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# Sustainable E-Governance: The Relationship among Trust, Digital Divide, and E-Government

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**Abstract:** This study empirically examines the correlation between the quality of e-government and trust in government. It used survey data collected in 2013 from the metropolitan areas of Seoul. An index was developed to measure the quality of e-government services, and the Gov 3.0 values were reflected in the analysis, including openness, sharing, communication, and collaboration. The results show a partial correlation between the quality of e-government service and trust in government. In addition, the level of trust varied according to the different type of the digital divide groups. It suggests that as ICT (Information Communication Technology) has become more sophisticated, a willingness to share information among organizations and stakeholders may become a major factor to those actively seeking information and resources to make value-added products. It also suggests that more integrated data management including network security and an open attitude toward information sharing will be more important beyond the level of technical issues.

**Keywords:** ICT; trust in government; digital divide

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## 1. Introduction

The current smart society suggests the beginning of a post-information society. Although this information society can make people's lives more convenient and efficient, it may fail to sufficiently address technology-driven initiatives, in which government-driven ICT (Information Communication Technology) policies often ignore individuals' creative and cognitive processes in response to the government's actions. A smart society focuses on the process of mutual communication and the incorporation of each individual's thoughts into some social agreement. There are four major attributes of a smart society [1]. First, mobilities deal with their mobile environments freely, facilitating environments that are "always connected" through mobile devices. Second, personalized social networks facilitate communication between individuals anytime, anywhere as a result of many smartphone users and activated social networks. Third, ethics, trust, and fairness are some of the major values floated as new norms to dominate social activities because the public's rights can strengthen from large corporations to netizens, groups to individuals, and producers to consumers. Finally, a smart society can foster smart workplace environments where people can work without being limited by time or space through advanced ICT applications.

With the rise of this smart society, "smart e-government" has been proposed as a new model of government in a smart society. Smart e-government is a system in which cooperative governments strengthen the partnership between the public and private sectors; intelligent governments provide administrative services that better meet national requirements; transparent governments facilitate the public's communication, participation, and trust. People in a smart society are more active than those in an information society. As in the case of smartphones and social media, smart technologies facilitate people's participation in their environments. In the past, it was difficult to disseminate the voice of people, despite their ICT use. However, a smart society enables faster, real-time, and personalized communication. In particular, personalized services reflect one of the most representative characteristics of a smart society. Not only enterprises, but also governments, can focus more on the provision of personalized services.

In a smart society, based on a model of future government, e-government is connected to Gov 3.0 [1]. Gov 3.0 is a national administrative system that strengthens the role of individuals by redesigning administrative methods and processes based on highly intelligent ICT applications and social connections. In Gov 3.0, the government shares information and knowledge with firms, citizens, and global communities and provides common platforms that can produce democratic value added by exchanges between social members.

The government not only governs but also provides public goods. The government requires the public's participation in policymaking and providing public services. In addition, the government manages and provides data for transparency, trust, and value added. In some respects, the issue of the "Big Brother" is outdated. Monitoring and participation have become easier because of cross-checking mechanisms enabling people's use of smart technologies. In the initial stages of ICT adoption by the government, the emphasis was on accurate, efficient, and fast public administration. However, innovative ICT applications have changed the world, as illustrated by the "Jasmin Revolution" of 2011 in the Middle East. This event demonstrates that smart technologies can provide citizens with the power to change outdated customs and norms through the process of public discourse. The world's least corrupt countries show a high correlation between the quality of e-government and the level of trust in government.

According to a 2007 Pew survey, in countries where people generally trust one another, there is greater confidence in the integrity of political leaders. Countries with a high level of e-government maturity tend to show a high level of trust (e.g., Sweden, Canada, and Britain). On the other hand, in low-trust countries, such as Nigeria and Lebanon, political corruption is widespread [2].

If there is some information asymmetry, then trust cannot be established. In the past, it was difficult to know what a government was really doing in every process of policy implementation. Even when a government provides well-designed e-government services, a high level of trust in government cannot be guaranteed. Unfortunately, many governments mistakenly believe that e-government services can promote trust in government. Therefore, many governments fail to transform their e-government into e-governance. This suggests a need to verify the factors driving the effect of e-government services on trust in government. Choi [3] stated that sustainability is a major subject of interest in the field of business and environmental management. Choi and Lee [4] emphasized the importance of long-term sustainability in Korea's regional innovation system and suggested that the governance approach can address sustainability. According to the literature, sustainability is an important factor in diverse fields. This suggests that a high level of trust in government can facilitate sustainable e-governance.

This study empirically examines the correlation between the quality of e-government and trust in government. The results have important policy implications for enhancing trust in government. Measurement instruments will be constructed to measure the quality of e-government services, and Gov 3.0 values are reflected in the analysis, including openness, sharing, communication, and collaboration. From this perspective, the digital divide issue may be one of the most serious factors to influence Gov3.0 policy and management. Although the advent of modern ICT has already relieved officials of the many tedious and routine managerial tasks, however, the question remains as to what degree the use of modern ICT can be more utilized which are greatly interactive with environments and related to human problems. In this research, the interests, conceptual relationships between the quality of e-government and trust will be discussed as well as examining the possible predictor of digital divide in e-government practices.

## 2. Literature Review

### 2.1. E-Government and Trust in Government

E-government plays an important role in fostering public trust and government transparency. Here the development of e-government services is necessary for transparency and trust. In this regard, it is conceivable that the Scandinavian model of governance, which “combines a high cost of government with high levels of trust and citizen participation,” can deliver good public services.

Tolbert and Mossberger [5] suggested that “e-government can increase process-based trust by improving interactions with citizens and perceptions of responsiveness” and that “e-government has been proposed as a way to increase citizen trust in government and improve citizen evaluations of government”. The least corrupt countries show a high correlation between the level of e-government and that of trust in government. They conducted empirical research about relationship between trust and e-government. They used the Pew Internet and American Life Project with 815 people who had

previously reported that they used government Web sites. At the result, they found that the perception of government responsiveness at the local level led to greater trust in local government.

Moon [6] claimed that the public's trust in government has continued to weaken because of various administrative, political, sociocultural, economic, and media-related factors. Focusing on the administrative dimension, he explored selected administrative factors responsible for the decline in the public's trust, including the public's perception of administrative corruption (a lack of transparency), inefficiency (wastefulness), ineffectiveness, and policy alienation. He argued that IT offers a potentially useful tool for governments by helping them to restore the public's trust through improvements in transparency, cost efficiency, effectiveness, and policy participation. He illustrated this argument based on four selected cases (the OPEN system in Seoul, e-VA in Virginia, e-Filing for IRS tax returns, and online policy forums in Seoul and Pennsylvania).

Welch *et al.* [7] addressed the relationships between Internet use, citizen satisfaction with e-government, and trust in government. They first reviewed the literature on trust and explored how radical IT applications influence the production and maintenance of trust. They then developed some hypotheses about the relationships between citizens' experience with e-government, satisfaction with e-government and government websites, and trust in government. In addition, their model of e-government and website satisfaction incorporated citizens' perspectives on electronic transaction, transparency, and interactivity. Using data obtained from the Council on Excellence in Government, they developed and tested a two-stage, multiple-equation model that simultaneously predicted experience, satisfaction, and trust and found positive relationships of the use of government websites to e-government satisfaction and website satisfaction and a positive relationship between e-government satisfaction and trust in government. They concluded that e-government strategies (transaction, transparency, and interactivity) are important factors directly influencing e-government satisfaction and indirectly influencing trust. Individuals who use government websites are not only major consumers but also demanding citizens.

McNeal *et al.* [8] stated that, in addition to improving the efficiency and transparency of government services, e-government can increase the frequency of interactions between citizens and governments as well as improve perceptions of quality and trust in government. Previous studies of citizen-initiated contact with governments based on the Pew Internet and American Life Project survey data have found that e-government can motivate citizen-initiated contact with governments in some demographic groups and magnify existing gaps in others. Online citizen-initiated contact can improve the quality of interactions with governments, but evidence provides no support for the argument that e-government increases users' trust.

Hong [9] stated that recent years have witnessed the increasing use of online media such as websites, blogs, and social networking sites by governments for various public relations purposes. The study used a dataset of a national survey on Americans' use of the Internet, which was conducted by Princeton Survey Research Associates International and released by Pew Research Center. The survey was completed in December 2009, selecting approximately 2200 adults based on the random-digit dialing (RDD) technique using both landline and mobile connections in order to ensure the representativeness of the sample. In this study, the respondents' experience with social media had a positive effect on their trust in government at the local and state levels. Those respondents who interacted with the government through social media were more likely to trust state and local governments than those who did not. However, the online use of transactional services (e.g., renewing a driver's license

and registering an automobile) showed a difference in public trust in government only at the federal level. The researcher suggest that state and local governments should prioritize their interactions with citizens by emphasizing social media, updating high-quality information, and enhancing the accessibility of information on government websites.

To examine the role of trust in e-government, Horsburgh *et al.* [10] analyzes three types of trust drawing on 438 telephone surveys in Australia and 498 in New Zealand. The analysis of data from our study of Australians and New Zealanders found no relationship between trust in government institutions and in various e-government functions. Compared to other studies, they explained the disjuncture that they found may be a function of the fact that the respondents were from different countries to those where other studies were based.

Morgeson *et al.* [11] highlighted large gaps in the literature on the relationship between e-government and citizen trust. They addressed some of these gaps by using a cross-sectional sample of 787 end users of U.S. federal government services, data from the American Customer Satisfaction Index study, and structural equation modeling techniques and exploring the structure of the relationship between e-government and citizen trust. Although they find evidence that e-government adoption positively predicts citizen confidence in an agency, this relationship is relatively weak. Further, they find no evidence that e-government is positively related to trust in government. Instead, the findings suggest that e-government may help build or rebuild trust in local government not federal government.

Park and Cho [12] designed a preliminary causal link between use of social media in public relations and change in the public trust in organization. They concluded that by minimizing the distortion of message and strengthening connectedness between government and public, social media promises the possibility of restoring public trust in government by case study.

Parent *et al.* [13] tests the extent to which online initiatives have succeeded in increasing trust and external political efficacy in voters. An Internet-based survey of 182 Canadian voters shows that using the Internet to transact with the government had a significantly positive impact on trust and external political efficacy. They agree with that e-government usage increase trust in government, but the research shows that e-government intensifies existing levels of trust if these are positive, with no positive effect on those whose trust is either neutral or negative.

Butter *et al.* [14] analyzed how to use IT to deploy trust-based regulation in the government-to-business (G2B) relationship, with the Authorized Economic Operator (AEO) certification in the Netherlands between the Tax and Customs administrations and the businesses as a case study. The article discusses how to implement the AEO by utilizing the modern ICT, at lower transaction costs, in the meanwhile enhancing the trust and reputation between the government and businesses.

Omari and Omari [15] suggested the proposed e-Government trust model and showed that trust was a multidimensional issue. Each part was fully integrated with the others in a certain relationship that formulates trust. The main building blocks of trust are: IT security, process automation, policies and procedures, social and culture practices, and legislation. This model represents a suitable guideline for any government who wishes to build or rebuild trust with its customers. It is necessary to use modern technologies to complete the trust architecture.

Teo *et al.* [16] examined the role of trust in e-government success using the updated DeLone and McLean IS success model as the theoretical framework. The model was tested via a survey of 214 Singapore e-government Web site users. They found that online trust is partly affected by the offline

trust in the government. Therefore, while Web site attributes, such as information quality, system quality, and service quality perceptions, are usually regarded as key success factors having effects on the final outcomes of e-government in terms of efficiency and effectiveness, these perceptions are in fact dependent on the trusting relationship between users and the government. They said that government agencies need to emphasize trust-building mechanisms in retaining users for their online public services.

Table 1 shows theories of E-government and trust in government. In previous studies, the relationship between e-Government and trust in government is divided into two opinions. However, in this study, we hypothesize that e-Government can lead greater trust in government. In Korea, many citizens are familiar with using ICT for public administration. According to UNPAN (United Nations Public Administration Network) in 2014, Korea was the highest ranked in index of e-Government. Horsburgh *et al.* [10] said that their research results depend on the countries because the results did not follow the other studies, which agree with positive relationship between e-Government and trust in government. Korea government utilized e-services for citizens in various ways. It is not only administrative work such as civil complaint and EDI but also tool for policy participation and value creation. It means that e-Government is not just technology for citizen in Korea but social platform, which can communicate with citizens and government. Through these trends in Korea, we expect that quality of e-Government can affect greater trust in government.

**Table 1.** Theories of e-government and trust in government.

Relationship between E-government and Trust in Government	Authors
Positive relationship	Tolbert and Mossberger [5], Welch <i>et al.</i> [7], Hong [9], Park & Cho [12], Butter <i>et al.</i> [14], Omari and Omari [15], Teo <i>et al.</i> [16]
No relationship or neutrality	McNeal <i>et al.</i> [8], Horsburgh <i>et al.</i> [10], Morgeson <i>et al.</i> [11], Parent <i>et al.</i> [13]

## 2.2. Digital Divide

The term “digital divide” comes from Gray Andrew Pole, a New York Times journalist in 1995. Since then, many researchers have defined this. Anderson and Bickson [17] highlighted the range of services available through the Internet and its equity implications when certain segments of the population are excluded from these services. Norris [18] defined the digital divide as a gap between the social haves and have-nots in their access to powerful new IT applications, particularly those embodied in the Internet. DiMaggio *et al.* [19] referred to the inequality in access to the Internet, the extent of use, knowledge of search strategies, the quality of technical connections and social support, the ability to evaluate information quality, and the diversity of use. Bélanger and Carter [20] distinguished between the information haves and have-nots, highlighting a gap between computer-literate individuals and those who are not. The digital divide is composed of two major barriers: access to and familiarity with technologies. Warren [21] stated that the digital divide can describe a situation in which a discrete sector of the population faces significant and possibly indefinite lags in its adoption of ICT through circumstances beyond its immediate control. Halford and Savage [22] stated that the notion of the

digital divide implies a simple and singular boundary between digitally engaged and disengaged individuals, which glosses the possibility of a more complex process of stratification.

Doong and Ho [23] analyzed the secondary data from 2000 to 2008 for 136 countries to examine the gap of ICT country-by-country. They found that the factors for difference of ICT accessibility were not only demographic factor (gender, ages, education, income, and job) but also various factors, which range from micro level to macro level. Even residential area, urban form and countries cause difference of ICT accessibility.

Billon *et al.* [24] found the type of digital divide by difference of ICT adoption for 142 countries including developing countries and developed countries. According to the research, the type of digital divide is classified by countries, degree of economic development, demographic factor and institutional infrastructure. Especially, income is main description factor for technology adoption like Internet, personal computer and broadband.

On the other hand, some studies suggest that non-economical factors like rural, communication infra and human capital can affect adoption of ICT [25–28].

Bélanger and Carter [20] explored the effects of demographic variables identified in the digital divide literature on usage of e-Government services. Consistent with previous literature, income, education, age, and frequency of Internet use significantly impact use of e-government services. Typically, those more likely to use e-government services include younger citizens, citizens with higher levels of income, citizens with higher levels of education, and citizens who use the Internet for other tasks. This confirms that the digital divide has a major impact on e-Government usage.

Warren *et al.* [21] said that there is a danger that non-users of the Internet are disenfranchised by such developments, and these include some of the most disadvantaged and vulnerable sectors of rural populations. Thus, the paper explores the links between digital exclusion and social exclusion in a rural context, to identify the likely consequences of this “digital vicious cycle”. They concluded that Internet offers the rural citizen significant benefits, helping to overcome the disadvantages of distance and social dispersion.

Halford and Savage [22] discussed conceptual tools, which might allow an elaborated sociological analysis of the relationship between information and communication technology on the one hand, and social inequalities on the other. They suggest that we need new perspectives and new tools which will enable us to go beyond established approaches to both technology and inequality and to find new ways of thinking, analyzing, and researching that get inside the complex and evolving nature of digital social inequalities.

Donnermeyer and Hollifield [29] examined the utilization of email and the Web, based on a sample of 471 residents from four rural communities in Nebraska and Wisconsin, in which the study found nearly identical levels and patterns of use across the communities. The findings are discussed in terms of the two variations on the digital divide. The first is a digital divide between rural people at the same place, based on their location within networks of co-workers and friends, which in turn influences awareness, knowledge, and eventual adoption of information technologies. The second divide is between rural communities that have growing economies and populations and those that are not growing, based on their locations relative to metropolitan areas and urban consumers.

Many digital divide researches are focusing on the factor of digital divide which cause gap of ICT accessibility. But some studies address trend of digital divide and criticize the bias of studies. Thus, they suggest that new concept is requested for deal with new digital divide.

Van Dijk [30] said that the main reason is that digital divide research suffers from a lack of theory. In the past 10 years, it has remained at a descriptive level, emphasizing the demographics of income, education, age, sex, and ethnicity. The deeper social, cultural, and psychological causes behind the inequality of access have not been addressed so far. In addition, he said that physical access the divide seems to be closing in the most developed countries whereas concerning digital skills, the use of applications for the divide persists or widens. Thus, it is needed to focus on utilization and outcome of ICT in a digital divide research.

Barzilai-Nahon [31] suggested an integrated analysis tool to measure digital divide, because previous studies could not address multidimensional digital divide. The researchers criticized that previous studies were limited to single-issues studies which focused on specific factor causing digital divide. These studies could not understand the whole aspect of multidimensional digital divide.

Park and Kwon [32] suggested multidimensional aspects of the digital divide by conceptualizing the magnitude of digital gaps in social, economic, cultural, and political relationships, going beyond its familiar definition. Because of digital disparity closely reflects social polarization, efforts to narrow digital inequality should be customized at four structural levels: individuals, communities, regions, and countries. According to these four levels, they examined various multidimensional approaches to the digital divide, including not only the accessibility and availability of information resources but also conscious and acceptable attitudes toward perceived gaps between the haves and have-nots.

### **3. Theoretical Model and Hypotheses**

#### *3.1. Theoretical Model*

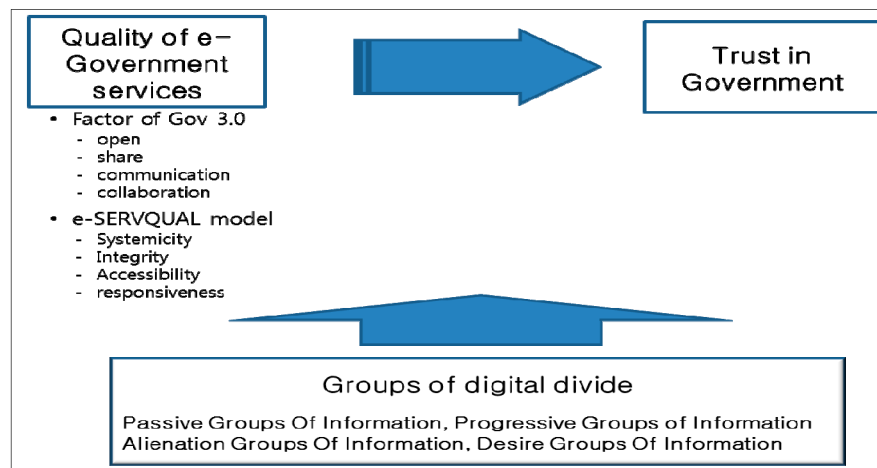
The theoretical model in Figure 1 was employed to describe the relationship between the quality of e-government services and trust in government. Previous studies have generally suggested that trust in government is a key driver of the use of e-government services. In the present study, measurement methods for Gov 3.0 were included for the quality of e-government services. In addition, different groups of the digital divide were included because of its key role in explaining the relationship between the quality of e-government and trust in government, which may vary across these groups. If individuals favorably perceive the quality of e-government services, then they are likely to actively collect data and participate in cyberspace, which is related to the formation of trust in government. The theoretical model was used to examine the relationship between the perceived quality of e-government and trust in government, which was considered to potentially vary across various groups of the digital divide.

The model in Figure 2 was used to classify groups of the digital divide and examine how the level of trust would vary across the groups. As classified in Seo [33], the digital divide is categorized as “passive”, “progressive”, “alienation”, and “desire” groups based on the ability and willingness to use ICT. As Park and Kwon [32] suggested, an individual’s personal ability to use ICTs has now understood as a key variable, attracting academic interests on a possible correlation between an individual’s

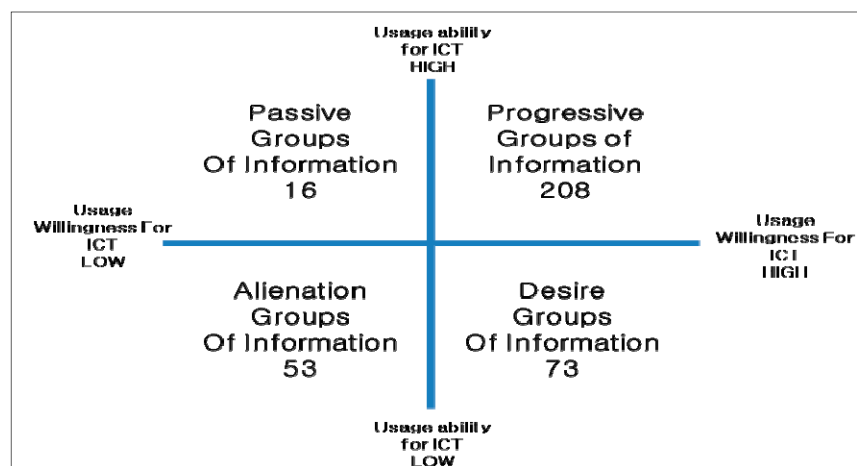


intentions and behavior of ICT use. Even if individual users lack sufficient ability to use ICT, their willingness to use ICTs may influence traditional factors, which determined the pattern of the digital divide. Seo [33] examines individuals' ICTs understanding and willingness and finds that individuals with similar intentions tend to belong to similar information groups.

**Figure 1.** Research model.



**Figure 2.** Digital divide groups.



### 3.2. Hypotheses

The effects of the perceived quality of e-government services on trust in government were examined to extend the literature to the perception of e-government services in the context of Gov 3.0, a newly emerging phenomenon. In addition, the correlation between the digital divide and trust in government was examined. To test the hypotheses, SPSS 18.0 was employed. The research methods included a multiple regression analysis and an ANOVA. Here two hypotheses were tested.

First, e-government may be an effective solution to the decline in trust in government [5]. This suggests that the perceived quality of e-government services may influence trust in government. Systemicity is measured by functional aspects from access and processing. Integrity is measured by perfection for service offer. Accessibility is measured by how many channels for information alienation groups. Responsiveness is measured by possibility for understanding and accepting user's needs. Open is

measured by quality of information. Sharing is measured by problem for security, possibility for wide use service and possibility for cooperative service by sharing information. Communication is measured by effort for pay attention to public opinion. Collaboration is measured by effort for communicating with people and providing service based on people's needs. In this regard, the following hypotheses are proposed:

H1: The perceived quality of e-government services has a positive effect on trust in government.

H1-1: Systemicity has a positive effect on trust in government.

H1-2: Integrity has a positive effect on trust in government.

H1-3: Accessibility has a positive effect on trust in government.

H1-4: Responsiveness has a positive effect on trust in government.

H1-5: Openness has a positive effect on trust in government.

H1-6: Sharing has a positive effect on trust in government.

H1-7: Communication has a positive effect on trust in government.

H1-8: Collaboration has a positive effect on trust in government.

Second, we suggest that digital divide research is, not just a problem between information have and information have-not, but a problem for social-economic gap. In addition, as previous studies explained, digital divide includes not only accessibility but also information literacy, which is more comprehensive problem. Based on this premise, we should avoid dichotomous frame like ordinary people and information have-not. We should address the digital divide among information have groups. In Korea, many Korean researchers are dealing with the issue on a new digital divide, because digital divide is related to social integration. On the other hand, Seo [33] classified "leading", "indifference", "desire", and "alienation" groups by using understating for ICT and usage willingness for ICT. Unfortunately his study did not conduct an empirical research based upon his theoretical classification nor it reflect recent paradigm shift such as service creation by active individual. In this study, thus, the digital divide is categorized as "passive", "progressive", "alienation", and "desire" groups, based on the ability and willingness to use ICT. Willingness for ICT is measured by ICT usefulness(e.g., possibility for acquiring useful information, possibility for using information), ICT availability(e.g., convenience for ICT equipment), and ICT acceptance intention(e.g., possibility for using the newest ICT equipment). Ability for ICT is measured by PC/Internet use ability(e.g., possibility for purchasing goods by PC), Mobile/Smart equipment use ability(e.g., possibility for downloading and using application, possibility for augmented reality by using smart equipment), ability to reacting information dysfunction(e.g., possibility for checking and curing virus program, possibility for screening harmful contents). Based on this theoretical classification, we examine the difference of trust in government by four groups. We hypothesize that each groups have different perception on trust in government.

H2: The level of trust in government varies depending upon the different type of the digital divide group.

#### 4. Data Collection and Measurement Methods

Table 2 shows demographic profile of respondents. Data were collected from a national survey conducted from 10 October to 31 October 2013. A pilot survey was conducted to assess the reliability

and validity of the questionnaire, which was sent to a total of 350 randomly sampled individuals who reside in Seoul metropolitan city by e-mail. The metropolitan area of Seoul was assessed having top-quality information systems and programs in the Local Informatization Evaluation Reports [34]. The organizational size is reported by many studies as the critical factor influencing the process of decision making or implementing the electronic government projects in U.S. cities [6,35–39]. They maintain that higher degrees of horizontal and vertical differentiation in larger organizations often bring an increased need for control and coordination within an organization. Therefore, metropolitan city governments might need ICT that could provide faster methods of information. The impact of ICT policies and projects could be perceived more diversely by citizen.

**Table 2.** Demographic profile of respondents ( $N = 350$ ).

Variables	Index	Frequency (no. of Individuals)	%
Sex	Male	173	49.4
	Female	177	50.6
Age	20s	67	19.1
	30s	75	21.4
	40s	78	22.3
	50s	66	18.9
	60s and over	64	18.3
Area of residence	Seoul	145	41.4
	Incheon	40	11.4
	Gyeonggi Province	165	47.1
Education	Middle school	28	8.0
	High school	185	52.9
	College	131	37.4
	Graduate school	6	1.7

## 5. Measurement Data and Construct Validity

For the constructs “the quality of e-government services” and “trust in government,” Myeong and Lee’s [40] instruments were adopted and measured using a five-point Likert-type scale ranging from “strongly disagree” (1) to “strongly agree” (5). Table 3 shows the measurement methods for variables and the rotated pattern of factors. A principal component analysis was conducted using items for each variable.

In this study, we utilize the e-SERVQUAL model, which is used for assessing quality of e-service. Kim [41] used e-SERVQUAL model to evaluate quality of e-Government services. Parasuraman *et al.* [42] developed SERVQUAL, which consist of five dimensions such as reliability, responsiveness, assurance, empathy and tangibles to measure quality of service. Kim [41] suggests e-SERVQUAL including systemicity, integrity, accessibility, and responsiveness by exploiting SERVQUASL. Additionally, we added the factors of Gov 3.0 which are slogan by Gun Hae Park administration: openness, sharing, communication, and collaboration, because e-SERVQUAL cannot sufficiently reflect trend of the smart society which is pervaded by mobile environment. This means that Gov 3.0 is different from previous e-Government services. Gov 3.0 emphasizes the role of private sector and government is not unilateral

service provider but supporter for private sector in Gov 3.0. In addition, Gov 3.0 is interested in value creation by private sector. According to this paradigm shift, we apply factors of Gov 3.0 to the measurement on e-Government services. By utilizing the research model, we suggest a research model which assumes the relationship between quality of e-Government service and trust in government.

**Table3.** Measurement instrument and rotated pattern of factors (Varimax Rotation).

Variable	Measurement Items	Factor Loading	Cron-bach's $\alpha$	Eigen Value	KMO (Kaiser-Meyer-Olkin)	Bartlett Sphericity
Systemicity	-Provision for total search function	0.772	0.902 ***	5.329	0.935	1553.470
	-Provision for sectoral search function	0.716				
	-Statement for relevant organization	0.733				
	-Search function within results	0.751				
	-Provision for button to return	0.765				
	-Search function for two more items	0.670				
	-Provision for button to move an write	0.702				
	-Function to view before and next info	0.704				
	-Function to print information provided	0.727				
	-Provision for viewer program	0.754				
Integrity	-Provision for real time complaints/publicity	0.702	0.885 ***	4.688	0.927	1236.126
	-Function to apply online complaints	0.710				
	-Provision for ONE-STOP service	0.750				
	-Provision for ZERO-STOP service	0.701				
	-Open for complaints process	0.703				
	-Immediate treatment until time limit	0.735				
	-Statement for complaints answer date	0.733				
	-Real time update for Q&A, FAQ	0.677				
	-Appointment of persons for service	0.780				
Accessibility	-Provision for service via Internet/call center	0.711	0.832 ***	3.291	0.872	698.275
	-Provision for service via various method	0.719				
	-Provision for add service to the disabled	0.685				
	-English version homepage for foreigners	0.822				
	-Exclusive homepage for youth	0.824				
	-Possession for digital divide guideline	0.667				

Table 3. Cont.

Variable	Measurement Items	Factor Loading	Cronbach's $\alpha$	EigenValue	KMO (Kaiser-Meyer-Olkin)	Bartlett Sphericity
Responsiveness	-Provision for info on citizen participation	<b>0.617</b>	<b>0.868 ***</b>	4.607	0.910	1172.432
	-System for online opinion	<b>0.685</b>				
	-Operation for bilateral policy forum	<b>0.697</b>				
	-Implementation for e-voting	<b>0.656</b>				
	-Implement for public survey/cyber poll	<b>0.656</b>				
	-Operation for bulletin board	<b>0.629</b>				
	-Function to check satisfaction for process	<b>0.727</b>				
	-Spontaneous announce for process/results	<b>0.689</b>				
	-Reflection for FAQ into processing	<b>0.703</b>				
	-Collect opinion for policy improvement	<b>0.721</b>				
Openness	-Accuracy	0.257	<b>0.820 ***</b>	Factor1: 2.696 Factor2: 2.010	0.863	794.420
	-No error	0.135				
	-Objectivity	0.225				
	-Provision for APP	<b>0.745</b>				
	-Provision for up to date info on civil	<b>0.772</b>				
	-Usefulness for policy info	<b>0.631</b>				
	-Usefulness for info on website and APP	<b>0.642</b>				
	-Support for immediate admin process	<b>0.774</b>				
Sharing	-No error and crash	<b>0.656</b>	<b>0.863 ***</b>	4.127	0.887	1053.393
	-Rapid handling	<b>0.691</b>				
	-Trust for technological function	<b>0.665</b>				
	-Possibility for tele-com service	<b>0.683</b>				
	-Support for mobile platform	<b>0.768</b>				
	-Convergence service for website and App	<b>0.709</b>				
	-Provision for new service via agency	<b>0.817</b>				
	-Provision for converge service via agency	<b>0.742</b>				

Table 3. Cont.

Variable	Measurement Items	Factor Loading		Cronbach's $\alpha$	EigenValue	KMO (Kaiser-Meyer-Olkin)	Bartlett Sphericity
Communication	-Various communication channel	0.369	<b>0.635</b>	<b>0.879 ***</b>	Factor1: 2.951 Factor2: 2.495	0.898	1195.408
	-Possibility for policy suggestion	0.196	<b>0.709</b>				
	-Possibility for immediate connection	0.194	<b>0.794</b>				
	-Use for necessary info anytime	0.274	<b>0.762</b>				
	-Possibility for finding location	<b>0.722</b>	0.171				
	-Possibility for identifying civil complaint	<b>0.736</b>	0.228				
	-Timely provision for policy info	<b>0.611</b>	0.391				
	-Quick loading speed	<b>0.757</b>	0.248				
	-Availability for connection with Venders	<b>0.81</b>	0.288				
Collaboration	-Effort for reducing cost of admin process	<b>0.764</b>		<b>0.879 ***</b>	4.558	0.917	1266.736
	-Effort for understanding people needs	<b>0.733</b>					
	-Effort for providing people service	<b>0.735</b>					
	-Effort for interagency cooperation	<b>0.734</b>					
	-Effort for cooperation to various Venders	<b>0.747</b>					
	-Effort for interaction with people	<b>0.753</b>					
	-Effort for service provision by gender/age	<b>0.735</b>					
	-Effort for personalized service provision	<b>0.833</b>					
Trust in Government	-General trust	<b>0.785</b>		<b>0.883 ***</b>	4.131	0.905	1089.501
	-Perceived professional competence	<b>0.763</b>					
	-Perceived content service	<b>0.753</b>					
	-Perceived efficient service	<b>0.761</b>					
	-Perceived spontaneous effort	<b>0.724</b>					
	-Perceived of providing various information	<b>0.792</b>					
	-Perceived improvement for old procedure	<b>0.795</b>					

$p < 0.1$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; (In Factor loading, values in bold mean more than a cutoff level 0.60).

The reliability of the items was assessed using Cronbach's alpha. As shown in Table 2, all items loaded on their proposed factors, satisfying the KMO threshold of 0.60 [43]. Cronbach's alpha for all items exceeded 0.60. Devellis [44] suggested that there is insufficient reliability if Cronbach's alpha for a scale is less than 0.60. All items for each variable loaded onto one factor except for openness and communication. First, systemicity was used as a factor to evaluate functional aspects from service access to processes in service provision. A total of 10 items were used, and according to a reliability analysis, Cronbach's  $\alpha$  was 0.902.

Second, integrity was used as a factor to evaluate whether e-government service users would obtain sufficient content and complete services ( $\alpha = 0.885$ ).

Third, accessibility was used as a factor to evaluate whether the diversity of channels for service provision and whether vulnerable social groups would facilitate easy access to those channels ( $\alpha = 0.832$ ).

Fourth, responsiveness was used as a factor to evaluate whether the government would aggressively accept and reflect the user's interests and opinions ( $\alpha = 0.868$ ).

Fifth, openness was used for the issue of Web 3.0, which emphasizes more individualized services based on information and service platforms provided by the government. A total of eight items loaded onto two factors (factor 1 = accuracy, factor 2 = usefulness of information;  $\alpha = 0.820$ ).

Sixth, sharing was used for the level of security and convergence, which were considered to play crucial roles in the provision of safer and reliable information services based on solid networks and systems. A total of eight items loaded onto one factor ( $\alpha = 0.863$ ).

Seventh, communication was used for interactions between the government, firms, and citizens. Communication refers to respecting other opinions and listening carefully to meet others' expectations. Therefore, to evaluate the level of communication, the extent to which the government pays careful attention to changing patterns and leading issues concerning public opinion was examined. A total of nine items loaded onto two factors (factor 1 = personalized accessibility, factor 2 = openness of communication;  $\alpha = 0.879$ ).

Eighth, collaboration was used to address how the government, the private sector, and people create value-added information content and services based on mutual understanding and cooperative infrastructure/institutional settings. A total of eight items loaded onto one factor ( $\alpha = 0.879$ ).

The dependent variable was the level of trust in government. Unlike general trust, trust in government is not a reciprocal but unilateral expectation because people do not trust the government if it fails to meet their performance expectations. As defined earlier, trust is the belief that the government would behave as expected in a socially responsible manner and thus that it would meet the trusting public's expectations [45–48]. In the present study, trust in government was evaluated through people's perceived expectations for the government's services and capability based on professional competence, content quality, efficient service, spontaneous efforts, information diversity, and procedural improvements. Here a total of seven items were used, and Cronbach's  $\alpha$  was 0.883.

## 6. Analysis Results and Discussion

### 6.1. Results of a Multiple Regression Analysis

Table 4 shows the multiple regression results with the independent variable and the control variable. The coefficient of determination in the regression model was 56.1%, indicating the model to be significant ( $F$ -value = 31.276,  $p < 0.001$ ).

**Table 4.** Results of a multiple regression analysis.

Items		Standardized Coefficients(B)	t value
Independentvariable	Systemicity	−0.068	−0.83
	Integrity	−0.122	−1.428
	Accessibility	0.093	1.15
	Responsiveness	0.052	0.594
	Openness	Accuracy	<b>0.399 ***</b>
		Useful of information	0.072
	Sharing		<b>0.162 *</b>
	Communication	Openness of communication	−0.014
		Personalized accessibility	−0.047
	Collaboration		<b>0.385 ***</b>
Items		<b>B</b>	<b>t</b>
Invariable		0.217	1.09
$R^2$		0.567	
adjusted $R^2$		0.548	
$F$ value		31.276 ***	

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

Accuracy ( $B = 0.399$ ,  $p < 0.001$ ), integration ( $B = 0.162$ ,  $p < 0.05$ ), and collaboration ( $B = 0.385$ ,  $p < 0.001$ ) were significant. The results provide partial support for H1, which predicted a positive effect of the perceived quality of e-government services on trust in government. As shown in Table 3, accuracy (openness), integration (sharing), and collaboration had significant positive effectson trust in government.

The empirical result shows that the level of trust is increased when the quality of e-Government services are more related with the Gov3.0 factors including Openness, Sharing, and Collaboration. Interestingly, accuracy is the most important factor in influencing the level of trust in government. It implies that people in the era of Gov3.0 ask more accurateinformation and data without error as well as objective. Collaboration among agencies is also critical for the Gov3.0 because of the environmental changes include less cost of administration process, understanding people's needs, interagency cooperation, interaction with citizen and venders, and a personalized service provision. As ICT has become more sophisticated, with a widely connected government system, willingness to share information among organizations and stakeholders may become a major factor to thoseactively seeking information and resources to make value-added products. It suggests that more integrated data management including network securityand an open attitude toward information sharing will be more important



beyond the level of technical issues. For this reason, the MOSPA [49] enacted “The Act of Provision and Use of Public Data” in 2013. It suggests that policy remedies be provided for overcoming obstacles in information sharing under the gov3.0 environment. Issues of protection of privacy and official authorization for providing information on individuals have also become a major agenda before the adoption of a new system in the public sector. For example, the MOSPA in 2011 has initiated the revision of the Individual Information Protection Act of 2006 through public hearings, which was more focused on the protection of individuals used in the government portal sites and related systems [50].

## 6.2. ANOVA Results

Table 5 shows differences in the perception of trust in government between digital divide groups ( $F$ -value = 3.275,  $p < 0.05$ ). The desire information group showed the highest level of trust in government (3.28), followed by the progressive information group (3.25) and the alienation information group (3.01). The passive information group showed the lowest level of trust in government.

**Table 5.** Differences in the perception of trust in government among digital divide groups.

Groups	Number	Trust in Government	
		Mean	Standard deviation
Alienation information group	53	3.01	0.685
Passive information group	16	2.93	0.536
Desire information group	73	3.28	0.554
Progressive information group	208	3.25	0.662
$F$		<b>3.275 *</b>	

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

These results imply that the digital divide may vary the degree of trust in government. For example, the alienation information group did not show the lowest level of trust in government. On the other hand, noteworthy is that the desire information group showed the highest level of trust in government. Although the desire information group can be considered a digital divide group, the results show clear differences in the perception on ICT between the desire and alienation information groups. The results suggest that the willingness to use ICT may be a possible predictor of trust in government. In a smart society, many people have opportunities to access smart and mobile devices because various services converge and inexpensive mobile technologies spread even to less developed countries. Therefore, to increase the level of trust, governments need to promote policies based on the willingness to use ICT instead of simply increasing the accessibility of hardware.

The results suggest that governments require policies that can increase the usability of ICT for alienation and passive information groups. In Gov 3.0, governments can play diverse roles such as platform providers, information collectors, intermediaries of governance systems, and market monitors. Such roles are crucial in unequal markets. Although participants themselves create value and establish environments to exchange services through various platforms, not all market participants are equal in terms of their ability and qualification. Therefore, to realize Gov 3.0, governments should provide accessible platform services with universal smart devices for groups who are not familiar with ICT

use. If a government is always open and easy to access, then isolated information groups can employ public data and create value, thereby increasing the level of trust in government in the long term.

## 7. Conclusions

This study examined the effects of the quality of e-government services on trust in government by focusing on various groups of the digital divide in the era of a smart society and Gov 3.0. The results show a partial correlation between the quality of e-government service and trust in government. In addition, the level of trust varied according to the different type of the digital divide groups. It also suggests that governments need to provide policy remedies for overcoming obstacles in information sharing surrounding issues of privacy protection, network security, collaboration among governance structures, and official authorization processes or providing information on individuals.

This study has some limitations, which require more comprehensive and interpretive measurement methods. As measurement instruments, various indicators of user satisfaction, including accessibility, usefulness, and convenience, were adopted, based on the acceptance theory of the information system. Although the analysis included new Gov 3.0 factors, better indicators are required to measure the complex patterns of self-governance forming the new paradigm of Gov 3.0 and a new model of governance.

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## Author Contributions

Seunghwan Myeong (co-first author/correspondent author) designed a research framework and wrote the paper with editing; Yongmin Kwon (co-first author) performed a survey and analyzed the data; Hyungjun Seo updated a literature review and re-conducted a data analysis.

## Conflicts of Interest

The authors declare no conflict of interest.

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