Abstract
Digital divide is, despite all efforts in research and practice, a matter of fact in most societies. In search for specific strategies to promote digital inclusion, one has to ask for the specific reasons and factors behind the problem. Here, the field of E-Government features several particular characteristics, including high privacy and security demands or high complexity of administrative processes, which might hinder the societal inclusiveness of such electronic public service delivery. Furthermore, the inclusiveness of citizens can be categorized in several steps. To discuss the influence of factors like security or complexity on the use of E-Government-services, we develop an E-Inclusion-gap-model and conduct a quantitative analysis of statistical data on E-Government usage in Germany, taking into account specific social digital divide groups, such as senior citizens, people with low education or people without employment.

Keywords
Introduction

E-Government (Electronic Government) is the key element to modernising public administrations. In the move of the Lisbon-Agenda, all EU (European Union) member states have committed to implementing an E-Government-oriented strategy of public administration modernisation. Web-based information and communication technologies are intended to become the primary channel for public service delivery. According to the European Commission (European Commission 2006c), in 2004 an average of 84% of all public services was available online in the EU member states and 40% of such online services enabled transactional E-Government. For 2007, the average sophistication level of online government services was the transactional level (Capgemini 2007).

Despite such positive efforts to provide (transactional) E-Government services, analyses of usage numbers and user structures indicate that digital exclusion today is primarily a demand side rather than a supply side issue. Here, especially senior citizens and people without employment or with low education are still very much excluded from participation in electronic services (European Commission 2006e; Timmers 2006). In June 2006, the EU ministerial conference declared to strengthen digital integration through E-Government (electronic inclusive public services), to include elderly people (E-Aging), to widely distribute electronic services (geographical digital divide), to increase accessibility of e-public services (E-Accessibility), and to strengthen digital competency (E-Competency) and cultural diversity by digital integration (cultural E-Inclusion). Such a strategy is reflected in specific efforts to provide citizen-centric services (Wang, Bretschneider and Gant 2005), which aim at understanding the problems and issues of those who are supposed to use them. In line with this declaration many research and practical work on minimizing the digital divide in Europe was funded.

While both recent literature and political practice acknowledge the variety of problem spheres behind non-usage of the Internet and, in alignment, E-Government (see, for instance Choudrie, Brinkman and Pathania 2007; Huijboom 2007; Mwangi 2007; Niehaves 2007), there is little empirical explanation of which distinct factors impact on the E-Government inclusion gap and to what extent (Kaplan 2005; Korteland and Bekkers 2007; Williams and Dwivedi 2007). Accordingly, it is not yet clear to a necessary extent which actors should be involved in and hold responsibility for what share of an inclusion strategy in order to overcome the digital divide in E-Government. Taking the example of Germany, we therefore seek to address the following research question:

"What is the current state of inclusive E-Government and which factors could explain a possible inclusion gap to which extent?"

In order to address this research question, the following section will relate our analysis to prior studies and the existing literature. After that the research methodology will be introduced in Section 3, focusing on a quantitative analysis of comprehensive most recent Eurostat data from digital divide group perspectives. Following a comparative presentation and discussion of relevant data (Section 4), a framework for classification of the data, the E-Inclusion-gap-model is introduced (Section 5). We will especially focus on the groups of senior citizens, low educated citizens, unemployed citizens and citizens from thinly populated areas. In the next section we discuss possible explanations for inclusion gaps in (German) E-Government and identify potential operational strategies to overcome a digital divide in E-Government (Section 6). The paper will conclude with a summary of results and an outlook to potentially fruitful avenues for future research (Section 7).

E-Inclusion Related Work

The digital divide poses challenges for implementing E-Government strategies (Hüsing and Selhofer 2004; Kraner 2004; Sanchez, Koh, Kappelmann and Prybutok 2003). Digital divide is in this context understood as an emerging polarization phenomenon in society, creating a gap between those who do have access to and use the potentialities of information and communication technologies, and those who do not (European Commission 2004a). For instance, the age divide refers, amongst others, to the fact that senior people often do not use ICT on a regular basis (Becker et al. 2008). The reasons for this gap result from several challenges which senior people often face. These include for instance isolation, physical disabilities, or low retirement pension (Kraner 2004). Disabilities can debar people from actively using information technology. For the usage of online services, the most important disabilities to consider are visual handicaps, cognitive defects and limitations of motor skills. Geographical divide refer to gaps in ICT usage between different regions. Socio-economic divide

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includes differences in occupation, income and education whereas ethnic and cultural divide identify barriers in the ICT usage of migrants and ethnic minorities.

E-Inclusion focuses on the elimination of these (digital divide) barriers for the use of ICT. The declaration of Riga gives the following definition of E-Inclusion: “eInclusion’ means both inclusive ICT and the use of ICT to achieve wider inclusion objectives. It focuses on participation of all individuals and communities in all aspects of the information society. eInclusion policy, therefore, aims at reducing gaps in ICT usage and promoting the use of ICT to overcome exclusion, and improve economic performance, employment opportunities, quality of life, social participation and cohesion.” (Ministers of the EU 2006, p. 1) The main focus of E-Inclusion is on creating accessible services over ICT. This effort can be divided into accessibility and usability aspects. Accessibility means the possibility for handicapped people to access the relevant service. This includes for instance creating opportunities for Braille support on web-sites and general thoughts about compatibility with older technologies. Usability focuses on the user-friendliness of a web-service. According to EU’s “Top of the web” report, the main criteria for this effort includes easy discovery and fast navigation within a website, easy use of the service, satisfying speed and a clear language that is easy to understand (European Commission 2004b). The topic of E-Inclusion – participation for all in the digital, knowledge-based information society – has gained significant awareness across European public administrations with the upcoming of the European Commission’s strategic policy framework program i2010 and its implications for an inclusive information society. In June 2005 the i2010 EU initiative2 was launched. It is devoted to a set of broad policy guidelines and prioritises three major policy fields: creating a single information space, fostering innovation and investment in research and technological leadership in the EU and promoting an inclusive European information society. Focusing on the third pillar of the i2010 initiative, social inclusion in the digital information society (E-Inclusion) becomes the key to an inclusive e-society. However, the i2010 initiative does not just suggest inclusion in general, but specifies priority issues, such as more inclusive public services, which leads us to inclusive E-Government (European Commission 2006f; Millard 2007).

With the EU Ministerial Declarations (European Commission 2006c), the European Commission has further specified this goal of E-Inclusion in an E-Government context (The European eGovernment Ministerial Conference 2005). Here, E-Government, in a wider sense, is to be understood as information technology (IT) usage in public administrations. Within this paper, we will focus on those elements of E-Government that involve the demand side, i.e. citizens. Accordingly, E-Government here circles around web-based electronic public service delivery. Such inclusive E-Government means, for example, that by 2010 all public websites are to be compliant with the relevant W3C common web accessibility standards and guidelines. Furthermore, it is stated that the design and delivery of key services and public service policies shall be user-centric and inclusive, “using channels, incentives and intermediaries that maximise benefits and convenience for all so that no one is left behind.” (European Commission 2006c; Millard 2007) Finally it also proposes to ensure “that electronic documents are available in such a way that they can be used by people with disabilities in an appropriate and, where possible, EU-wide recognised” (European Commission 2006e) format. With these statements, declared by 34 member countries, E-Inclusion in E-Government or inclusive E-Government becomes a key issue in many EU countries (Becker et al. 2008; Digital Inclusion Team 2007). A major measurable goal, set by the Riga Ministerial Declaration – and also motivating this study on barriers for inclusive E-Government – is the ambition to address E-Inclusion by reducing “the differences in Internet usage between current average use by the EU population and use by elderly people, people with disabilities, women, lower education groups, unemployed and ‘less-developed’ regions” (European Commission 2006c) by half, comparing 2010 to 2005. With our study we seek to contribute to this timely topic and identify possible rationales for existing E-Inclusion gaps, so that future studies can focus on how to properly address these barriers to inclusive E-Government (Digital Inclusion Team 2007; European Commission 2006a; European Commission 2006d).

Research Methodology

In order to answer the research question, a comprehensive quantitative analysis of current Eurostat data from 2006 (Eurostat 2007) on individual internet-based service usage was conducted. A methodological description of the survey is given by the European Commission (European Commission 2006b). While such data is secondary data and publicly available, a specific investigation of the in- and exclusiveness in European, and specifically German E-Government has not yet been

undertaken. Consequently, the analysis of such comprehensive and high quality data (sample size: n=21,160) offers great potential to shed new light on the question of the status-quo of inclusive E-Government and on the question of which factors could explain possible inclusion gaps. Table 1 shows the questionnaire items used to collect the data for the different variables.

<table>
<thead>
<tr>
<th>Analysis Dimension</th>
<th>Questionnaire Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>I have used the Internet in the last 3 months</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>I bought or ordered goods or services, over the Internet, for non-work use, in the last 3 months</td>
</tr>
<tr>
<td>E-Government for Information</td>
<td>I have used Internet, in the last 3 months, for obtaining information from public authorities web sites</td>
</tr>
<tr>
<td>E-Government for Transaction</td>
<td>I have used Internet, in the last 3 months, for sending filled forms</td>
</tr>
</tbody>
</table>

Table 1. (Individual) Usage of Internet, E-Commerce, E-Banking, and E-Government and Corresponding Questions.

Moreover, in order to allow for a deeper analysis of non-use of E-Government services, reasons for non-use (on an individual basis) are taken into account and range from non-availability of services over concerns about data security, privacy or costs to complexity of (electronic) public services (see Table 2).

<table>
<thead>
<tr>
<th>Reason</th>
<th>Questionnaire Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service not available / to difficult to find</td>
<td>I'm not using Internet for dealing with public services or administrations, because: The services I need are not available online or difficult to find</td>
</tr>
<tr>
<td>Personal contact missed</td>
<td>I'm not using Internet for dealing with public services or administrations, because: I miss personal contact</td>
</tr>
<tr>
<td>Immediate response missed</td>
<td>I'm not using Internet for dealing with public services or administrations, because: I miss immediate response</td>
</tr>
<tr>
<td>Concerned about data security</td>
<td>I'm not using Internet for dealing with public services or administrations, because: I'm concerned about protection and security of my data</td>
</tr>
<tr>
<td>Concerned about additional costs</td>
<td>I'm not using Internet for dealing with public services or administrations, because: I'm concerned about additional costs</td>
</tr>
<tr>
<td>Too complex</td>
<td>I'm not using Internet for dealing with public services or administrations, because: It's too complex</td>
</tr>
<tr>
<td>Other reasons</td>
<td>I'm not using Internet for dealing with public services or administrations, because of other reasons</td>
</tr>
</tbody>
</table>

Table 2. (Individual) Reasons for Non-Usage of E-Government and Corresponding Questions.

These two analysis dimensions (usage data and reasons for non-use) are mirrored against potential digital divide group perspectives (besides population average: senior citizens of age 55 to 74, citizens with low education, citizens living in thinly populated areas, and citizens without employment).

Data: In- and Exclusiveness in E-Government

Analysing in- and exclusiveness of electronic public service delivery in Germany, data regarding internet, E-Commerce, and E-Government usage was contrasted (Table 3). Here, distinct levels of

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3 Areas with up to 100 inhabitants per square kilometer.

4 ISCED Education Levels 0, 1 or 2. 
interaction in E-Government were differentiated (E-Government for information, and E-Government for transaction). Similar Data was also found for the UK (Dutton and Helsper 2007).

<table>
<thead>
<tr>
<th></th>
<th>Total Population</th>
<th>Senior citizens (55-74)</th>
<th>Citizens with low education</th>
<th>Thinly populated areas</th>
<th>Unemployed citizens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>69%</td>
<td>37%</td>
<td>61%</td>
<td>65%</td>
<td>66%</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>38%</td>
<td>15%</td>
<td>29%</td>
<td>35%</td>
<td>31%</td>
</tr>
<tr>
<td>E-Government for Information</td>
<td>28%</td>
<td>12%</td>
<td>17%</td>
<td>22%</td>
<td>29%</td>
</tr>
<tr>
<td>E-Government for Transaction</td>
<td>9%</td>
<td>n.a.</td>
<td>5%</td>
<td>8%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: Data based on Eurostat (2006).

Table 3. Usage of Internet and E-Government by population groups in Germany

In order to analyse the role of certain digital divide groups regarding the inclusiveness and exclusiveness of German E-Government, group-specific data on internet, E-Commerce, and E-Government usage was examined (Table 4).

<table>
<thead>
<tr>
<th></th>
<th>Total population</th>
<th>Senior citizens (55-74)</th>
<th>Citizens with low education</th>
<th>Thinly populated areas</th>
<th>Unemployed citizens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>1.00</td>
<td>0.74a</td>
<td>0.87</td>
<td>0.98</td>
<td>0.85</td>
</tr>
<tr>
<td>E-Government for Information</td>
<td>1.00</td>
<td>0.78</td>
<td>0.70</td>
<td>0.86</td>
<td>1.10</td>
</tr>
<tr>
<td>E-Government for Transaction</td>
<td>1.00</td>
<td>n.a.</td>
<td>0.56</td>
<td>0.91</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Source: Data based on Eurostat (2006).

a eService Usage Ratio describes the relation of specific eService usage within a certain digital divide group to eService usage among the average population, e.g., (SeniorCit.E-CommerceUsers/SeniorCit.Onliners)/(Aver.Pop.E-CommerceUsers/Aver.Pop.Onliners); (15%/37%)/(38%/69%)=0.74

Table 4. eService Usage Ratio of Digital Divide Group Onliners and Population Average in Germany.

All digital divide groups generally feature lower usage numbers in all analysed dimensions compared to the German population average (single exception: informational E-Government by unemployed citizens). Senior citizens are most affected by the digital divide and show lowest usage numbers in all dimensions.

Even though citizens with low education use the internet less often than the average (low educated: 61%, average: 69%), the usage of E-Commerce, and E-Government is over-proportionally little. For instance, 55% (=average E-Commerce Usage/average Internet usage; 32%/69%) of all population Onliners use E-Commerce, while only 47% of the Onliners with low education do so. Comparing these two groups, the Onliners’ usage in E-Commerce (population average: 38%, low educated: 29%), and transactional E-Government (population average: 13%, low educated: 8%) provides a similar picture.

The Analysis of specific reasons for non-usage in such digital divide group led to the following key findings (see Table 5).
Concerning the population average, missing personal contact, concerns about data security, and the complexity of services are considered as major reasons for E-Government non-usage among digital divide groups in Germany. Concerns about data security were mentioned as reasons for non-usage of E-Government 1.27 times and 1.22 times more often by senior citizens resp. citizens from thinly populated areas than the population average. The complexity of E-Government services was mentioned as a reason for non-usage 1.24 times and 1.13 times more often by senior citizens resp. unemployed citizens than the population average.

**The E-Inclusion Gap-Model**

Starting point for our analysis of the digital divide especially in Germany and other European countries is the assumption that there are several factors influencing the usage of E-Government by citizens. However, not all of these factors are exclusive to E-Government. Some address the participation in the information society in general. In order to perform a more detailed analysis of these factors we
introduce an “E-Inclusion gap model” (see Figure 1) to categorize the types of non-usage. The gap model, based on Eurostat data, is representative for the German situation and in this context analysed later on.

The basis for taking part in the information society is access to the internet. Without this access, advanced services like E-Government or E-Commerce cannot be used by citizens.

**Gap A (Total population – internet usage):** Following the explanation above, the first gap in the model is the gap between the total population and the part of it using the internet. People in this gap do not take part in the information society as they are missing the basic requirement of access to the internet. Is should be mentioned that – besides the later on interpretation of possible factors for Gap A – all...
criteria from the Riga declaration (European Commission 2006c) must be taken into account to explain this gap.

The second figure used to analyse the barriers to the usage of E-Government is the use of E-Commerce by individuals. The usage of E-Commerce shows that an individual is willing and able to engage in more complex actions in the internet. Literature points out similarities between the adoption of E-Government and E-Commerce (Carter and Bélanger 2004; Srivastava and Teo 2006).

**Gap B (Internet usage – E-Commerce usage):** The individuals in this gap fulfill the elementary requirement of having access to the internet. However, they do not engage in transactions

The third figure of relevance in the model is the E-Government usage for information retrieval. In common models of E-Government service development the provision of information is the first step when deploying E-Government services (Capgemini 2007). Accordingly, the retrieval of this information can be seen as the first step in using E-Government services.

**Gap C (E-Commerce usage – E-Government usage for Information):** People in this gap perform transactions using the internet. Therefore they have the qualification necessary to engage in more complex actions and also no trust issues regarding the internet. However they do not participate in E-Government at all. While discussing this Gap it should be mentioned, that the numbers pointing out the difference between Gap B and C are based on Eurostat data which asked for E-Government service use within the last three month. It should be mentioned that a part of this number could be explained with a missing need for an (E-)Government service within that timeframe.

The fourth and last measure of the model is the usage of E-Government for transaction. The use of transactional E-Government services by an individual marks the full usage of the potential of E-Government services. It therefore represents the desired state for all individuals of an inclusive information society.

**Gap D:** (E-Government usage for Information – E-Government usage for transaction): Individuals belonging to this gap are aware of the presence of E-Government as they use it as an information source. However, they do not use E-Government for transactions.

Concluding on the identified E-Inclusion-Gap-model we assume some kind auf ascending order of the Gaps. Of course there might be citizens using E-Government but not E-Commerce. However, based on the given data this bias cannot be examined furthermore.

**Discussion and Interpretation**

Literature studies and data analysis lead to least five categories of reasons why citizens do not use the different offers of the information society. In the following we will introduce these five categories and will discuss their contribution to the identified E-Inclusion Gaps (see Figure 2):

![Figure 2. Categories explaining E-Government Inclusion Gaps.](image)

**Infrastructure and Accessibility:** In the literature, access to the internet has been identified as an important factor influencing the adoption of E-Government (Koh, Ryan and Prybutok 2005; Srivastava and Teo 2004; von Haldenwang 2004). E-Inclusion literature offers several issues which might impact on infrastructure availability. For instance, internet and broadband connection is not available in some thinly-populated areas (see internet usage in thinly populated areas is 0.65; compared with 0.69
average). Taking into account the social and socio-demographical view on inclusion, age and education influence internet usage. For instance, senior citizens (of age 55 to 74) did use the internet in only 37% of all cases, citizens with low education in 61% (compared with 69% population average). The category of Infrastructure and Accessibility clearly addresses Gap A.

**Security, trust and (service) complexity.** Besides the factors of infrastructure and accessibility (as discussed above), E-Commerce usage involves issues like security, trust, and service complexity (Aldridge, White and Forcht 1997). E-Commerce habitually involves financial transactions and monetary investments, often requiring the provision of credit card details, security mechanisms, personal data etc. Here, for instance, 55% of all population Onliners use E-Commerce, while only 47% of the Onliners with low education do so. One possible answer to this lack are security aspects (Bélanger, Hiller and Smith 2002; McKnight, Choudhury and Kacmar 2002). Moreover, only 41% of the senior citizen Onliners did use E-Commerce offerings during the last 3 months. While factors of security and service complexity have been discussed related to transactional E-Commerce (38% usage), these issues seem to affect transactional E-Government in an even stronger manner (only 9% usage). Here, 40% of the population name concerns about data security as a major reason for not using E-Government. Service complexity, mentioned in 24% of the cases (see also Bonfadelli 2002; Lenz 2000), plays an evenly important role in non-usage behaviour. Regarding such complexity concerns, digital divide groups are strongly affected, e.g. senior citizens naming complexity as non-usage reason 1.24 times as often as the population average (unemployed: 1.13 times, thinly populated: 1.01 times). The category of Security, trust and complexity explains especially Gap B and also has influence on Gap A regarding personnel data.

**Marketing and Marketability:** Besides the factors mentioned above (e.g., accessibility, trust, complexity etc.) marketing and marketability of electronic public services might influence E-Government non-usage. While commercial services are habitually more frequented than governmental services, still 21% of the German population state as a reason for not using E-Government that the demanded services are not available or are hard to find. While commercial internet has already developed and made use of technology potential, such as amazon.com, ebay.com or diverse social network services, public sector offerings are still missing such ‘killer applications’. The simple fact of missing marketing budgets for advertising E-Government services, at least in German public administrations, adds on to such E-Government inclusion gap (Kaplan 2005). The category of Marketing explains Gap C and Gap D in the E-Inclusion Gap Model.

**Personal contact:** 48% of the population is reluctant to use E-Government services due to missing personal contact. Interpretations could be that a) E-Commerce services are nowadays much more established and perceived to be on an adequate security level, b) E-Government services are a more sensitive field to the citizens, and/or c) E-Government services and their underlying processes are perceived as very complex and intransparent so that people seem to be in need of reliable and personal guidance through the complexity of administrative issues. This category explains Gap B and Gap C and – in connection with the category of complexity especially Gap D.

**Costs:** Going hand in hand with security issues in E-Government, costs become an important reason for non-usage (McKnight et al. 2002; Ryder and Skok 2003). This holds specifically true for transactional services which, in governmental fields, require rigid authentication and authorisation mechanisms. While E-Commerce often only relies on password or credit card details and E-Banking often utilises a PIN & TAN-method, transactional E-Government (in Germany) in most cases requires an electronic/digital signature. Investment costs regarding necessary equipment seem to be a major concern for senior citizens and people from thinly populated areas which mentioned costs as reason for non-usage of E-Government 1.27 respectively 1.22 times as often as the average population (giving this reason in 13% of the cases). This category especially explains Gap D and – in a weaker meaning – Gap A.

**Summary and Future Research**

From the perspective of E-Government managers, there is an uncertainty of which measures to undertake in order to increase inclusiveness of electronic public service delivery. One can identify several problem streams, issues and barriers overlapping and adding upon one another creating the current picture of prevailing E-Government exclusiveness. But which measures are to be undertaken from the perspective of an E-Government manager? Here, an analysis of different inclusion gaps in Germany, based on current Eurostat data, provided a more differentiated picture. 28% of the population make use of informational E-Government only 9% go for transactional E-Government services. Within our discussion we identified five categories of explanation streams related to some
kind of digital divide in our E-Inclusion-Gap-Model. In this regard, concerns regarding service complexity, data security, and costs are mentioned as major reasons for non-usage. Such issues were even over-proportionally often named by senior citizens, people from thinly populated areas, and citizens without employment. Getting citizens 'from looking to booking' seems to necessitate measures aiming at the general population, but also measures taking into account specific digital divide group needs. Moreover, as 38% of the population utilise E-Commerce services, issues like accessibility, security, and service complexity did not hold back more than one third of the Germans from using high value internet services. This leaves implications for E-Government managers to further improve electronic public services delivery and maybe also to stimulate an awareness for such services by means of marketing.

Though, the focus is this paper is an analysis of inclusiveness in E-Government, some conclusions can be derived for inclusive ICT Business. Still, one third of the German has no internet access and the figure of 38% of Germans making use of E-Commerce leaves still plenty of room for improvement. The digital divide groups, especially senior citizens, show even lower numbers. Therefore, accessibility, security and trust and service complexity are issues which apply to the ICT Business sector as well as for an inclusive E-Government.

Further research might aim at collecting best-practices and successful projects on inclusive E-Government. The European Commission started several research streams to co-finance research and development on solutions for a better inclusion in their actual research frame programme. Special solutions for the specific social digital divide groups of the well cited Ministerial Declaration, mapped on the categories of weaknesses should be operationalized. Here, the analysis undertaken to identify specific inclusion gaps (E-Inclusion Gap Model) might help to structure such efforts.

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