2004: 52).

Trust

The research for this dissertation indicates that trust in technology has three different dimensions: trust in security, trust in privacy, and trust in the accountability of the system. Here we focus on the latter dimension. The current debate about whether or not electronic voting systems need to have a verifiable paper audit trail, focuses on the third dimension of trust (in the accountability or verifiability of the system). Among researchers in the field of electronic voting it is widely assumed that a voter-verified paper trail is the only way voters can have confidence that their vote has been recorded correctly. However, our research showed that the opinion of users about the accountability of systems is based on perception rather than on facts. Our voters reported in majority that they could easily check whether their vote had been correctly counted, whereas the system actually did not allow them to do so. Put differently, people will use unverifiable systems only because they think the systems operations can be verified – even when the technology does not enable this.

In other words, trust in technologies seems to be based on other things than the technologies themselves. We hypothesized that people base their trust in, and their perception of, security on factors like the reputation of the organising institution, the opinions in the mass media about technologies, the attitudes and opinions of friends and family, and the convenience the system brings them, and that this trust influences the use of voting technology.

Indeed, studies show that the majority of internet users are extremely naïve in trusting what they see on a computer screen: "A message such as 'your vote has been received and counted' might be enough to satisfy the voting population" (Peralta, 2003: 157). When the MORI Social Research Institute investigated what determines trust they found that people are influenced by a range of information sources. One of the most powerful appears to be personal experience and the experiences of friends and family. The media also represents a significant influence (MORI, 2003: 22-26).

Many social scientists have shown that trust in political institutions is related to political participation. In a study of the 2004 ballot in Geneva, Christin and Trechsel (2005) were able to verify this. They questioned their respondents about general trust in institutions

such as direct democracy or federalism, trust in Swiss politicians and confidence in public authorities such as the Geneva State executive and public administration. Their results showed a direct relationship between trust and political participation (Christin and Trechsel, 2005: 26). The MORI study on trust in public institutions shows that trust in organisations really matters (Mori 2003). The level of trust in an organisation affects levels of use and engagement with services. Where there is some choice, the participants in their research choose the institutions that they think will provide the best quality. Where there are no alternatives, for example with some local council services, some avoid contact with services they do not trust unless it is absolutely essential. Levels of trust vary considerably across different organisations and groups (MORI, 2003: 12-14).

Trust in organisations (and the political system) is key to participation and engagement. If it is actually trust in the political system which influences political participation, then it would be a mistake to assume that improved voting technologies will automatically lead to an increase in turnout. Instead, as our TrueVote case illustrated, it will be the other way around, with a higher trust resulting in an increased turnout as well as in an increased use of new voting technologies. The current search for technological solutions for the problem of trust in government seems to be paradoxical because, to increase public trust and confidence, governments will be relying on information and communication systems that themselves require a high level of trust. It is for this reason that it seems to be a bad idea to look for technical fixes (e-voting systems) to solve largely social problems (declining trust in government and politicians, resulting in lower turnout at elections).

Free and secret voting

The issue of coercion was also discussed by the users and pollsters in our twelve focus groups (Chapter 6). In a recommendation report written by the Council of Europe (2004) five basic principles of democratic elections and referenda are specified. Elections need to be universal, equal, free, secret, and there should be direct suffrage. These principles apply to traditional voting as well as to new voting methods. With electronic voting the voters must be identified by the system; the tallier must be able to distinguish the votes cast by valid voters from those cast by voters that are non-eligible. At the same time the votes must remain anonymous and secret. No one should be able to determine how any individual voted, and voters should not be able to prove how they voted because this would facilitate vote selling or coercion.

Coercion occurs when the vote is not free, i.e. when the voter is forced or bought into voting for an option which he would not have chosen had he not been under pressure of if he had not been offered a bribe (van Acker, 2004). The voting booth as we know it provides sufficient privacy against coercion. There is no point in somebody bribing a voter on how to cast a ballot if that voter can then go into the privacy of a polling booth and double-cross them and take the money but cast their vote in the way that they would have wanted. But if somebody can actually see how a voter is using his/her vote, then that is something that makes bribery worthwhile.

Remote electronic voting increases the risk of coercion of the voter by, for instance, a dominant spouse, the teacher at school, or the boss at the workplace. Our research shows that the possibility of coercion is a real concern among voters. Of the participants

in the e-voting experiments, some 85% did not trust that the system would allow a secret vote. And, according to a majority of the focus group participants, the greatest risk of remote e-voting is the possibility that a voter can be forced by someone else to vote for a certain alternative. With remote voting there will never be the same privacy that a voting booth provides. This phenomenon of 'family voting' is also possible with other voting technologies. Husbands could accompany wives into the polling booth, and this is indeed a real problem in many cases[53]. However, appropriate regulation may prevent this from occurring, because voting in a polling station is in the public domain and therefore controllable. As is often argued, the education of voters and a stable political situation may heavily reduce the risks of family voting. In our view, however, the voting system should be robust also in periods of political tension.

When we compare our results to other studies we see that the fear of coercion that our respondents expressed is not uncommon.

Ferguson says that making the act of voting private instead of public could have an impact on how people vote. She links this strongly to coercion, whereby people are told by family members or employers how to vote. However, she does not present any empirical data to underpin her predictions. Since remote electronic voting has not been used in many elections yet, there is little evidence that coercion or persuasion actually takes place. However, we can look at postal voting as another form of remote voting which has been around much longer. There is some evidence that coercion has indeed been an issue with postal voting. The Guardian for instance, reported in June 2001 that fears were raised after police began an inquiry into claims that gangs had coerced people to apply for postal votes which could then be filled in by activists. Apparently, in some streets every household had applied for a postal vote after receiving visits from groups of men. In 2004, The Times reported that the Independent Electoral Commission had dropped its support for postal-only voting because it feared that dominant husbands, fathers, community leaders or candidates may have coerced people into voting against their will (Kennedy and Sherman, 2004). The Commission had previously supported all-postal voting for local elections, but based on evidence from the 2004 pilots and in particular, the strength of public criticism of a single voting method, the Commission decided that all-postal voting should no longer be pursued for use at UK elections. Instead, the Commission suggested that a new model should be devised that allows voters to go to polling stations if they wish, while retaining the best features of all-postal voting. In their report 'Delivering Democracy? The future of postal voting' the Commission states: "The potential for voter coercion or intimidation by a strong member of the family or a community, by the staff in an old people's home or even by the candidates themselves were also issues that were raised by the public and some candidates and parties" (The Electoral Commission, 2004: 64).

Peralta (2003) points out that there is no consensus about what the potential sources of coercion are that make secret voting so necessary. He states that the public as well as left wing and right wing intellectuals in the U.S. believe that the Government is an

[53] See for an example of instances of 'family voting' the Dutch report about the local elections in Amsterdam where voters (mainly ethnic minorities) were instructed how to vote by others who accompanied them (Gemeentelijke Ombudsman, 2006) .

important threat, while "To people in other countries, social entities such as the Church and the corporate sector are more important threats to electoral freedom than the Government is" (Peralta, 2003: 156). Another completely different potential source of coercion, according to Peralta, is people close to the voting individual such as spouses, parents, co-workers, etc. Spousal coercion has been raised as a major reason not to allow voting from home or work.

There are a lot of papers written with ideas for electronic voting systems that should make coercion impossible (Juels, Catalano and Jakobsson, 2005; Shubina and Smith, 2004; van Acker, 2004). These papers point out that the possibility of coercion is also a genuine concern among the people who actually build electronic voting machines. Complicated schemes and solutions are presented that would make it impossible for spouses or others to make someone vote in a certain way. Systems which for instance allow people multiple votes but only count either the first or last can help the problem of coercion, or systems that issue the voter with two passwords: one to be used to cast your real vote and one to cast a fake vote. Nonetheless, very few of these 'coercion resistant' or 'coercion-free' systems, seem to be completely secure or practical. According to Peralta it is highly unlikely that spouses who are vulnerable to vote coercion have the sophistication to understand and use the (so-called) coercion free systems (Peralta, 2003: 156).

Our research has shown that people are genuinely concerned about the increased possibilities of coercion when using an electronic voting system from home or work. For any form of remote voting, it is hard to eliminate coercion opportunities by a family member. This applies as much to postal voting as internet voting or voting by text message. Although a lot of research is being done to develop systems that will make coercion more difficult, there is still not a solution to the problem. Citizens with domineering spouses or bosses should be able to cast their vote in a controlled and secure environment like the polling booth. Yet another good reason to keep parallel systems alive or to avoid remote voting completely.

Voting behaviour

According to the pollsters who took part in the focus groups, the techniques used to cast a ballot would affect the voting results (Chapter 6).[54] This interesting issue needed more attention. As e-voting enables people to vote from different places and social contexts, this may influence their vote or opinion. We set out to examine in which ways the actual voting procedure and technology would influence the voting results. We asked the question whether e-voting affects the type of people who participate in elections. We already discussed the issue of effects on the voters' population in the section about the digital divide. We will return to this issue below.

We also investigated the effect of voting technology on voting behaviour by addressing the issue of trust, and the social identity theory (Tajfel, 1978; Ellemers, 1999).

First of all, we investigated in a field experiment whether voters have different levels of trust in the various voting media, and whether this influenced their voting behaviour.

[54] In the section on *digital divide* we already discussed another way in which voting technology may influence the outcome of a ballot: through an effect on the demography of the voting population.

Our hypothesis was that the nature of the voting technology may influence the trust in the privacy of the system and through this the voting decision. We did indeed find that when people had a lower trust in the privacy of the system they used, they were more inclined to adopt the majority opinion. Our analysis of the Finnish election results showed that the voters who had a high trust in the secrecy and privacy of the system (the TRUEVOTE voters) more often adopted the minority position than those who did not trust the system they used (in our case the CAWI voters).

Secondly, we investigated whether the articulation of political preferences and opinions by citizens is affected by social identity. Social psychological theory suggests that social identity is dependent on the social situation a person is in, and that the voting decision may be different depending on these identities. If this is true, the outcome of a vote may be influenced by the deployment of internet-based systems, as these systems allow a high variability in voting locations. The findings reported in Chapter 9 confirm the expectation that voters' social identity varies in different situations (voting in polling booth, voting from home, etc.) and that the voting medium may have an effect on the voting outcome. We concluded that home voters seem to take up a more private identity and vote slightly different compared to those who voted elsewhere. This suggests that e-voting technologies have social effects without taking a technological deterministic point of view. Of course we are not claiming that political preferences will be entirely determined by the voting context. However, these contextual effects may be especially important in the case of "floating" voters who often decide the result of the election.

The field experiments gave a first indication that electronic voting systems are not entirely neutral. The use of remote voting systems seems to have an impact on the ballot outcome. Is this a result that is seen anywhere else? Political scientist Valelly pointed out the importance of going to a polling station to cast a ballot. Not just because it makes us feel good about ourselves, but also because it gets us to think about public issues differently than we would otherwise. "While it is generally assumed that people vote on the basis of their pocketbooks, surveys show that people actually focus on things such as the national good, not their narrow self-interest when they vote" (Valelly, 1999). Valelly claims that one of the possible reasons for this is the fact that people are obliged to leave their homes and enter the public domain. He argues that this tends to make them more public-minded. Although Valelly's argument points in the same direction as our research, he has not conducted an empirical study to ground his view.

There is indeed very little systematic empirical research on the relationship between voting technology and election outcomes (Solop, 2000, Hout et al. 2004; McCollough and Plassmann, 2004). Due to the fact that e-voting is still a relatively new technology, not many studies have specifically analysed the impact of electronic voting on the result of the ballot, and there are even less studies on the impact of *remote* electronic voting on the voting result. The studies that have paid attention to the question whether or not electronic voting technology could affect election outcomes usually refer to technical problems such as accidents, errors and software deficiencies or fraud. Instead of approaching the issue of neutrality from a solely technical perspective, we looked at e-voting as a socio-technical system and tried to establish whether or not it influences the outcome of a ballot.

One of the first researchers to ask the question whether internet voting affects the type of people who participate in elections, and the effects of internet voting upon election outcomes is Solop (2000). Solop studied the 2000 Arizona Democratic primary election using data from telephone surveys. In the Arizona election, 86.907 ballots were cast with almost half of all votes cast over the internet (46%). Among the internet voters, 90 percent cast their vote from remote internet sites in the four days prior to Election Day, the other 10 percent visited an election site to cast their ballot online. From the remote voters group, 78 percent voted from home, 7 percent from work and 6 percent from elsewhere. Solop investigated whether the internet voters related differently to the political system than other voters and whether they voted differently than other types of voters. He found that internet voters have a greater sense that their participation matters, they are more engaged in the political process, and pay more attention to current events than other voters. But do these internet voters also show a difference in vote preference? According to Solop, the internet voters were slightly more likely to support Al Gore over Bill Bradley, than either non-internet voters or voters as a whole. More interestingly, "the margin of error restricts us from making too much of this insight, but it is suggestive of internet voting serving as a tool to reinforce mainstream vote choice rather than to bring new, radically different, voices into the electoral process" (Solop, 2000: 11). The home-internet voters from Arizona reinforced the majority vote choice. But why? From Solop's study it remains unclear what the reason is that home-voters voted differently than either non-internet voters or voters as a whole. However, the results from both our own study and Solop's research suggest that electronic voting is not neutral and that further research into this issue needs to be conducted on a far larger scale.

A more recent study that deals with the question whether or not e-voting is neutral is a research by Christin and Trechsel (2005). They have analysed the 26th September 2004 ballot in Geneva, where both federal and cantonal issues were voted upon. Four federal referendums and two cantonal referendums were observed and analysed. The report provides an analysis of a telephone survey they have conducted on a representative sample of 1014 citizens in four Geneva municipalities (2 towns and 2 villages). During the Geneva ballot, postal voting remained the favourite voting channel, with more than 70% of all cast ballots. Internet voting comes second, with 22% of the votes. Polling station voting comes third, with less than 6 % of the votes. The majority of internet votes were cast at home (81.3%). Only 16.1 % of the voters filled their electronic ballot paper in their workplace. Only a negligible share of voters used other places such as public access PCs, cyber cafes, etc. The fact that the electronic vote is mostly cast from home, even if the voter has multiple internet access suggests that having an internet connection at home is a crucial element of online voting, since citizens are not prone to vote in a public context (Christin and Trechsel, 2005: 10).

One of the important questions the researchers asked was: how does internet voting affect the other voting channels and how does it impact the outcomes of the ballots? They report as an essential finding that the three voting channels that have been used (poll station voting, postal voting and internet voting) are all politically neutral. In other words, it is impossible to guess a voter's political choices on the basis of the voting channel he chooses. However, Christin and Trechsel (2005: 26) also include the group of non-voters in their analysis, which seems to distort the results. When we repeated the

same analysis but without the non-voters, we got a different result. Voters with a high trust in the institutions were more inclined to use internet voting and polling station voting. When they have less confidence in the institutions, they use postal voting. We have to bear in mind that it is not known from the group of non-voters which voting method they would have used, and therefore they need to be omitted from this particular analysis. When the group of non-voters is not taken into account, the results do show that trust in the institutions is related to the use of a particular voting method. So the claim by the authors that the voting channels are politically neutral seems too strong.

Card and Moretti (2005) showed that even non-remote e-voting can have an effect on the outcome of a ballot, in this case through changes in the voters population. Card and Moretti have used county level data on voting technology and election outcomes in the 2000 and 2004 American Presidential elections to try to determine whether there is evidence of systematic manipulations associated with electronic voting. Their results suggest that e-voting has a small effect on election outcomes, but that the mechanism is not illegal vote manipulation. Their research showed that there is a small positive correlation between adoption of touch-screen voting technology and the level of electoral support for George Bush (after controlling for income, demographic composition and other factors). They found that the Republican vote share increased more in counties that adopted the new touch-screen systems than in counties that did not. “Although small, this effect would have been large enough to influence the final result in some closely contested states, and therefore the final election outcome” (ibid : 21). The authors also found that voting technology can affect electoral outcomes indirectly, through an effect on turnout. In counties with a larger fraction of Hispanic residents, touch-screen voting was associated with lower turnout rates. The researchers state that: “By changing the mix of voters who go to the polls, this turnout effect could ultimately influence election outcomes”. Card and Moretti rightfully point out that with a narrowly divided electorate even minor problems in the accuracy of polling could tip election results for one party or the other.

Our own research and other studies suggest that electronic voting does have an effect on the voting behaviour. Further research is needed to come to a definite conclusion whether electronic voting influences the ballot outcome. If new media do indeed influence the participation in and outcome of polls and ballots, this would require rethinking the implications for design, regulation and modalities of use of the new voting systems.

Summary

In summary, we showed that social, political, organisational, cultural and behavioural aspects of complex ICT systems are at least as important as technical issues. In the international e-Gov case, interoperability proved to be a deeply social and cultural problem, for which no (IT based) technical solution exists. In the e-voting case, we found problems with usability, accountability, trust, digital divide, and effects on voting behaviour. These five non-technical risks of remote electronic voting pose real challenges for e-Government (Oostveen & Van den Besselaar, 2005; 2006). Therefore, there is a need for radical rethinking of the deployment of e-voting technologies. Our research suggests that remote e-voting suffers from too many social problems to use it for either local, national or international elections. Yet, difficulties with new voting

technologies are not limited to the remote e-voting systems. Voting computers in a controlled setting (polling booth) are also open to software malfunctions, errors, or corruption. Therefore, this on-site voting equipment needs to be redesigned, using at least a paper trail to provide independent accountability.

10.4 THE ROLE OF EXPERIMENTS

Technologies always have unanticipated (side-)effects in addition to their intended first-order effects. On the one hand, there might be unexpected *benefits*, on the other hand there might be unexpected *negative consequences*. Unexpected second-order effects can be social, economical, political, ethical or aesthetical. Healy (1997) distinguishes between unanticipated and undesired consequences: "The former are consequences which are not foreseen and dealt with in advance of their appearance. Undesired consequences are those which are harmful, but which we are willing to accept, or accept the risk of occurring".

Anticipated consequences (first-order effects)	**Unanticipated consequences** (second-order effects)
• intended and desired	• desirable
• undesired but common or probable	• undesirable
• undesired and improbable	

Table 10.1 Types of consequences (source: Healy, 1997)

Merton argues that there are three factors which limit our ability to anticipate consequences. First of all, he notes that "the most obvious limitation to a correct anticipation of consequences of action is provided by the existing state of knowledge" (Merton, 1936: 898). Secondly, a major factor of unexpected consequences is error: "We may err in our appraisal of the present situation, in our inference from this to the future objective situation, in our selection of a course of action, or finally in the execution of the action chosen" (ibid.: 901). The final factor Merton addresses is what he calls the "imperious immediacy of interest" (ibid.: 901) which refers to situations where the actor's main concern with the foreseen immediate consequences excludes consideration of longer-term consequences. Healy points out that unintended consequences will always be part of change. These second-order consequences cannot be eliminated but their extent can be lessened by gaining additional information or knowledge.

Because of the complexity of modern technological systems it is difficult to predict their future impact. To reduce our ignorance and to increase our understanding of second-order effects, Merton emphasises that it is "important to direct attention toward the need for a systematic and objective study of the elements involved in the development of unanticipated consequences of purposive social action" (1936: 904). This is also the point that Knight makes (Knight 1921, referred to by Healy, 1997). According to this scholar we can decrease our uncertainty in four ways: to increase our knowledge, to combine uncertainties through large scale organisation, to increase control of the situation and to slow the march of progress. Healy agrees that an increase in knowledge can help us reduce uncertainty: "We can carry out additional studies, analyses and experiments. The major problem with this approach is the cost in money and time".

It is very difficult to predict all the effects of new technologies because of the increasing complexity of technological systems and the inventiveness of people in finding new applications. The question we asked in this dissertation is whether we can increase our understanding and investigate second-order order effects at an early phase of designing a new system? Real-life experiments with prototypes of the system seem a viable strategy.

In the TRUEVOTE case the anticipated and intended goals and consequences were cost and time savings, increased convenience and efficiency for citizens, increased turnout, and a modern image for governments. The anticipated but undesired consequences are the possibility of widening the digital divide and enabling voter coercion. Besides these desired and undesired anticipated consequences, we also found unanticipated and undesirable effects of the system. These related to the immense cultural diversity between the participating countries, low trust (on various levels) among citizens and effects on voting behaviour. We have, for instance, seen with the TRUEVOTE pilot system that the turnout among voters does not increase (Chapter 7), and that the system has an unintended influence on the ballot outcome (Chapter 9).

Concluding, our studies have shown that real-life experiments in an early phase are relevant because they help to point out the first- and second-order effects of new technologies. The early experiments and analyses helped us to establish more unanticipated consequences than would otherwise have been uncovered. Discovering potential effects early in the development is important because at that point there is still time to elaborate on different choices that can be made. There is never just one solution possible for complex problems. Our results suggest that early experiments can yield insightful, rich and usable data, even when applied to complex and large-scale systems. Real-life experiments therefore should become a standard activity in technology development projects.

10.5 THE SOCIAL INFORMATICS APPROACH

We will now come back to the last research question, and argue why the Social Informatics approach provided us with a useful framework for understanding e-government systems and their (second-order) consequences.

As argued in Chapter 1, Social Informatics has the following characteristics. Firstly, it stresses the relevance of the broader social context on how technologies are developed, implemented and used. Secondly, it combines social science knowledge with computer science knowledge to study the social implications of technical change in a problem driven and interdisciplinary way. Thirdly, it aims at studying social implications of technologies to inform design and implementation. Fourthly, it emphasizes that insights from all social actors that are directly or indirectly affected by the technology are important. And finally, Social Informatics aims to stimulate the public debate about social implications of new technologies.

Because of these characteristics, Social Informatics research is at the same time analytical, critical and normative (Kling et al., 2000). It is analytical because it develops

theories about ICTs in institutional and cultural contexts, and conducts empirical studies that contribute to such theorizing. It has a critical orientation as it examines ICTs from the perspectives of the people who might be using the technologies rather than just the groups that commission, design, or implement specific information technologies. Its normative orientation aims to inform and suggest alternatives for professionals who design, implement, use or make policy about ICTs. Normative studies want to influence practice by providing empirical evidence that illustrates the diverse and conflicting outcomes of ICTs. In our research project, we also have combined these normative, analytical and critical lenses to develop an understanding of e-government systems and their effects. We now briefly discuss the five characteristics distinguished above.

1. The social context of information technology plays an important role in influencing the way in which people design and use information technologies. "Social Informatics refers to the interdisciplinary study of the design, uses and consequences of ICTs that takes into account their interaction with institutional and cultural context" (Kling et al., 2000). "Context-dependency is a core principle of social informatics scholarship" (Sawyer 2005). He explains that the situated nature and uses of computing mean that context and use are bound up through practice. ICT applications are always linked to their environment of use and this means that ICTs cannot be considered independently from the situation in which they are used (Kling et al., 2000: 117). We therefore studied the use of the two systems in a variety of social contexts. In the TRUEVOTE case we deliberately chose locations in different countries, but also in different types of organisations: a large membership organisation, two virtual communities and two municipalities. In these different situations, people with very diverse backgrounds, expectations, experiences, ideas and values participated in the evaluation of the system (critical approach). This indeed showed that the different contexts influenced the meanings and roles of the new technologies. The title of this dissertation reflects the importance of the context.

2. Social informatics researchers are problem-driven rather than theory-driven. This means that we did not choose a single theory as our starting point (e.g., social constructivism, or actor network theory), but instead focused on particular issues. This way we were able to approach the concerned issues (e.g. e-voting) from different interesting interdisciplinary theoretical angles, adopting a range of qualitative and quantitative research methods (Chapter 3). These different research methods allowed us to better understand the expected and unexpected effects of new ICTs. Our multi-method approach to the various data sources and their analysis has proven to be very fruitful for determining user needs, socio-technical requirements, contextual issues, and issues that have to do with social processes such as trust, identity, conflicting interests and privacy.

3. Most research into the social implications of technological change adopts a historical viewpoint. Effects and consequences are pointed out and discussed with hindsight. Unfortunately, this means that these insights generally will not have an impact on the socio-technical system itself. At the most, the valuable insights can be used for similar future applications. This is a missed opportunity. As emphasized within Social Informatics, we studied the effects of the e-government technologies during the design and development, which made it possible not only to study but also to inform the

design, development and implementation. As argued for example in Chapter 4, the findings of our research did indeed influence the system design while they were still being developed. It is not only important to participate from the start of a technological project as argued above, one also needs to be present after the design process. The social informatics approach emphasises the importance of research after the initial design and development phase. At that stage people actually start using and appropriating the new technologies, and it is precisely this period of 'consuming' new innovations that sheds light on the consequences of social groups using various technologies (Kling, 1991). In our study we used real-life experiments (see e.g., Chapter 7, 8 and 9) to investigate the way that users 'took possession' of new technologies during actual use. This normative approach served to inform professional practice. Our empirical research led us to the conclusion that neither remote e-voting, nor electronic voting in a polling station without a paper trail is acceptable. We hope that our findings will convince system developers and policy makers to look for alternative solutions.

4. Social informatics claims that all actors that are directly or indirectly affected by the technology should have a voice. In the two cases we firstly investigated which were the relevant social groups, and secondly studied the values, the opinions, and the interests of these parties. The inclusion of a variety of views and interests may broaden the perspectives on possible trajectories of socio-technical change. This informed the research on the social implications of the proposed systems and it also resulted in design alternatives.

5. Finally, as the technologies under study here have society wide coverage, developing e-government innovations needs to be accompanied by a public debate in order to democratize the design and implementation of these large technical systems. When governments choose to use certain technologies they have to be aware of the effects of these technologies. Different choices have different consequences and the use of certain ICTs can benefit some groups in society more than others. As Kling et al. (2000) point out in relation to ICTs: "their use creates winners and losers". Our research indicates that not everybody may benefit equally from new developed ICT systems. In particular, our research on remote voting indicates there are groups of citizens who have a great risk of being shut out of the possibility to partake in the envisaged e-democracy. Some of the main goals of e-government are to empower citizens, to reduce the digital divide by providing equal access and to tailor services to individuals' needs. However, constraints for realizing these goals include skill and knowledge deficits, privacy concerns, social exclusion and cultural barriers. These barriers are often underestimated or not acknowledged at all by government officials and politicians. Opening up the public debate will create awareness of the problems and of the possible solutions. The point of departure should not be that we are moving towards *the* e-society, based on e-business, e-commerce, and last but not least e-government, but that we have to evaluate critically in what direction we are moving, and what social choices can be made. In other words, debating the different opinions may help to avoid the obstacles and misunderstandings frequently found when introducing new technologies. Public debates between users, politicians, researchers and designers can identify problems before they become disasters.

10.6 FUTURE RESEARCH

e-government and electronic voting are still in an early phase of development, and therefore a considerable amount of research remains to be done to obtain a thorough understanding of the social, cultural and political implications of such complex large technical systems. The research reported in this thesis is a contribution to this agenda. One of the central issues that came from our research is the importance of *trust*. Trust seems an essential factor in the diffusion of this type of technology. However, very little research exists to show what the role of trust is in relation to e-government and e-democracy technologies. Let us briefly outline our future research on this issue.

Public trust is fundamental for democracy, yet it is widely acknowledged that trust in government is declining. According to the literature one of the main reasons for this decline in trust is the alienation of citizens from policy processes. Many authors argue that citizen participation would make government more effective by bringing it closer to the people. One of the dominant governmental strategies, to earn and retain public trust, is to adopt modern information and communication technologies (ICTs) to strengthen the relationship between government and citizens: e-democracy. The aims of e-democracy are to increase people's choices as to how they can participate, have their voices heard and their views considered, and to restore their trust in government - but does this governmental strategy really work?

In this dissertation we examined the social and organisational conditions that influence the use and adoption of e-voting technologies. We found evidence that *trust* in e-voting technology is influencing its use (turnout), and possibly the outcome (voting behaviour). Our results showed that trust in e-voting technology: a) has three different dimensions (privacy, security, accountability), b) differs for the various e-voting applications we studied, c) seems to influence voting behaviour, d) seems to be related to trust in the institution organising the ballot, e) is only partly related to the 'objective quality' of the system itself and partly to the perceptions people form of a new technology. From these results there appears to be a complex relation between trust in e-democracy technology and trust in government. In order to fully understand citizens' willingness to use e-democracy tools, and to understand the effects of e-democracy, we need to study the socio-political issues as much as the technological issues that define trust. A major challenge is to further specify and investigate the relations between trust in e-democracy technology, use of the technologies, and the effects on public trust (and political participation). This leads to the first question: "*Does e-democracy increase trust in government, and, if so, under what conditions?*"

As stated above, the current search for technological solutions to the problem of distrust in government seems to be paradoxical because, to increase public trust and confidence, governments will be relying on information and communication systems that themselves require a high level of trust. Information technology is poorly understood by many people, which may reduce their trust in the technology, as well as in governments that use ICTs. Socio-economic variations amongst citizens in terms of age, gender, income, education, geographic location and other characteristics are also expected to influence their level of trust in ICTs. This brings us to the second question: "*How does*

trust or distrust in e-democracy technologies influence the use of these technologies and tools?"

Not only can the level of trust in e-democracy technologies influence the level of trust in government, the opposite may also be true: the use of (and trust in) e-democracy technology can depend on the citizens' level of trust in government. In that case, e-democracy arrangements will not be useful to increase the level of trust in government. Furthermore, e-democracy technologies may create expectations which governments cannot fulfil – resulting in a declining trust in government. Finally, many different e-democracy tools are available, and are used in the different stages of policy-making (design, decision making, implementation, and evaluation). The impact on trust in government may vary depending on the technologies used and the stages of policy making. It is essential to recognize that ICT can improve access to democracy, but that it can also raise new barriers for those already excluded. And, new ICTs might pose threats to democracy if we do not take into account whether citizens actually trust these technologies enough to actively use them.

Relatively little research has been directed toward exploring the role of new technologies in shaping public attitudes towards government. Despite the wide range of discussions and concerns about trust in government (Warren, 1999), the complexity of the role of e-democracy technologies in relation to public trust has, so far, gone largely unexplored. The proposed questions for further research will enable us to determine if the use of e-democracy technologies can help to re-establish trust in government, and, if so, under which conditions. The search for answers to these questions constitutes a relevant and interesting research agenda, which I will work on in the next two years (Oostveen, 2006).

SAMENVATTING

Met de inzet van Informatie- en Communicatietechnologie (ICT) proberen overheden een verbeterde dienstverlening aan burgers, bedrijven en instellingen te realiseren. Betere communicatie, betere besluitvorming, hogere productiviteit en een groter vertrouwen zijn de beoogde doelen. Het gebruik van ICT voor deze doeleinden wordt aangeduid met de term 'e-overheid' of 'de elektronische overheid'. Deze dissertatie analyseert het ontwerp en de effecten van twee grootschalige elektronische overheidstoepassingen vanuit het perspectief van de Sociale Informatica. In het FASME project werd een prototype ontwikkeld van een systeem dat Europeanen ondersteunt in het oplossen van de administratieve problemen die zij tegen kunnen komen wanneer zij naar een ander Europees land verhuizen. Het doel van het TRUEVOTE project was de ontwikkeling van een elektronisch stemsysteem dat gebruik maakt van digitale handtekeningen en PKI. Het systeem stond toe dat burgers kunnen stemmen met iedere computer, vanaf iedere locatie (thuis, werk, buitenland, etc).

Het proefschrift begint met de beschrijving van de theoretische achtergrond die de basis vormt van dit onderzoek. Er wordt uitgelegd waarom er voor een Sociale Informatica benadering is gekozen. Sociale informatica (SI) wordt door Kling (2000) gedefinieerd als “de interdisciplinaire studie van het ontwerp, het gebruik en de gevolgen van informatie en communicatie technologieën die rekening houdt met de interactie van deze ICTs met de institutionele en culturele context waarin zij geïmplementeerd worden”. Het doel van Sociale Informatica is niet alleen het academische begrip over ICTs te vergroten, maar ook om het publieke debat te stimuleren.

Het centrale idee achter SI onderzoek is dat ICTs niet in sociale of technologische afzondering bestaan. De sociale context van informatietechnologie heeft een enorme impact op hoe mensen informatie en technologie daadwerkelijk gebruiken. Het is daarom van belang om naar de bredere context te kijken waarin nieuwe technologieën worden gebruikt. In tegenstelling tot Sociaal Constructivistische theorieën onderzoeken Sociale Informatici niet alleen met een terugkijkende blik de gevolgen van nieuwe technologie. Zij proberen juist al in een vroeg stadium van de ontwikkeling aanwezig te zijn zodat het nog mogelijk is invloed uit te oefenen op de te ontwikkelen systemen en de implementatie daarvan. Verder onderzoeken Sociale Informatici wat er gebeurd nadat een nieuw systeem in gebruik is genomen; zij bestuderen technologische innovaties over een langere periode. Dit is belangrijk omdat de ontwikkeling van een technologie niet direct stopt na het ontwerpproces.

De Sociale Informatica wordt gekenmerkt door een probleemgestuurde aanpak. Dit betekent dat er niet één bepaalde theorie aan het onderzoek ten grondslag ligt. Meerdere theorieën en perspectieven worden gebruikt om inzicht te verkrijgen in de relatie tussen technologie en samenleving. SI onderzoekers maken niet alleen gebruik van een multi-theoretische en interdisciplinaire aanpak maar gebruiken ook een scala aan methodologische benaderingen om de sociale aspecten van ICT ontwerp, gebruik en gevolgen te onderzoeken. Het onderzoek in deze dissertatie is dan ook gebaseerd op een multi-methoden strategie, en gebruikt verschillende theorieën.

Een van de centrale vragen in dit proefschrift is: Hoe zijn deze grootschalige systemen ontwikkeld en hoe kunnen gebruikers aan het ontwerp deelnemen? Omdat ons onderzoek inzichtelijk wil maken wat de mening van de gebruikers is hebben wij gebruik gemaakt van een combinatie van methoden zoals focus groepen, interviews, vragenlijsten, workshops, logboeken, 'real-life' experimenten, etc. Kunnen de huidige methoden van gebruikersparticipatie aangepast worden aan de context en de karakteristieken van grootschalige e-overheid applicaties? De resultaten van ons onderzoek hebben aangetoond dat een combinatie van participerend ontwerpen en technology assessment in grootschalige en complexe systemen erg nuttig is om grip te krijgen op de behoeften, verwachtingen en percepties van eindgebruikers en andere belanghebbenden. Tot voor kort waren de experimenten met participerend ontwerpen vrij klein en gebaseerd op niet erg strategische applicaties binnen organisaties. Echter, moderne ICT applicaties zijn steeds meer gebaseerd op een netwerktechnologie en zijn daardoor complex en grootschalig geworden. Dit vereist een andere methode van gebruikersparticipatie. In de meeste e-overheid projecten wordt niet veel nadruk gelegd op de participatie van eindgebruikers. Wij zijn echter van mening dat het betrekken van gebruikers bij het ontwerp en de uitvoering van nieuwe e-overheidssystemen van zeer groot belang is omdat deze systemen een niet-commercieel karakter hebben. Burgers zijn voor sommige handelingen afhankelijk van elektronische overheidstoepassingen en hebben geen mogelijkheid om voor een alternatief te kiezen (denk hierbij aan de ID-kaart, elektronisch stemmen, etc). Omdat bij elektronische overheidstoepassingen de mensen min of meer gedwongen zijn gebruik te maken van de aangeboden systemen is het belangrijk dat zij al in een vroeg stadium inspraak hebben op het ontwerp van deze systemen. Het geeft gebruikers de mogelijkheid om al in het ontwikkelingsproces niet akkoord te gaan met technologieën die zij als negatief beschouwen. Het is belangrijk dat het besef bestaat dat er maatschappelijke keuzes gemaakt kunnen worden, voordat een ongewenste technologie een voldongen feit is.

Nadat in ons onderzoek de gebruikers waren geïdentificeerd, is er een combinatie van verschillende methoden toegepast om de gebruikers te betrekken bij het ontwerp, de implementatie en de evaluatie van de systemen. Deze onderzoeksmethode gaf de verschillende groepen gebruikers de mogelijkheid om oplossingen te suggereren, ontwikkelen en testen. Omdat het in grootschalige infrastructuren onduidelijk is hoe je alle gebruikers direct zou moeten laten participeren hebben bij onze aanpak gebruikers zowel direct in het ontwerpteam geparticipeerd als indirect door onze onderzoeksactiviteiten. Dit bleek een effectieve methode te zijn die veel waardevolle input heeft opgeleverd voor de ontwikkeling van de systemen. Deze combinatie van sociaal onderzoek (technology assessment) en participerend ontwerpen heeft ook geleid tot een beter begrip van de fundamentele sociale dimensies van internationale e-overheidssystemen.

Onze tweede onderzoeksvraag richtte zich op de bedoelde, onbedoelde en tweede-orde effecten van e-overheidssystemen zijn. Wij kijken naar de effecten van deze complexe systemen en naar de condities waaronder zij geïmplementeerd worden. In de dissertatie worden enkele belangrijke sociale effecten besproken waarbij de nadruk ligt op de gevolgen van elektronische stemsystemen. Zo komt uit ons empirisch onderzoek naar voren dat in tegenstelling tot de verwachting, elektronisch stemmen niet tot een hogere opkomst zal leiden. Sterker, wij zagen zelfs een daling van de opkomst nadat de

nieuwigheid van het elektronisch stemmen verdwenen was. Mensen wennen blijkbaar snel aan nieuwe stemmethoden en voor de lage opkomst bij verkiezingen moeten dan ook andere oorzaken gezocht worden dan het systeem dat wordt gebruikt. Ons onderzoek geeft ook aan dat de digitale tweedeling (digital divide) bij internetstemmen zeker een rol speelt. Niet iedereen heeft toegang tot een computer en niet iedereen heeft de kennis om online zijn stem uit te brengen. Zeker niet als daarvoor speciale software geïnstalleerd moet worden. Er is een groot risico dat als traditionele stemmethoden volledig worden vervangen door elektronisch internetstemmen, er grote groepen mensen worden buitengesloten van deelname aan de verkiezingen. Dit brengt het democratische proces overduidelijk in gevaar.

Een opvallende uitkomst van ons onderzoek is dat het vertrouwen in nieuwe technologieën niet gebaseerd is op feiten maar veeleer op de perceptie die mensen hebben van nieuwe innovaties. Gebruikers baseren hun vertrouwen vaak op de reputatie van het instituut dat de verkiezingen organiseert. Het blijkt dat vertrouwen in organisaties (en in het politieke systeem) ten grondslag ligt aan de wil om te participeren in politiek. Het is dus een vergissing om ICT-oplossingen te zoeken voor problemen die grotendeels sociaal zijn (afnemend vertrouwen in politici resulterend in een lagere opkomst).

De respondenten in ons onderzoek gaven aan zich zorgen te maken over de mogelijkheid tot dwang bij internetstemmen. Wanneer iemand buiten de gecontroleerde en afgeschermde omgeving van het stemhokje zijn stem uitbrengt is er nooit de garantie dat de stem zonder dwang is uitgebracht. Een dominante partner of een overheersende baas kan bij internetstemmen zo'n druk uitoefenen dat de kiezer niet vrijwillig op een bepaalde partij of kandidaat stemt. Dit is een goed argument om naast stemmen op afstand parallelle traditionele systemen te blijven gebruiken, of om zelfs het internetstemmen in zijn geheel te vermijden.

Internetstemmen maakt het mogelijk voor mensen om vanaf elke willekeurige locatie en sociale context online te stemmen. Dit zou van invloed kunnen zijn op de uitgebrachte stem of opinie. Door middel van veldexperimenten onderzochten wij of vertrouwen en sociale identiteit invloed hebben op de uitkomst van een verkiezing. Wij toonden aan dat het zeker mogelijk is dat elektronisch stemmen van invloed is op het stemgedrag van mensen. Mensen met een groot vertrouwen in de geheimhouding (secrecy) en de privacy van gebruikte stemsysteem zijn eerder geneigd om een minderheidspositie in te nemen. We zagen dat de sociale identiteit van mensen eveneens invloed heeft op hetgeen ze stemmen. Thuisstemmers hebben een sterkere private identiteit en lijken daardoor anders te stemmen dan mensen die van elders hun stem uitbrengen. De context waarin men stemt is dus van invloed op de uitkomst. Elektronisch stemmen is niet neutraal! Verder onderzoek op een grotere schaal is gewenst om hier meer duidelijkheid over te krijgen.

We kunnen stellen dat sociale, politieke, organisatorische, culturele en gedragsaspecten even belangrijk zijn bij de ontwikkeling en implementatie van e-overheidssystemen als technische issues. Met name in ons onderzoek naar elektronisch stemmen toonden wij aan dat er veel niet-technische aspecten een belangrijke rol spelen. Wij denken daarom dat het noodzakelijk is om de toepassing van elektronisch stemmen nog eens goed te

overdenken. Ons onderzoek laat zien dat er te veel sociale problemen gepaard gaan met het gebruik van internetstemmen om het te gebruiken voor lokale, nationale of internationale verkiezingen. Maar deze problemen beperken zich niet slechts tot internetstemmen. Ook het gebruik van stemcomputers in een gecontroleerde omgeving is kwetsbaar voor software problemen, fouten of moedwillige corrupties. Het is daarom zaak dat er nieuwe stemcomputers worden ontwikkeld die tenminste een papieren kopie produceren van ieder uitgebrachte stem zodat de verkiezingen transparant en controleerbaar zijn.

Wij bestudeerden of het mogelijk is om onverwachte tweede-orde effecten al in een vroeg stadium van de ontwerpfase van een nieuw systeem te onderzoeken. Dit bleek door middel van 'real-life' experimenten zeker mogelijk te zijn. Deze experimenten en de analyses daarvan toonden ons ongewenste effecten aan die anders niet of veel later duidelijk waren geworden. Het is van belang dat deze mogelijke negatieve effecten al in een vroeg stadium aan het licht komen omdat er dan nog de mogelijkheid is om veranderingen in het systeem aan te brengen en andere keuzes te maken. Er is immers nooit maar één oplossing voor een complex probleem. Experimenten in een vroeg stadium van technologieontwikkeling leveren rijke en bruikbare data op die ook toegepast kunnen worden op complexe en grootschalige systemen.

Concluderend kunnen we stellen dat de toepassing van een Sociale Informatica aanpak zeer vruchtbaar is geweest. Ons empirisch onderzoek dat gebruik maakte van meerdere methoden en theorieën heeft een beter inzicht gegeven in gebruikersbehoeften, contextuele issues, en problemen die samenhangen met sociale processen zoals vertrouwen, identiteit, onverenigbare interesses en privacy. Met onze Sociale Informatica benadering hebben we de effecten van grootschalige e-overheidssystemen gedurende de ontwerp- en ontwikkelingsfase bestudeerd. Onze onderzoeksresultaten hebben het ontwerp, de ontwikkeling en de implementatie van de nieuwe systemen beïnvloed. Tevens heeft ons onderzoek een belangrijke bijdrage geleverd aan het publieke debat over elektronisch stemmen. Door dit publieke debat tussen gebruikers, politici, onderzoekers en ontwerpers is het mogelijk om problemen te identificeren voordat ze tot rampzalige gevolgen leiden.

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Appendices

A1
FASME
Mobile Citizens Questionnaire

Have You Had Problems Moving To A New Country?

FASME (Facilitating Administrative Services for Mobile Europeans) is a European Research project looking at ways to help people moving between different countries. A JavaCard will be developed to improve the user-friendliness of administrative procedures in public administration in European Member States. The main idea of FASME is to base all technical developments on the actual needs and demands of those users who will really use the JavaCard. To do this we need to find out what problems people have encountered when they have moved within Europe. Perhaps you have worked or studied in another country, or moved to join family.

* Would you be able to spare a few minutes filling in this questionnaire for us?
* Maybe you know someone else who would be able to help us?

All information that you provide will be kept strictly confidential. No individual will be identified in our reports. The experiences and judgements that you and the other 'mobile citizens' provide are critical in helping us understand the true problems encountered by migrating European citizens. The active involvement of users will be crucial during the development of the JavaCard. We would like to ask you therefore to fill in the questionnaire and to forward this URL to other people you know, who have moved between European countries.

Thank you very much for your input.

Sincerely yours,

Anne-Marie Oostveen, *University of Amsterdam*
Siobhan Walsh, *Newcastle City Council*

Visit the FASME website at http://www.fasme.org

Facilitating Administrative Services for Mobile Europeans

Mobile Citizens Questionnaire

This questionnaire consists of 3 parts. The first part asks you about your personal data, the second part inquires about the migration data. Finally, a number of questions about specific administrative tasks will be asked. Please contact Anne-Marie Oostveen (oostveen@swi.psy.uva.nl) at the University of Amsterdam if you have any questions about this questionnaire.

Any information that you will provide will remain confidential. No names or contact addresses will be passed on to any individuals or organisations outside the FASME partnership.

Part 1: Personal Data

1. What is your age? _____

2. Are you male or female?

- □ Male
- □ Female

3. What is your native language?

- □ English
- □ French
- □ Italian
- □ Spanish
- □ Dutch
- □ Greek
- □ German
- □ Finnish
- □ Danish
- □ Swedish
- □ Other _____

4. What other language(s) can you speak? (you may choose more than one answer)

- □ English
- □ French
- □ Italian
- □ Spanish

- □ Dutch
- □ Greek
- □ German
- □ Finnish
- □ Danish
- □ Swedish
- □ Other _____

5.1 What ethnic group do you consider yourself to belong to?
_____

5.2 Which religious group do you belong to?
_____

6. Please fill in your highest educational achievement.
_____

7. At present, what is your working status?

- □ Student
- □ Employed full-time
- □ Employed part-time
- □ Unemployed
- □ Retired
- □ Other

8.1. Do you consider yourself to have a disability?

- □ Yes
- □ No, Go to question 9

8.2. If Yes, which of the following best describes your disability? **(you may choose more than one answer)**

- □ Rather not say
- □ Mobility
- □ Sight
- □ Speech
- □ Hearing
- □ Learning disability
- □ Mental Health
- □ Other

Part 2: Migration Data

9. Which city & country have you moved from? Please specify:
City:_____
Country:_____

10. In which city & country are you now resident? Please specify:
City:_____
Country:_____

11. How long have you been in this country?

- □ Less than 6 weeks
- □ 6 weeks - 3 months
- □ 3 months - 6 months
- □ 6 months - 12 months
- □ 1 year - 3 years
- □ More than 3 years

12. How long do you intend to stay in this country?

- □ Less than 6 weeks
- □ 6 weeks - 3 months
- □ 3 months - 6 months
- □ 6 months - 12 months
- □ 1 year - 3 years
- □ More than 3 years

13. When you leave the country in which you are currently resident, what do you intend to do?

- □ Return to my native country
- □ Move to another city within the country that I am now staying
- □ Move to another European country
- □ Move to a non-European country
- □ Other

14. What was your primary reason to travel abroad?

- □ Work
- □ Military Move
- □ Part of long term travel plan
- □ Study
- □ To seek asylum/refuge
- □ To be with partner
- □ To be with family
- □ To be with partner & family
- □ Retirement
- □ Other

15. Who did you travel with?

- □ Alone
- □ With partner & family
- □ With family
- □ With partner
- □ With friends
- □ With work colleague(s)

□ Other

Part 3: Administrative Problems

In the following section a number of (administrative) services will be mentioned. For each service, please answer the 5 questions by ticking the appropriate response.

Passport

16.1. Did you encounter problems?

□ Yes, please give a short description:
□ No, Go to question 17.1
□ Not applicable, Go to question 17.1

16.2. When did you first encounter the problem?

□ Before travel
□ On arrival into the new country
□ In the first 4 weeks of arrival
□ In the first 6 months of arrival
□ After the first 6 months of arrival

16.3. Was the problem solved?

□ Yes
□ No
□ Partly

16.4. How long did it take to resolve the problem?

□ Not applicable
□ Immediately
□ Less than a day
□ 2-7 days
□ 2-4 weeks
□ 1-3 months
□ 4-6 months
□ More than 6 months

16.5. Who helped you to resolve the problem? *(you may choose more than one answer)*

□ Passport Administration staff
□ Employer
□ Work Colleague(s)
□ Government Official
□ Partner/Family
□ Friend(s)
□ Nobody
□ Other _____

16.6 What kind of help did you receive from the person(s) you mentioned in the previous question? *(you may choose more than one answer)*

- □ Information
- □ Administrative help
- □ Other

16.7 Could you describe (in a few words) the "Information"/"Administrative"/"Other" help you have received?

_____

_____

The same questions were also asked for the following administrative services:

- Police
- Housing
- Utilities (e.g. Gas, Electric)
- Welfare Benefits (e.g. Income Support)
- Medical Care
- Health Insurance
- Banking
- Driving Licences
- Car Registration
- Car Insurance
- Tax
- Pension
- Telephone
- City / Local Government (Please specify the service)
- Other (Please specify the service)

Finally

32. Is there anything else you would like to share with us?

_____

_____

_____

Thank you for helping us with our research!

A2
FASME
Citizens Evaluation Questionnaire

AMSTERDAM 9th July 2001

Thank you for agreeing to take part in the evaluation of the FASME project.
FASME has been designed to meet requirements from a number of user perspectives. The role for which you have been asked to evaluate is defined as a European citizen. Please try to assess the statements from this viewpoint.

Rating.
Please read the statements carefully and rank them according to what you have seen and heard during the presentations and demonstrations. Please **circle** the number that most closely represents your opinion:

1. **Agree Strongly with the statement**
2. **Agree**
3. **Agree slightly**
4. **Disagree slightly**
5. **Disagree**
6. **Disagree Strongly**

If you have no opinion or don't know then please circle the **0** in the first column.

Please note that all results are confidential and will be used only to produce statistics.

The following statements have been formulated from the requirements of users. Please circle as to whether you agree or disagree with the statements using the sliding scale.

DON'T KNOW	**AGREE**					**DISAGREE**
0	*Strongly* 1	2	3	4	5	*Strongly* 6

Please Circle

1	FASME is easy to use	**0**	**1 2 3 4 5 6**
2	FASME will assist me in moving abroad	**0**	**1 2 3 4 5 6**
3	I want the system to tell me who can access my data	**0**	**1 2 3 4 5 6**
4	The electronic forms are simple and straightforward to understand	**0**	**1 2 3 4 5 6**
5	I understand what I am doing when I click a button	**0**	**1 2 3 4 5 6**
6	FASME should give me access to all the information held about me in the system	**0**	**1 2 3 4 5 6**
7	FASME is beneficial	**0**	**1 2 3 4 5 6**
8	FASME provides the user with information on the implication of their transactions	**0**	**1 2 3 4 5 6**
9	FASME allows the user to cancel the transaction at any stage	**0**	**1 2 3 4 5 6**
10	FASME provides easy to understand instructions	**0**	**1 2 3 4 5 6**
11	I want the system to tell me who has used my data and when	**0**	**1 2 3 4 5 6**
12	I am afraid that thieves will steal the card and my finger(print)	**0**	**1 2 3 4 5 6**
13	FASME does not require the citizens to have training prior to using the system	**0**	**1 2 3 4 5 6**
14	FASME can be used by anyone	**0**	**1 2 3 4 5 6**
15	FASME will assist citizens by avoiding language problems	**0**	**1 2 3 4 5 6**

Please continue on the next page →

DON'T KNOW	**AGREE**					**DISAGREE**
0	*Strongly* 1	2	3	4	5	*Strongly* 6

16	Losing the card is not dangerous, because of the fingerprint technology	**0**	**1 2 3 4 5 6**
17	I prefer human to human interaction	**0**	**1 2 3 4 5 6**
18	The system improves existing services	**0**	**1 2 3 4 5 6**
19	I trust the FASME kiosk in that my privacy is protected	**0**	**1 2 3 4 5 6**
20	I want the system to tell me what data is being collected	**0**	**1 2 3 4 5 6**
21	This type of systems can be made reliable	**0**	**1 2 3 4 5 6**
22	The data transferred is protected enough (against misuse by others)	**0**	**1 2 3 4 5 6**
23	FASME does not use technical terms or jargon	**0**	**1 2 3 4 5 6**
24	This type of technology reduces human interaction	**0**	**1 2 3 4 5 6**
25	FASME makes the administrative process simpler- does this relsate to processes, or to users, or to civil servants??	**0**	**1 2 3 4 5 6**
26	I am comfortable giving my fingerprint as a means of verification	**0**	**1 2 3 4 5 6**
27	The information in FASME is easy to understand	**0**	**1 2 3 4 5 6**
28	FASME reduces bureaucracy for citizens	**0**	**1 2 3 4 5 6**
29	FASME should store frequently asked questions (FAQ's) about public services on the card	**0**	**1 2 3 4 5 6**
30	When I move to another EU country, I want to have a FASME card	**0**	**1 2 3 4 5 6**

Please continue on the next page →

A. What is your age?

B. What is your nationality?

C1. Have you ever migrated to another EU member state?
YES / NO

C2. If yes, what was the main reason for this move?

- work
- study
- family reasons
- other:
  _____

C3. If yes, have you encountered any problems related to moving between EU memberstates? Which one(s):

- foreign police
- registration number
- housing
- medical care
- health insurance
- car registration
- car insurance
- driving licence
- banking
- other _____

THANK YOU FOR YOUR HELP IN THIS EUROPEAN PROJECT

A3
TRUEVOTE
Design of the Demonstration Questionnaires

For each question or group of question there is a box like this:

***Who**:*	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	*Traditional (paper, CAWI, telephone, …) voters*
***When**:*	*Que1 (before 1st ballot)*	*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

It summarises the voters who are supposed to fill the questionnaire (**Who**) and at what moment the question or group of questions are supposed to be answered to (**When**).

In this file you will find a summary of all the questionnaires. Indeed, we will use 4 different version of the Questionnaire:
- First questionnaire common to ALL the voters (TruE-Vote and Traditional)
- Second and Third Questionnaire for TruE-Vote online voters (from home)
- Second and Third Questionnaire for TruE-Vote kiosk voters
- Second and Third Questionnaire for Traditional voters

Note that the text in [ ] has not to be printed in the version for the final voters (and obviously it's the same for the boxes with the information about "Who" and "When")

***Who**:*	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	*Traditional (paper, CAWI, telephone, …) voters*
***When**:*	*Que1 (before 1st ballot)*	*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[0.] Please give your name and address: you can win a prize at the end of the demonstration and we need these information to send it to you!!!

Name / surname
Address - City - Post Code - State

[GENERAL INFORMATION]

Valid for all "general information" questions:

***Who**:*	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	*Traditional (paper, CAWI, telephone, …) voters*
***When**:*	*Que1 (before 1st ballot)*	*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[1.] Sex

- ❍ Male
- ❍ Female

[2.] How old are you (Years of age) (fill in): _____

[3.] Please fill in your highest educational achievement

_____

[4.] At present, what is your working status?

- ❍ Student
- ❍ Employed full-time
- ❍ Employed part-time
- ❍ Irregular jobs
- ❍ Unemployed
- ❍ Retired
- ❍ Other (specify)

[Different for each country]

[5.1] What's your nationality?

- ❍ English / Finnish / French / Italian
- ❍ Other (fill in): _____

[5.2] What's your country of origin?

- ❍ English / Finnish / French / Italian
- ❍ Other (fill in): _____

[5.3] What's your mother tongue?

- ❍ English / Finnish / French / Italian
- ❍ Other (fill in): _____

[6.] Think about the last <u>three</u> elections (whichever: for local government and/or national and/or European), have you gone and voted:

- ❍ Every time (three times)
- ❍ Two times
- ❍ One time
- ❍ Never

[6.1] (If less than three) Why? (three answers as a maximum)

- ❍ I did not vote because it makes no difference who wins
- ❍ I did not vote because I am not interested in politics
- ❍ I did not vote because my individual vote won't make a difference to the results
- ❍ I did not vote because politics is not for people like me
- ❍ I did not vote because I did not know enough about the topic
- ❍ I did not vote because it was too time-consuming
- ❍ I could not vote because I was not in the country
- ❍ I could not vote because of bad weather conditions
- ❍ I could not vote because I was ill
- ❍ I did not vote because I did not understand the voting method I had to use
- ❍ None of these

[ICT use]

Valid for all "ITC" questions:

***Who**:*	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	*Traditional (paper, CAWI, telephone, …) voters*
***When**:*	*Que1 (before 1st ballot)*	*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[7.] Which of the following do you have at home? And at work or school/college/university/other educational institution (if student) ? (you may choose more than one answer)

	Home	**Work**	**School / College / University**	**None**
[7.1] PC / Personal computer ..	❍	❍	❍	❍
[7.2] Internet / World Wide Web connection.....	❍	❍	❍	❍
[7.3] E-mail	❍	❍	❍	❍

[8.] And which of the following do you yourself use at home? And at work or school/college/university/other educational institution (if student) ? (you may choose more than one answer)

	Home	Work	School / College / University	None
[8.1] PC / Personal computer..	❍	❍	❍	❍
[8.2] Internet / World Wide Web connection.....	❍	❍	❍	❍
[8.3] E-mail.....	❍	❍	❍	❍

[9.] (If you use at home) How many times have you yourself used them <u>last</u> week, at home?

	Almost every day	3-4 times	1-2 times	Never
[9.1] PC / Personal computer..	❍	❍	❍	❍
[9.2] Internet / World Wide Web connection.....	❍	❍	❍	❍
[9.3] E-mail.....	❍	❍	❍	❍

[10.] (If you use at Work / Educational institution) How many times have you yourself used them <u>last</u> week, at work or school/college/university/other educational institution (if student)?

	Almost every day	3-4 times	1-2 times	Never
[10.1] PC / Personal computer.....	❍	❍	❍	❍
[10.2] Internet / World Wide Web connection.....	❍	❍	❍	❍
[10.3] E-mail.....	❍	❍	❍	❍

[11.] (If you use a PC at home) What do you use a PC for at home?

	Always (every day)	Often	Some time	Never
[11.1] To send e-mail.....	❍	❍	❍	❍
[11.2] To gather information ..	❍	❍	❍	❍
[11.3] To download music.....	❍	❍	❍	❍
[11.4] To play games.....	❍	❍	❍	❍
[11.5] To chat	❍	❍	❍	❍

[11.6] To purchase goods	❍	❍	❍	❍
[11.7] To exchange data	❍	❍	❍	❍
[11.8] To take part in online discussion	❍	❍	❍	❍
[11.9] To write documents	❍	❍	❍	❍

[12.] (If you use a PC at work) What do you use a PC for at work?

	Always (every day)	**Often**	**Some time**	**Never**
[12.1] Administrative data processing.....	❍	❍	❍	❍
[12.2] Reporting / Presentation of your job	❍	❍	❍	❍
[12.3] Sharing information within work-group.....	❍	❍	❍	❍
[12.4] Access to / management of data base	❍	❍	❍	❍
[12.5] Searching information through the Web.....	❍	❍	❍	❍

[13.] Do you use the Internet from other access points?

	Yes	**No**
[13.1] Another person's home.....	❍	❍
[13.2] Public library	❍	❍
[13.3] Internet café / Shop.....	❍	❍
[13.4] Community / Voluntary organisation.....	❍	❍
[13.5] Post office	❍	❍
[13.6] Somewhere else	❍	❍

[ICT SELF ASSESSMENT AND OPINION]

Valid for all "ITC self assessment" questions:

Who:	**TruE-Vote online voters**	*TruE-Vote kiosk voters*	*Traditional (paper, CAWI, telephone, …) voters*
When:	*Que1 (before 1st ballot)*	*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[14.] Do you consider yourself as a computer expert?

❍ Very expert
❍ Fairly expert

❍ Not very expert
❍ Not expert at all

[15.] How much do you agree or disagree with these statements? Choose one position between "Strongly agree" and "Strongly disagree"

	Strongly agree					Strongly disagree
[15.1] Computer skills are important	❍	❍	❍	❍	❍	❍
[15.2] Nowadays all of us are "obliged" to use computers, even those who don't like them	❍	❍	❍	❍	❍	❍
[15.3] Science and technology are making our lives healthier, easier, and more comfortable	❍	❍	❍	❍	❍	❍
[15.4] Thanks to science and technology, there will be more opportunities for the future generations	❍	❍	❍	❍	❍	❍
[15.5] I am worried that we are becoming too dependant on computers	❍	❍	❍	❍	❍	❍

[16.] Science and technology change the way of live. Do you think that computers and information technologies, and telecommunications will improve our way of life in the next 20 years, they will have no effect, or they will make things worse?

	Improve our life	**No effect**	**Make things worse**
[16.1] Computers and information technologies	❍	❍	❍
[16.2] Telecommunications	❍	❍	❍

[17.] By using the Internet you can get access to different services. Which of the listed services do you find interesting?

	Very interesting	**Quite interesting**	**Not very interesting**	**Not interesting at all**
[17.1] Taking part, from home, in a debate with a politician	❍	❍	❍	❍
[17.2] Following a training programme from home, as if attending the course in person	❍	❍	❍	❍
[17.3] Consulting local town or council services from home	❍	❍	❍	❍

[17.4] Getting documents you need without having to go to an office.....	❍	❍	❍	❍

[18.] The use of some services provided on the networks leaves "electronic tracks", that is pieces of information such as name, address, date of birth, gender. How much do you agree or disagree with these statements? Chose one position between "Strongly agree" and "Strongly disagree"

	Strongly agree					Strongly disagree
[18.1] I would not use the new communication technologies and new services they offer, because the risk that someone could use my personal information in a way I do not agree with seems to me to be too great.....	❍	❍	❍	❍	❍	❍
[18.2] I would be worried about leaving personal tracks(information like my name, address, gender etc) on electronic networks	❍	❍	❍	❍	❍	❍
[18.3] I would not hesitate to use these new technologies and new services if there was a way to guarantee that I could control how my personal information would be used...	❍	❍	❍	❍	❍	❍
[18.4] I would use these technologies and services anyway, because when you use a bank or credit card, for instance, you also leave personal information tracks	❍	❍	❍	❍	❍	❍
[18.5] I would use these new technologies and services, but as little as possible so as to leave the least possible personal information	❍	❍	❍	❍	❍	❍
[18.6] It has to be possible to get access to the services on these networks by giving no or every little personal information.....	❍	❍	❍	❍	❍	❍
[18.7] I always want to know who has information about me and what they intend to do with it	❍	❍	❍	❍	❍	❍
[18.8] I does not matter to me what is done with my personal information if it enables me to use a new service	❍	❍	❍	❍	❍	❍
[18.9] If I am told in advance, it does not bother me if companies use information about me to send me advertising leaflets.....	❍	❍	❍	❍	❍	❍
[18.10] I want the tracks that I leave on the network when I use these new technologies to remain confidential or to be erased automatically so that no one can use them.....	❍	❍	❍	❍	❍	❍

[TRUE-VOTE VOTING SYSTEM]

***Who**:*	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	
***When**:*		*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[19.] You've used the TruE-Vote system. How much do you agree or disagree with these statements? Chose one position between "Strongly agree" and "Strongly disagree"

	Strongly agree					Strongly disagree
[19.1] It is easy to use	❍	❍	❍	❍	❍	❍
[19.2] The system is too slow	❍	❍	❍	❍	❍	❍
[19.3] I do not have to go through too many screens	❍	❍	❍	❍	❍	❍
[19.4] The text is easy to read	❍	❍	❍	❍	❍	❍
[19.5] I always know where to click	❍	❍	❍	❍	❍	❍
[19.6] I could easily check that my vote has been counted	❍	❍	❍	❍	❍	❍
[19.7] I knew what to do in case I lost my card	❍	❍	❍	❍	❍	❍
[19.8] I didn't know what to do in case I forgot my pincode	❍	❍	❍	❍	❍	❍

***Who**:*	*TruE-Vote online voters*		
***When**:*		*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

	Strongly agree					Strongly disagree
[19.9] It's difficult to connect (access) to the TruE-Vote web site	❍	❍	❍	❍	❍	❍
[19.10] It's quick to connect (access) to the TruE-Vote web site	❍	❍	❍	❍	❍	❍
[19.11] It's easy to install the software	❍	❍	❍	❍	❍	❍
[19.12] To install the software requires al lot of time	❍	❍	❍	❍	❍	❍

Who:	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	
When:		*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

	Strongly agree					Strongly disagree
[19.13] It's easy to correct mistakes (if any) during the voting session	❍	❍	❍	❍	❍	❍
[19.14] To correct mistakes (if any) during the voting session takes a lot of time	❍	❍	❍	❍	❍	❍
[19.15] It's difficult to send the vote	❍	❍	❍	❍	❍	❍
[19.16] It's quick to send the vote	❍	❍	❍	❍	❍	❍
[19.17] It's difficult to verify the vote	❍	❍	❍	❍	❍	❍
[19.18] It's quick to verify the vote	❍	❍	❍	❍	❍	❍

[MEANING OF VOTING]

Who:	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	*Traditional (paper, CAWI, telephone, …) voters*
When:	*Que1 (before 1st ballot)*	*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[20.] How much do you agree or disagree with these statements about voting? Choose one position between "Strongly agree" and "Strongly disagree"

	Strongly agree					Strongly disagree
[20.1] As voting is a civic duty, I prefer to vote in a public space	❍	❍	❍	❍	❍	❍
[20.2] With new technologies it is possible to create a system so secure, that nobody could change my vote or stop it being counted	❍	❍	❍	❍	❍	❍
[20.3] Voting from the work place is a good thing, as I can discuss my political views with colleagues	❍	❍	❍	❍	❍	❍
[20.4] Electronic voting is not a good voting system because I can't control who's managing the system	❍	❍	❍	❍	❍	❍
[20.5] My vote reflects my personal interests more than collective interests	❍	❍	❍	❍	❍	❍
[20.6] When people vote using a voting terminal, others around them may be able to influence the way they vote	❍	❍	❍	❍	❍	❍
[20.7] Traditional voting is safer than e-voting	❍	❍	❍	❍	❍	❍

[20.8] I prefer voting from home through internet because I think voting is a completely private issue.....	❍	❍	❍	❍	❍	❍
[20.9] It is important that people see each other going to the polling place.....	❍	❍	❍	❍	❍	❍
[20.10] I share my political opinion with many of my colleagues	❍	❍	❍	❍	❍	❍

***Who**:*	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	
***When**:*		*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[21.] You've used the TruE-Vote system. How much do you agree or disagree with these statements? Chose one position between "Strongly agree" and "Strongly disagree"

	Strongly agree					Strongly disagree
[21.1] Nobody can find out about my vote with TruE-Vote system.....	❍	❍	❍	❍	❍	❍
[21.2] Hackers can easily break into the TruE-Vote system...	❍	❍	❍	❍	❍	❍
[21.3] Registration for the smart card requires too much information	❍	❍	❍	❍	❍	❍

***Who**:*	*TruE-Vote online voters*	*TruE-Vote kiosk voters*	*Traditional (paper, CAWI, telephone, …) voters*
***When**:*		*Que2 (after 2nd ballot)*	*Que3 (after 3rd ballot)*

[22.] Which method of voting did you use to cast your ballot?

❍ paper ballot
❍ PC in a public access point with TruE-Vote system
❍ dedicated electronic voting terminal
❍ from home with TruE-Vote system
❍ from work with TruE-Vote system
❍ CAWI (by e-mail or Internet)

[23.] What did you vote?
[replace with the specific ballot used in different demonstration places]

A4
TRUEVOTE
Voting Sessions Checklist

Introduction

This is a checklist for the demonstrators, in order to help them to collect information about the TruE-Vote voting sessions. The information gathered will be used by UVA/NIWI, together with the results of the three Questionnaires. With the help of this data we will analyze the result of the TruE-Vote project in terms of impact on the involved population and we will try to find answers to the questions we have put in our "The field research" document describing the main aims of the demonstrations itself.

From a general point of view, it is necessary that each partner collects and describes all the relevant issues that occur during the demonstrations, paying attention in particular to any problems and difficulties.

In particular, it's important to observe and describe, for each voting session:

- The average amount of time to complete the voting task
- The percentage of participants who finished the voting task successfully
- The number of cases in which the participants were not able to complete their vote due to an error from which they could not recover
- The number of times the participant used the help line or on-line documentation for each task
- The number of positive or critical statements about the on-line help documentation
- Number of and types of errors, including:
- *Non-critical error*. A participant makes a mistake but is able to recover during the task .
- *Critical error*. A participant makes a mistake and is unable to recover and complete the task. The participant may or may not realize a mistake has been made.
- The number of indications of frustration or joy from the participants
- The number of subjective opinions of the usability and aesthetics of the product expressed by the participants

1. Organisational / logistical issues

We will simulate a typical polling station environment during the tests. Because the application is a networked one, the test must take place in a location where a network connection is available. The location will be large enough to comfortably accommodate at least one kiosk for the participants to use while completing the voting session. This section needs to be filled in by the organising staff/managers. Please answer the questions and give additional comments.

#	Review Checklist	Yes No N/A	Comments
1.1	Did you receive the voting hardware (card readers, personalised cards etc) on time?	O O O	
1.2	Did you receive the voting software (CD-Rom) on time?	O O O	
1.3	Did you have problems finding staff (technical staff, people minding the kiosks, people helping the voters, etc)?	O O O	
1.4	Did you have problems 'training' the staff?	O O O	
1.5	Was the training material (user manual) easy to use?	O O O	
1.6	Did you have problems arranging a voting location?	O O O	
1.7	Did you receive the voting equipment (computers/kiosks) on time?	O O O	
1.8	Are there enough computers/kiosks available?	O O O	
1.9	Did you receive the PR material on	O O O	

	time? (brochure)		
1.10	Did you have enough time to translate the brochure?	O O O	
1.11	Did you have problems distributing the brochure?	O O O	
1.12	Did you have problems finding enough participants for this voting session?	O O O	
1.13	Did the voting session take place on the date it was originally scheduled?	O O O	
1.14	Did you have problems finding a voting topic?	O O O	

2. Technical Issues

This section should be filled in by the technical staff /ICT staff. Please answer the questions and give additional comments.

#	Review Checklist	Yes No N/A	Comments
2.1	Did you have clear instructions on how to set up the equipment?	O O O	
2.2	Was it easy to install the Voting Application?	O O O	
2.3	Did you have clear instructions on how to program your own voting topic?	O O O	

2.4	Did you encounter any network problems?	O O O	
2.5	Has the network been down during the voting period?	O O O	
2.6	Did the system crash at any point?	O O O	
2.7	Did the card reader work?	O O O	
2.8	Did you have to call in help from Postecom?	O O O	
2.9	Did you have to call in help from Certinomis?	O O O	
2.10	Did you have to call in help from the University of Milan?	O O O	

3. User issues

When the users come in to vote at a kiosk, they might have comments about the system, they might have questions about the procedure, or they might make mistakes. This section should be filled in by staff present at the kiosks. Please answer the questions and give additional comments.

#	Review Checklist	Yes No N/A	Comments
3.1	Were there users who had FORGOTTEN their personalised card?	O O O	
3.2	Were there users who had LOST their personalised card?	O O O	

3.3	Were there users who had NEVER RECEIVED their personalised card?	O O O	
3.4	Were there users who had FORGOTTEN their PIN code?	O O O	
3.5	Were there users who had LOST their PIN code?	O O O	
3.6	Were there incidents where the PIN code did not work?	O O O	
3.7	Did users come to the right voting medium? (no home-voters coming to the kiosk?)	O O O	
3.8	Is the interface designed to be visually pleasing to the user?	O O O	
3.9	Does the system provide user feedback and system status when needed?	O O O	
3.10	Is the system quick and easy to use?	O O O	
3.11	Is the language and are the phrases familiar to the user?	O O O	
3.12	Does the system meet physical handicap requirements?	O O O	
3.13	Do the users understand the systems navigation? (clarity)	O O O	

3.14	Do the users use online help buttons?	O O O	
3.15	Do the users ask the staff for help?	O O O	
3.16	Do non-computer literates understand how the card reader works?	O O O	
3.17	Do non-computer literates understand how the keyboard/mouse works?	O O O	

4. Legal Issues

We are testing the TruE-Vote system in different countries and situations. The legal standards are not the same in these particular situations. Please answer the question(s) and give additional comments.

#	Review Checklist	Yes No N/A	Comments
4.1	Is the design of the system conform legal standards?	O O O	
4.2		O O O	
4.3		O O O	

5. Other issues?

Are there any other comments you would like to make?

THANK YOU!