

Article

Effects of Application of Information on the Expectations of Benefits from GaaP: Moderating Effects from Perceptions of IIT

Hyungjun Seo ¹ and Seunghwan Myeong ^{2,*}

¹ Center for Security Convergence and eGovernance, Inha University, Michuhol-gu, Inharo-100, Incheon 22212, Korea; shj@inha.ac.kr

² Department of Public Administration, Inha University, Michuhol-gu, Inharo-100, Incheon 22212, Korea

* Correspondence: shmyeong@inha.ac.kr; Tel.: +82-032-860-7951

Abstract: In the age of digital transformation, this study aims to reveal the determinant factors of the expectations of public officials of the benefits from Government as a Platform (GaaP). This study utilizes information as an independent variable, with the perception of intelligent information technologies (IIT) as a moderating variable, along with practical effects from three types of GaaP (cooperative GaaP, intelligent GaaP, and transparent GaaP) as dependent variables in establishing our research model. We conducted multiple regression analysis and moderating effect analysis to verify the proposed hypotheses. The robust regression relation analysis was adopted to solve outlier problems. Based on the results, we recommend that governments promote favorable circumstances for using information and that all government officials should get used to utilizing IIT in their jobs. The government also needs to adopt the bottom-up approach for adopting IIT or innovation. We also found that leaders need to be careful when considering a top-down approach in the public sector because strong leadership is a double-edged sword.

Keywords: government as a platform (GaaP); intelligent information technology (IIT); application of information; digital transformation; digital government



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1. Introduction

Along with the Fourth Industrial Revolution, digital transformation has been leveraged in all aspects of society, regardless of the field. The term transformation involves re-engineering, restructuring, renewing, and regeneration, so the digital transformation is defined as fundamental changes that stem from digital technologies' pervasive nature and proliferation [1]. The World Economic Forum (WEF) launched a digital transformation initiative (DTI) in 2015 to acknowledge the impact of DTIs. Digital transformation can impact industries with value migration and value addition, and societal impacts involve the environment, consumer benefits, and labor. The WEF suggested a framework of public-private collaboration with DTIs [2].

To achieve digital transformation, many governments have proactively adopted digital technologies in public processes beyond e-government. The main technologies of digital transformation are intelligent information technologies (IITs), including artificial intelligence (AI), the Internet of Things (IoT), cloud computing, big data, blockchain, and mobile computing, as they were developed [3]. Intelligence refers to people's intellectual ability, including cognition, memory, judgment, thought, imagination, and other capabilities [4]. IIT is a sort of base or underlying technology that can conduct high-level information processing activities (cognition, learning, reasoning, and decision making) [5]. IIT has led the mainstream of the Fourth Industrial Revolution to come mostly from decision making for a better alternative rather than automation. Nowadays, IIT has permeated the various decision-making areas, including the medical field, legal field, enterprise field [6]. Additionally, the feasibility of IIT-driven policy decision making has risen in the public

sector. Until now, although the role of IIT has been restricted to merely support tools for human decision makers [7], from now on, we can encounter AI decision makers with the improvement of technologies and low-trust government. Aside from this, developed countries with information and communication technologies (ICT) have announced their visions of IIT, like the American AI Initiative by the US government, AI Sector Deal by the UK government, AI Strategy 2019 by the Japanese government, and Digital New Deal by the Korean government, to keep abreast of the digital trends and to take a leading position.

Although these efforts to apply IIT can contribute to government transformation, the main digital transformation strategy is not merely restricted to using advanced technologies. The main factors in digital transformation should involve redesigning and restructuring all public sector processes for next-generation government models like Government as a Platform (GaaP) [8–10]. GaaP allows the relationship between public and private institutions to be more cooperative and horizontal. It was first introduced by O’Reilly, who was inspired by the success of the platform business model [8]. The public digital platform has usually focused on creating value from open data, combining public services, and tailoring public services based on citizens’ preferences [11]. An authoritarian government confronts barriers now that public agendas have become more complicated, with the rapid trends in technologies, the environment, citizens, and governance. This is especially true since Coronavirus Disease 2019 (COVID-19) has defeated many governments that underestimated or concealed its effects. In such cases, the common point of failure is where governments mostly excluded external stakeholders and peremptorily made decisions to combat COVID-19. The lesson from COVID-19 shows why governments should transform themselves into GaaP to deal with challenging issues. Based on these trends, ICT-developed countries have been interested in implementing GaaP beyond e-government.

Based on a positive recognition of GaaP, this study aims to find which factors influence the positive expectations in public officials of the benefits from GaaP. GaaP can contribute to bringing various benefits, including transparency, efficacy, and innovativeness, with the structural characteristics of GaaP, including ecosystems, modularity, and openness. It is important to shed light on how public officials, the main facilitators of public platforms, have a positive attitude for GaaP [10,11]. For example, external stakeholders can create tailored public services by utilizing various resources like open data in GaaP [11]. The series of processes in GaaP can improve citizens’ needs and cooperation with each stakeholder, innovative outcomes, transparency, and even trust. In the meantime, most GaaP studies have focused on concept, case, and framework research, so there is a need to conduct empirical research on how to promote GaaP in the public sector [8–21]. This study utilizes the perception of information use and the perception of IIT use as independent variables for the expectation of benefits from GaaP and the perception of IIT as a moderating variable between the independent and dependent variables. Perception of information use involves the following:

- The purpose of the information;
- The behavior in using the information;
- The benefits from using information.

Due to the advent of the information age with ICT, information use has been considered a crucial skill in formal and informal areas for each person [22]. IIT is a sort of advanced ICT, and a favorable attitude toward IIT can contribute to adapting to the Digital Age with effective and rapid problem solving. This study conducts multiple regression analysis empirical research based on the perception of information use, the perception of IIT, and the expectation of benefits from GaaP to reveal which factors affect those expectations. First, we assumed that the application of information use was positively related to GaaP, because a previous study by Lee et al [22]. proved that a positive perception for information affects high information use. Since GaaP pursues openness and utilization of information for innovative outcomes [8,10,14,21], we postulate that positive perception for information can influence high expectations of GaaP. Second, according to previous GaaP studies, we assumed that a high perception of IIT was positively related to the perception of information

and GaaP. Since IIT can contribute to gathering, analyzing, and utilizing information, the use of IIT has been increased in the age of digital transformation that utilized information as crude oil [1,10,21]. Therefore, we utilized the perception of IIT as a moderating variable. In particular, based on previous user acceptance models which used perceived usefulness of new technology or a sort of innovative thing, we categorized three types of perception of IIT due to revealing the difference of each perception type. Ultimately, through empirical research, this study aims to suggest a policy implication that encourages public officials to have a favorable attitude toward GaaP.

2. Literature Review

2.1. What Is GaaP?

The term platform has various definitions and meanings depending on the field, but usually, a platform has been understood to promote cooperation among stakeholders and to produce innovative services and products based on co-creation [19,23]. Above all, the platform leads the trends because of the emergence of success cases using the platform business model. Most leading global companies have commonly used a platform strategy and have made huge profits with platform business models. Digital business has two main components. First, it enables interaction between distinct participants to create or exchange something of value. Second, participants use a common platform that institutes standards, conditions, and rules [11]. One of the well-known platform business cases is the success of Apple. When Apple first launched the iPhone on the smartphone market, various traditional mobile manufacturing companies were there already. However, Apple utilized the App Store as a platform strategy and led the market despite being the second mover. The App Store is a common platform connecting participants in two-sided markets: developers and users. With this network effect, the App Store could produce tremendous applications that benefitted both developers and users [24].

O'Reilly paid attention to the success of the platform business model in the private sector, being interested in how the government could become an open platform that allowed all participants to innovate. He considered GaaP as the direction for Government 2.0, with Web 2.0 as the next-generation government [8]. An open government initiative by the Obama administration in the US was suggested as a role model for GaaP. The definition of GaaP follows various studies. O'Reilly mentioned an open platform that allows people inside and outside government to innovate and evolve outcomes through interactions between a government and its citizens [8]. Myeong et al. suggested the concept of GaaP as a public platform that converges with users to create new services and increase the value [9]. Linders mentioned that GaaP could enable governments to make their knowledge and IT infrastructure available to the public with a near-zero marginal cost from digital data dissemination and computer-based services [12]. Janssen and Estevez defined GaaP as an infrastructure used by different actors to develop all kinds of outputs for public or private purposes [13]. The Organization for Economic Co-operation and Development noted how GaaP uses technologies and data to harness people's creativity in groups and create collaborations to address policy challenges jointly [25].

GaaP researchers have emphasized the benefits from the introduction of GaaP with collaboration among stakeholders, regardless of the area. O'Reilly mentioned that GaaP enables the private sector to make new applications that governments do not recognize [8]. Linders suggested that governments could improve productivity, decisions, and welfare by using GaaP [12]. Bartlett mentioned that GaaP could contribute to making collaborative policy designs by not using a top-down approach, positively affecting government work [26]. Cordella and Paletti suggested three reasons why GaaP could improve the level of efficiency in public agencies [17]:

1. GaaP creates more value with less investment through the participation of external actors;
2. GaaP reduces complexity stemming from cooperation;

3. GaaP provides easier access to public processes and simplifies the creation and modification of services.

As researchers have mentioned, the introduction of GaaP could positively impact both the public and private sectors. According to a UK government report, GaaP could contribute to better service delivery, to civil service reform, and to reinventing procurement for the digital age, and GaaP makes it easier to procure and use third-party providers [27]. Huang and Karduck mentioned that GaaP could allow public agencies to achieve their missions and improve business capabilities with a platform-based transformation that could provide private businesses with useful information [28]. Shin suggested budget reduction, transparency in the policy-making process, improvement in public-private partnerships, and the creation of a new business model as beneficial effects of GaaP implementation [16].

On the one hand, GaaP is similar to governance involving civic engagement and co-creation in a bottom-up approach. However, there are a few distinct points between the two concepts. Table 1 shows the differences in four categories. Because GaaP involves autogenous behavior, decentralization, and ecosystems, various dimensional GaaP models can be operated that are not just GaaP by the central government [10,11,17]. The Minister of Economy, Education, and Digital Society of the Thuringia state government in Germany inaugurated a digital platform that supports small and medium-sized companies, which are in difficulty in the digital economy [29]. Kato introduced the case of children's cafeterias that support free meals and playing with children for poverty class in Japan. Because these social enterprises are likely to be small or micro-sized businesses, they have difficulties getting resources and networks despite their purpose of public interest. In the case of the children's cafeteria, the local government supported the social enterprise by establishing a platform that could manage the whole process and the participants. Especially because of COVID-19, since a fiscal deficit of the public sector makes it hard to alleviate the gap between the rich and the poor, the researcher emphasized that local governments should be transformed from a traditional provider into a platformer in order to offer stable public services [30]. According to Oates' decentralization theorem, which provided the foundation for local finance, public goods should be supplied at the local level when the local preferences of the citizens are very heterogeneous. In the specific condition, local governments can provide citizens with public goods at Pareto efficiency, which is more effective or at least as effective as the central government [31]. Local governments have a closer contact point to citizens than the central government, which can contribute to two-way communication and tailored services. Oates' decentralization theorem allows local-level GaaP to distinguish its benefit factors from central-level GaaP.

2.2. Research Trends in GaaP

Since O'Reilly argued that governments should convert public institutions to GaaP, other researchers have adopted a platform approach in the public sector to increase government efficiency and citizen-tailored public services. According to our review of the GaaP literature, the authors classified GaaP studies into two approaches. First, some studies involved a concept or framework of GaaP that focused on its characteristics and its main components. Second, some case studies dealt with integrated systems or platform portals in the public sector as implementations of GaaP. Table 2 shows the GaaP literature.

Table 1. Comparison between GaaP and governance.

	GaaP	Governance
Origin	Private sector (Platform business model)	Public sector (To overcome limitations of government)
Purpose of engagement	Performance-centered (Pursuing better output with more stakeholder engagement)	Process-centered (Pursuing better procedural legitimacy with more stakeholder engagement)
The degree of intervention from government	Government does not intervene in all activities among stakeholders Mixture of formal and informal activity	Government intervenes in most activities as a main participant Formal activity
Attitudes for output	Output belongs to the private sector or the public sector Allows pursuit of profit	Output belongs to the public sector Does not allow pursuit of profit

Source: Seo and Joo [19].

As shown in Table 1, conceptual studies were mostly conducted when the GaaP concept was introduced in the early 2010s, whereas case studies belonged to the recent research approach. The authors assumed that research trends in GaaP depended on the development of technologies, on open-data initiatives, and on the perception of stakeholder engagement. Due to mature conditions for building GaaP, the researchers could find and evaluate GaaP cases in each government. However, there is a lack of empirical research that reveals the main factors strongly related to GaaP in the public sector. Although Seo and Myeong revealed determinant factors for the adoption of GaaP, their research cannot represent the main research trends in GaaP. Because of the biased research trends in GaaP, a working group in the public sector that does not know what factors affect the implementation of GaaP could have difficulty forming a strategy. Since public officials could be the platform owner and an intermediary that could initially create GaaP and provide a primitive protocol for the stakeholder ecosystem, it is imperative for public officials to have a favorable attitude toward GaaP.

2.3. Literature Review for the Theoretical Framework

As we stated above, empirical research into GaaP has not advanced significantly thus far. Hence, to build a theoretical framework, we referred to previous empirical studies dealing with information systems, e-government, open data, and other such initiatives. Although GaaP cannot be limited to informatization, many GaaP studies emphasized the role of IIT and open data as its main infrastructure [8–10,14]. Following up on the research purpose, this study focused on how informatization could bring beneficial effects to the individual or organizational aspects. The research listed in Table 3 shows the empirical results from the relationship between informatization and its expected effects.

Table 2. Summaries of the GaaP literature.

Researcher(s)	Main Contents	Research Approach
O'Reilly [8]	Suggesting a GaaP concept based on the success of the platform business model and offering seven suggestions for the introduction of GaaP	Conceptual studies
Linders [12]	Suggesting citizen co-production models involving citizen sourcing, GaaP, and do-it-yourself government in the age of social media	Conceptual studies
Janssen and Estevez [13]	Proposing lean government that is similar to GaaP, suggesting the key factors of lean government	Conceptual studies
Brown et al. [14]	Developing a platform appraisal framework (PAF) and applying PAF to UK government cases	Case studies
Cordella and Paletti [17]	Describing how GaaP can contribute to improving public value through documents from an Italian GaaP	Case studies
Mukhopadhyay et al. [18]	Drawing on GaaP theory in the Aadhaar case of the Indian government, which is a biometric identity platform, in order to show how GaaP factors have positive impacts on scalability of an e-government service	Case studies
Seo and Myeong [10]	Finding main factors for establishing GaaP with the AHP methodology	Conceptual studies
Seo and Joo [19]	Analyzing informatization cases involving ICT usage, open data, and app creation to combat COVID-19 in Korea according to four main components of GaaP	Case studies
Styrin et al. [20]	Describing a Russian GaaP (Gosuslugi.ru), which is an intergovernmental e-portal service with a technology enactment framework, and drawing implications from it	Case studies
Seo and Myeong [21]	Finding determinant factors for the adoption of GaaP, focusing on public officials in South Korea	Explanatory studies

Table 3. The literature on expectations of positive effects from ICT.

Researcher(s)	Research Target	Expected Positive Effect	Positive Variable(s)
Welch et al. [32]	509 citizens in the U.S.	Government website use and trust in government	Government website use: Internet use and satisfaction with information provision from government Trust in government: government website satisfaction
Tolbert and Mossberger [33]	815 people who used government websites	Government transparency and effectiveness, accessibility, and responsiveness	Use of government websites
Hossain et al. [34]	367 government officials who use an e-government system in Korea	e-government system value (organizational efficiency, operational transparency, and public satisfaction)	e-government system assimilation
Baldwin et al. [35]	240 public employees in New Zealand	ICT builds better public relations, and ICT facilitates greater public input	ICT builds better public relations: e-mail use ICT facilitates greater public input: e-mail use and hours dealing with public
Jun et al. [36]	949 people in Guangdong province	Perceived transparency of district government and perceived capacity of district government	Perceived transparency of district government: frequency in visiting government website and public service information via government website Perceived capacity of district government: frequency in visiting government website
Myeong et al. [37]	300 citizens in the Seoul metropolitan area	Trust in government	Quality of e-government services (accuracy, sharing, and collaboration)
Stefanovic et al. [38]	154 employees of e-government systems in Serbia	Benefits of e-government systems	Intention to use the systems; user satisfaction with the systems
Porumbescu [39]	1100 citizens in Seoul	Trust in government	Public sector social media
Fan and Zhao [40]	128 local government departments on platforms for Beijing, Shanghai, and Wuhan	Quality of OGD	Institutional capacity, public pressure (moderated), and pressure from higher-level governments (moderated)

Table 3. Cont.

Researcher(s)	Research Target	Expected Positive Effect	Positive Variable(s)
Berlilana et al. [41]	366 citizens in Indonesia	e-government relationship quality	Perceived e-government credibility and perceived e-government usability
Nam (2018) [42]	179 countries	Corruption control	e-government maturity
Liang et al. [43]	158 IT directors and senior IS managers at government agencies in China	Operational public value and the extent of e-government cloud use	Assimilation depth of e-government cloud and assimilation breadth of e-government cloud
Lee et al. [44]	500 potential users of e-government services in Korea	Trust in government websites	Information literacy and perceived usefulness
Zhenbin et al. [45]	102 employees of public agencies who use open data platforms in Singapore	Open data sharing behavior	External innovator and conformity needs from agencies
Jeon [46]	321 public social welfare officials in Seoul	Organizational innovation	Information system utilization, education and training, and organizational trust

Welch et al. used citizen survey data from the Council for Excellence in Government to verify the effect of e-government's use, and they showed that Internet use and satisfaction with information provision provided by a government are positively related to government website use. Furthermore, government website satisfaction positively affects trust in government [32]. Tolbert and Mossberger focused on people who used government websites from the Pew Internet and the American Life Project and revealed that government websites affect the perception of improved government transparency and effectiveness, improved government accessibility, and improved government responsiveness. They assumed that the improved perception of government could lead to improved trust in government [33]. Hossain et al. focused on government officials who used e-government systems in Korea, revealing that assimilation of an e-government system has a positive effect on an e-government system's value, including organizational efficiency, operational transparency, and public opinion satisfaction [34]. Baldwin et al. collected data from New Zealand public agencies and showed that e-mail use and hours dealing with the public yield positive expectations from IT for better public agencies [35]. Jun et al. collected data from 949 people (local government officials, entrepreneurs, and citizens) in one city in Guangdong province. They revealed that the frequency of visiting a government website and accessing public service information via government websites had a positive impact on the perceived transparency in district government, and the frequency of visiting government websites had a positive impact on the perceived capacity of the district government [36]. Myeong et al. targeted citizens in the Seoul metropolitan area and showed that accuracy, sharing, and collaboration in e-government services positively affects government trust [37]. Stefanovic et al. collected data from municipal public employees related to an e-government system in Serbia. They proved that intention to use the system and user satisfaction directly affect an e-government system's benefits, like making a job easier and saving time [38]. Porumbescu used data from citizens in Seoul and demonstrated that the use of public sector social media positively relates to trust in government [39]. Fan and Zhao analyzed

128 local government departments on platforms for Beijing, Shanghai, and Wuhan and proved that the institutional capacity positively affects the quality of Open Government Data (OGD) [40].

Moreover, public pressure and pressure from higher-level governments moderate the relationship between institutional capacity and the quality of OGD [40]. Berlilana et al. focused on citizens in Indonesia and showed that perceived e-government credibility and perceived e-government usability have a positive effect on the e-government relationship quality [41]. Nam focused on data from 179 countries in one global index and showed that e-government for each country could increase corruption control by improving transparency in e-government [42]. Liang et al. used data from IT directors and senior IS managers at government agencies in China, proving that the assimilation depth of an e-government cloud and the assimilation breadth of the e-government cloud have positive impacts on operational public value based on the extent of e-government cloud use [43].

Lee et al. focused on actual and potential users of e-government services in Korea and revealed that information literacy and perceived usefulness positively affect trust in government websites [44]. Zhenbin et al. surveyed employees of public agencies who used open data platforms in Singapore and showed that dependence on external innovators and the conformity needs in agencies positively relate to open data sharing behavior [45]. Jeon focused on public social welfare officials in Seoul and showed that information system utilization, education and training, and organizational trust positively affect organizational innovation [46].

Previous studies have dealt with different expectations of positive effects, including internal work efficiency, organizational innovation, cooperation, transparency, and trust, proving the relationship between the informatization variables and these expectations of positive effects in public organizations. Those studies imply that governments have adopted and used informatization for both external stakeholders (like citizens) and internal organizations. Because transparency and trust strongly relate to policy acceptance by citizens, many governments have utilized ICT involving online platforms to gather citizen support. However, due to the lack of empirical research on GaaP, we developed our research model to reflect the present trends.

3. Research Design

3.1. Research Model and Hypotheses

Lee et al. categorized the application of information into two types: practicability and usability. First, practicability is active information sharing behavior that coincides with applying the information in one's daily life to the broad social network as results-oriented characteristics. Practicability comprises three sub-components: information sharing (sharing and reusing information with a network), adjustment (sorting useful information from tremendous amounts of information), and behavior about expanding the scope of formal or informal social relationships with information tools. Second, usability is the ability to comfortably utilize information tools to satisfy one's daily life needs as an entertainment characteristic. Usability comprises three sub-components: rapidity (quickly acquiring information), accessibility (utilizing information without any discomfort), and richness, which is satisfying individual needs like enjoyment [22]. Following Lee et al., this study utilizes six sub-components stemming from practicability and usability as variables of application of information.

According to one suggestion for GaaP by Myeong et al., we utilized three types of GaaP concepts: cooperative government, intelligent government, and transparent government. The first (cooperative GaaP) relates to sharing resources and information on the platform through interaction with other stakeholders, including other public agencies and the private sector. The interaction on the platform pursues new value-added creation. Second, intelligent GaaP can proactively provide user-demanded and personally tailored public services. Intelligent GaaP needs to provide reliable information with advanced technologies in response to citizen demands. Third, transparent GaaP focuses on intangible

values (like trust), compared with the previous two types. GaaP can increase civic engagement by admitting autonomous behaviors, including policymaking and public services. Because GaaP pursues openness and communication, citizens can easily access and monitor the public process. Ultimately, this series of behaviors from GaaP can increase trust in government and create a virtuous circle in the public process [9].

In this study, we utilized those three types of GaaP as dependent variables, including the expectation of benefits from cooperative GaaP, intelligent GaaP, and transparent GaaP. Our research model aims to reveal which factors affect the expectations of benefits. We especially focus on perceptions of informatization as determinant factors to reflect the digital transformation that has reinvented both the public and private sectors.

Representing individual capabilities in the information society, we regarded the application of information (or information literacy) as the appropriate independent variable. GaaP can be established on a powerful ICT infrastructure. According to a report from the National Commission on Libraries and Information Science (NCLIS), information literates are people who can utilize information for their work. They focus on adopting techniques and use a wide range of information tools and primary sources of information to solve their problems [47].

The application of information is defined as the capacity to use information and communication technologies to reach particular personal and professional goals or the ability to recognize and locate needed information using search strategies. Many kinds of research have proved that effective application of information could bring beneficial effects to the internal or external public sectors.

Hossain et al., Baldwin et al., Stefanovic et al., Liang et al., Zhenbin et al., and Jeon proved that the application of information has a positive effect on improving organizational efficiency [34,35,38,43,45,46]. They were interested in how information can effectively evolve the internal work process, and they argued that improvement via informatization benefits both public officials and citizens. Public agencies could save time by getting rid of repetitive work and easily cooperating with stakeholders. Moreover, they can entirely focus on important jobs, influencing better policymaking and improving public services to citizens. The result contributes to increased quality of life for citizens, which is the government's priority. Furthermore, previous studies demonstrated that the application of information is positively related to transparency or trust in government [32,33,36,37,39,41,42,44]. Those researchers indicated that the increases in engagement, communication, and empowerment from information tools in the public sector allow citizens to have a positive perception of government, and this makes them willing to agree with government directions.

Hypothesis 1 (H1). *The application of information positively affects the expectation of benefits from three types of GaaP.*

In order to reflect new technical trends, we utilized the perception of IIT (called the core and representative technology of the Fourth Industrial Revolution) as a moderating variable. Intelligence refers to people's intellectual ability, including cognition, memory, judgment, thought, imagination, and other capabilities. The shock of AlphaGo's success achieved by Google's DeepMind subsidiary in 2016 caused discussion concerning IIT's economic, social, and political impact [10]. Nowadays, IIT has expanded its leverage on our society regardless of the areas in which it is used. Concerning the public sector, many developed countries have adopted IIT in their future national plans to take advantage of global competitiveness. Although GaaP cannot be restricted only to technology, many GaaP researchers have emphasized the role of advanced technologies in giving shape to GaaP and not just to the ideal concept. Because a platform strategy focuses on connecting separated services, digitizing all kinds of components, and merging various stakeholders onto one platform, advanced technologies like IIT are imperative in supporting the strategy [19].

Many GaaP researchers have regarded actual implementations as integrated systems or online platforms that can be established with advanced ICT components [8,9,11,13,14,17,18].

Hence, we assumed that positive perceptions or attitudes toward advanced technologies like IIT relate to positive expectations from GaaP. Davis proved that the perceived usefulness of IT systems has a positive effect on attitudes toward using IT systems and actual usage of IT systems [48]. Hung et al. demonstrated that perceived usefulness and trust in mobile government services relate positively to attitudes toward mobile government services. Furthermore, a positive attitude toward mobile government services positively affects the intention to accept mobile government services [49]. Nam suggested that perceived desirability, efficacy, and expectancies from Government 3.0, an innovative government model with advanced technologies, have a positive effect on participation in Government 3.0 [50]. Santa et al. showed that greater trust in online services positively affects the quality of the system, the quality of the service, and the quality of the information provided by e-government services [51].

On the one hand, individual perceptions of technologies, the perceptions of colleagues and supervisors, and the organizational culture relate strongly to the adoption of or attitudes toward informatization. Venkatesh et al. emphasized that the role of social influence from important others such as colleagues and supervisors affect an individual's behavior toward using new technologies, because individuals are subject to following another's expectations in the Unified Theory of Acceptance and Use of Technology (UTAUT) model [52]. Karahanna et al. suggested that subjective norms toward adopting IT from a supervisor, peers, and friends positively affect behavioral intentions to adopt IT [53]. Alraja suggested that social influence is positively associated with the adoption of e-government [54]. Nam showed that facilitating leadership and peer influence for Government 3.0 positively affects participation in Government 3.0 [50]. Soong et al. proved that social factors, including co-workers and supervisors, affecting the perception of e-systems would positively affect the use of public e-procurement [55]. In this study, we utilized the perception of IIT, including individual and other organizational aspects, as a moderating factor for the relationship between independent and dependent variables. The moderating variables comprise the perception of the individual toward IIT (individual IIT), the perception of the leadership toward IIT (leadership IIT), and the perception of co-workers toward IIT (co-workers IIT). The whole research model is described in Figure 1.

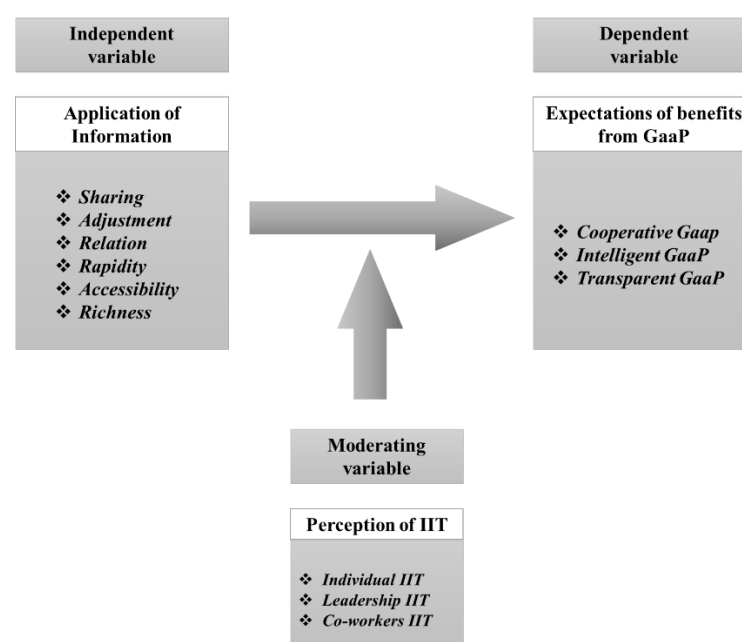


Figure 1. Research model.

Hypothesis 2 (H2). *A positive perception of IIT can moderate the relationship between the independent variable and the expectations of benefits from the three types of GaaP.*

3.2. Data Collection and Research Method

Questionnaires were distributed to public officials in Korean government agencies and companies from 18 June to 26 June 2020 through an online survey system of a professional research company. In all, 267 responses were collected, and 261 were used (6 responses were unsuitable for analysis). Table 4 shows the demographic characteristics of the respondents using SPSS v.23. This study included multiple regression analysis based on robust regression to verify the hypotheses using STATA v.14. Before suggesting the results of our research, we compared the results of linear regression and results of robust regression, finding that each result showed a slightly different value and significant effect. Because robust regression can draw robust estimates regardless of outliers, we adopted the results of robust regression with an M-estimator [56,57].

Table 4. Demographic characteristics of survey respondents.

Items	Index	Frequency (N)	Percentage
Gender	Male	101	38.7
	Female	160	61.3
Type of organization	Central government	93	35.6
	Local government	168	64.4
Age	20s	60	23
	30s	115	44.1
	40s	57	21.8
	50s or older	29	11.1
Job tenure	Less than 5 years	103	39.5
	5 to 9 years	61	23.4
	10 to 14 years	34	13
	15 to 19 years	20	7.7
	More than 20 years	43	16.5
Grade	8–9	113	43.3
	6–7	127	48.7
	5 or more	21	8

Moreover, because the goal was to prove the moderating effects of IIT, we adopted a simultaneous entry approach, which input all independent variables, moderating variables, and dependent variables simultaneously [58]. One of the main issues of moderating effect analysis is whether researchers should adopt a mean centering approach or not. Nowadays, researchers argue that mean centering cannot solve the collinearity that has been the main reason for using mean centering [58,59]. However, we followed the same approach because many existing moderating effect studies have still been conducted with mean centering techniques.

3.3. Measurement Data and Construct Validity

Table 5 shows all measurement items from the research variables. The independent variables specifically categorized the application of information based on the work of Lee et al. [22]. We referred to previous studies that dealt with IT acceptance to utilize IIT perceptions as moderating variables [52–55]. The dependent variables suggested three types of expectancy from GaaP based on Myeong et al. [9]. All variables were measured with a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

Table 5. Measurement items from the research variables.

Variable	Measurement Item	Previous Studies	
Independent variable	Sharing	(1) I have joined an online community to acquire information. (2) I ask the online community what I want to know. (3) I share information that I know with the online community.	Lee et al. [22]
	Adjustment	(1) I try to share information as much as possible. (2) I can easily acquire information that I want from among tremendous amounts of material. (3) If there is a tailored information provision service, it can improve work efficiency.	Lee et al. [22]
	Relation	(1) Information sharing can improve relationships with families and other acquaintances. (2) Information sharing can improve relationships with strangers. (3) Information sharing can contribute to solving public issues.	Lee et al. [22]
	Rapidity	(1) I can rapidly deliver my opinion with application of information. (2) The information search tools (PC, tablet, smart phone, and so on) are faster than in the past. (3) Application of information allows work to be done more speedily.	Lee et al. [22]
	Accessibility	(1) I can use necessary information anywhere and anytime. (2) I know the source (people, book, website, and so on) of necessary information. (3) I can easily use information search tools.	Lee et al. [22]
	Richness	(1) It is a pleasure to acquire new information that I did not know. (2) Application of information enriches my life. (3) Application of information makes me take a step forward, compared to other people.	Lee et al. [22]

Table 5. Cont.

	Variable	Measurement Item	Previous Studies
Moderating variable	Individual IIT	(1) IIT can support work. (2) IIT can support decision-making processes. (3) IIT can support communication with citizens.	Davis [48], Hung et al. [49], Nam [50], Santa et al. [51]
	Leadership IIT	(1) The head of my organization has a lot of interest in IIT. (2) The head of my organization recommends using IIT with the work. (3) The head of my organization tries to encourage policies for using IIT with the work (action plans, education, seminars, and so on).	Nam [50], Venkatesh et al. [52], Karahanna et al. [53], Soong et al. [55]
	Co-workers IIT	(1) My co-workers have a lot of interest in IIT. (2) My co-workers have the will to adopt IIT in their work. (3) My co-workers are willing to attend education sessions or seminars about IIT provided by my organization.	Nam [50], Venkatesh et al. [52], Karahanna et al. [53], Alraja [54], Soong et al. [55]
Dependent variable	Cooperative GaaP	(1) GaaP can promote communication in an organization. (2) GaaP can promote communication with the private sector (citizens, enterprises, and so on). (3) GaaP can make collaboration with the private sector more equitable.	Myeong et al. [9]
	Intelligent GaaP	(1) GaaP can provide tailored public services. (2) GaaP can preemptively find a citizen's needs. (3) GaaP can provide citizens with more trusted information.	Myeong et al. [9]
	Transparent GaaP	(1) GaaP can transparently release more information about public agencies. (2) GaaP can facilitate civic engagement in the policy decision-making process. (3) GaaP can improve trust in government for citizens.	Myeong et al. [9]

Table 6 shows the results of Exploratory Factor Analysis (EFA) and Cronbach's alpha, examining each variable's validity and reliability by using SPSS v. 23. First, each factor loading and Kaiser–Meyer–Olkin (KMO) test value was more than the recommended

threshold (0.6) through EFA and varimax rotation [60]. Second, each Cronbach's alpha value also exceeded the recommended threshold of 0.6 [61]. Satisfying validity and reliability with the measurement item test verified the suitability of all measurement items for conducting empirical analysis.

Table 6. The EFA and Cronbach's alpha results.

Variable	Factor Loading	Eigen Value	KMO	Bartlett Sphericity	Cronbach's Alpha
Sharing	0.832 0.863 0.687	1.909	0.624	169.908 ***	0.699
Adjustment	0.837 0.853 0.843	2.14	0.71	239.577 ***	0.798
Relation	0.848 0.886 0.828	2.191	0.701	273.256 ***	0.813
Rapidity	0.828 0.872 0.895	2.246	0.705	307.425 ***	0.832
Accessibility	0.866 0.768 0.852	2.065	0.674	219.8 ***	0.769
Richness	0.86 0.878 0.782	2.121	0.68	246.895 ***	0.787
Individual IIT	0.891 0.932 0.921	2.511	0.741	504.667 ***	0.902
Leadership IIT	0.900 0.94 0.927	2.553	0.743	550.473 ***	0.912
Co-workers IIT	0.912 0.936 0.921	2.557	0.753	543.042 ***	0.913
Cooperative GaaP	0.911 0.93 0.907	2.518	0.749	502.604 ***	0.903
Intelligent GaaP	0.919 0.902 0.897	2.463	0.745	449.699 ***	0.890
Transparent GaaP	0.911 0.911 0.923	2.512	0.753	491.626 ***	0.903

*** $p < 0.001$.

4. Empirical Research

4.1. Multiple Regression Analysis

Table 7 shows the multiple regression of the dependent and independent variables by robust regression. Figure 2 shows significant independent variables in multiple regression. In Model 1, relation, rapidity, and richness positively affected cooperative GaaP. Next, in Model 2, relation and richness positively affected intelligent GaaP. Lastly, in Model 3, rapidity and richness positively affected transparent GaaP. Concerning significant independent variables, because relation focuses on improving the social network, it positively affected

cooperative GaaP and intelligent GaaP, which strongly relate to communication with other people. In previous studies, the relation positively affected the behavior of information used for a purpose and method [22].

Table 7. The results of multiple regression analysis.

Variable	Model 1 (Cooperative GaaP)		Model 2 (Intelligent GaaP)		Model 3 (Transparent GaaP)		
	Coef.	t-Value	Coef.	t-Value	Coef.	t-Value	
(Constant)	0.20	0.96	0.58	2.57 **	0.25	1.12	
Independent variable	Sharing	0.02	0.29	0.01	0.09	0.01	0.16
	Adjustment	0.02	0.24	0.09	0.64	0.27	1.47
	Relation	0.30	3.36 **	0.23	2.43 **	0.13	1.44
	Rapidity	0.18	2 *	0.13	1.28	0.26	2.65 **
	Accessibility	0.10	1.54	0.04	0.52	0.04	0.43
	Richness	0.30	3.11 **	0.34	3.22 **	0.22	2.45 *
Wald chi-squared	348.59		267.19		339.73		
Pseudo R-squared	0.39		0.37		0.39		

* $p < 0.05$. ** $p < 0.01$.

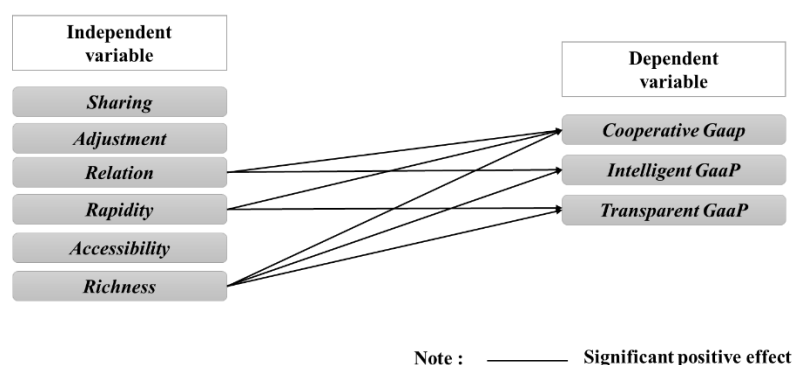


Figure 2. Significant independent variable in multiple regression.

Cooperative GaaP and intelligent GaaP are connected to practicality in terms of the task in an organization. It assumes that high networks with information use can improve public officials' jobs. GaaP studies have emphasized that the network effect with other stakeholders can improve work efficiency. Like Apple's iPhone app market, public officials can get inspiration, ideas, and resources that can be utilized for making services and policies from encountering unexpected stakeholders [8,10,17]. Rapidity is about finding information as speedily as possible, so it is related to increased communication with other stakeholders and increased transparency by swiftly releasing public information to citizens. In previous studies, rapidity positively affected information use for the method [22]. Rapid communication can encourage public officials to collaborate with other stakeholders because of increasing interaction. Interaction with people with different backgrounds can bring serendipity that supports public issues [22]. ICT allows people to find the information they want in an online space, compared with the past, when much information had been stored by paper documents that could not be easily found. We postulate that rapid methods for acquiring information can bring transparency to a government. The richness among the independent variables had a uniquely positive effect on all dependent variables. Because richness involves individual needs (like job promotion and entertainment), it represents the benefits of information behavior. Hence, we infer that public officials who show positive recognition of information behavior are likely to agree with the beneficial effects of GaaP. In

previous studies, richness had a positive effect on the behavior of information used for the method, especially for younger people, who showed high richness compared with middle- and older-aged people [22]. Richness is superficially restricted to satisfying individual needs, but young people connect individual needs and official things involving work, community, and even society when compared with older people. The effect of richness slightly depends on the age bias of a sample that is inclined to young people, because most middle-aged and older people had learned that official and individual things should be separated in hierarchical culture.

4.2. Moderating Effect Analysis

This section deals with the results of the moderating effects from perceptions of IIT. In order to verify a moderating effect, each model includes each moderating variable and interaction term apart from the independent variables. Table 8 shows the moderating effect of individual IIT between the independent variables and dependent variables by robust regression. In Model 1, relation, richness, and individual IIT positively affected cooperative GaaP. In Model 2, relation, richness, and individual IIT positively affected intelligent GaaP. Finally, in Model 3, rapidity positively affected transparent GaaP. Figure 3 shows significant interaction terms for the dependent variables, which revealed significant moderating variables in the moderating effect model.

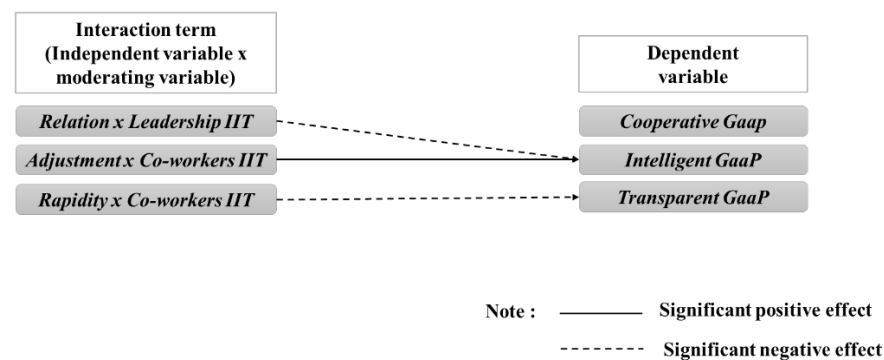


Figure 3. Significant interaction terms in moderating effect analysis.

Individual IIT had no significant moderating effect on the relationships among the independent and dependent variables in terms of a moderating effect. However, individual IIT as an independent variable positively affected cooperative GaaP. Although the results do not statistically prove the hypotheses including moderating effect, they support previous studies claiming a positive effect from individual perceptions of adopting technologies [48–51]. Individual IIT comes from perceived usefulness for ICT, which has been widely utilized in the technical acceptance model, including the TAM and UTAUT [48,52]. It is assumed that high personal benefits can affect positive attitudes or the recognition of new technologies or systems [49]. In particular, cooperative GaaP, which is related to improving work efficiency with inducing cooperation, is strongly connected to high performance. For example, the case of the US Southern Nevada Health District in 2015 showed that nEmesis, which can analyze an SNS about the review of restaurants based on machine learning, could find more problematic restaurants that might cause foodborne disease than human inspectors [62].

Table 9 shows the moderating effects of leadership IIT between independent variables and dependent variables. In Model 1, relation, accessibility, richness, and leadership IIT positively affected cooperative GaaP. In Model 2, richness and leadership IIT positively affected intelligent GaaP. However, relation \times leadership IIT negatively affected intelligent GaaP. In Model 3, adjustment, rapidity, richness, leadership IIT positively affected transparent GaaP.

Table 8. The results of moderating effects from individual IIT.

Variable	Model 1 (Cooperative GaaP)		Model 2 (Intelligent GaaP)		Model 3 (Transparent GaaP)		
	Coef.	t-Value	Coef.	t-Value	Coef.	t-Value	
(Constant)	3.74	118.75 ***	3.79	113.01 ***	3.83	116.79 ***	
Independent variable	Sharing	0.05	0.64	0.01	0.11	0.03	0.31
	Adjustment	0.02	0.13	0.04	0.27	0.23	1.2
	Relation	0.24	2.38 *	0.21	2.37 *	0.12	1.15
	Rapidity	0.17	1.72	0.15	1.36	0.29	2.77 *
	Accessibility	0.07	0.96	0.04	0.49	0.00	0.03
	Richness	0.22	2.35 *	0.26	2.47 *	0.21	1.96
Moderating variable	Individual IIT	0.15	2.62 **	0.15	1.82	0.05	0.68
Interaction term	Sharing × Individual IIT	−0.01	−0.16	−0.04	−0.44	−0.02	−0.15
	Adjustment × Individual IIT	0.01	0.08	0.18	0.95	0.06	0.23
	Relation × Individual IIT	0.17	1.23	−0.02	−0.13	−0.05	−0.35
	Rapidity × Individual IIT	−0.16	−0.99	−0.06	−0.32	−0.02	−0.11
	Accessibility × Individual IIT	0.07	0.56	−0.11	−0.64	−0.11	−0.66
	Richness × Individual IIT	0.00	0.01	0.11	0.51	0.21	1.44
Wald chi-squared	468.4		356.27		393.41		
Pseudo R-squared	0.41		0.38		0.4		

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

The moderating variable of leadership IIT shows a significant effect on both sides of the independent and moderating variables. First, leadership IIT positively affects all dependent variables, so the results proved previous studies that showed the head of an organization influences the adoption of technologies (or innovation) [50,52,53,55]. Leadership is one of the main social factors for the user acceptance model because other people influence individuals. Warsaw suggested that individuals are mostly inclined to comply with others' expectations when those referent others can reward the desired behavior or punish non-behavior [52,63]. The influence and pressure from leaders to adopt innovation reduce the risk of adoption and uncertainty, because they provide strong evidence indicating the legitimacy and appropriateness of the adoption decision [53], due to the hierarchical culture that pursues vertical communication, a top-down approach, and direction from the government, such as a national strategy for IIT. Although GaaP is not yet a universal term in the public sector, various plans by governments have suggested an IIT-based next-generation government model similar to GaaP that suggested work efficiency with IIT, open data, stakeholder engagement, and the creation of tailored services or policies [10,21,27].

Table 9. The results of the moderating effect of leadership IIT.

Variable	Model 1 (Cooperative GaaP)		Model 2 (Intelligent GaaP)		Model 3 (Transparent GaaP)		
	Coef.	t-Value	Coef.	t-Value	Coef.	t-Value	
(Constant)	3.76	126.13 ***	3.81	141.92 ***	3.85 ***	138.88 ***	
Independent variable	Sharing	0.00	−0.08	0.01	0.12	−0.02	−0.25
	Adjustment	0.03	0.39	0.08	0.76	0.27	2.25 *
	Relation	0.23	2.43 **	0.13	1.56	0.07	0.86
	Rapidity	0.17	1.74	0.17	1.8	0.25	2.77 **
	Accessibility	0.14	2.12 **	0.09	1.16	0.06	0.88
	Richness	0.31	3.54 ***	0.31	3.14 **	0.23	2.72 **
Moderating variable	Leadership IIT	0.16	3.11 **	0.15	2.61 *	0.12	2.28 *
Interaction term	Sharing × Leadership IIT	0.07	1.2	0.03	0.55	0.06	1.01
	Adjustment × Leadership IIT	0.02	0.14	0.18	1.37	0.13	1.14
	Relation × Leadership IIT	−0.22	−1.5	−0.18	−2.07 *	−0.19	−1.61
	Rapidity × Leadership IIT	−0.08	−0.39	−0.08	−0.72	−0.04	−0.28
	Accessibility × Leadership IIT	−0.02	−0.13	−0.10	−0.58	−0.17	−1.29
	Richness × Leadership IIT	0.20	1.71	0.18	1.09	0.25	1.84
Wald chi-squared	492.96		360.49		561.27		
Pseudo R-squared	0.44		0.42		0.44		

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

Secondly, in terms of moderating effect, the interaction term with relation and leadership IIT shows negative effect on intelligent GaaP in spite of positive effect of each relation and leadership IIT for intelligent GaaP. This negative effect is called an interference effect. Although the independent and moderating variables affect the dependent variable in the same direction, the interaction term affects the dependent variable in the reverse direction [58,59]. Relation is related to the improvement of information sharing. It assumed that leadership IIT promotes OGD trends at the top of a government, which includes the release of information to internal or external stakeholders for better public processes. However, the strong pressure of leadership IIT might cause resistance by public officials. Because environments, institutions, and laws for work that have hindered active attitudes remain, leadership IIT influences public officials negatively, despite innovative movements like intelligent GaaP. The risk-averse culture in the public sector, which is the main barrier to open data, can be indicated as one of the reasons for adverse moderating effects. It makes public officials passive and neglect to release information to others to maintain organizations and evade responsibility [64–66]. In addition, organizational cynicism, which is defined as the perception that organizational improvements will not be made and thus problems will not

be solved because of various failures inherent in the organization, is indicated as the main barrier for adopting innovative government in the public sector [42,67].

Table 10 shows the moderating effect of co-workers' IIT between the independent variables and dependent variables. In Model 1, relation, rapidity, and richness, and co-workers IIT had a positive effect on cooperative GaaP. In Model 2, relation and richness had a positive effect on co-worker IIT, and adjustment \times co-workers IIT positively affected intelligent GaaP. In Model 3, rapidity and richness had a positive effect on transparent GaaP. However, rapidity \times co-workers IIT had a negative effect on transparent GaaP.

Table 10. The results of the moderating effect from co-workers IIT.

Variable	Model 1 (Cooperative GaaP)		Model 2 (Intelligent GaaP)		Model 3 (Transparent GaaP)		
	Coef.	t-Value	Coef.	t-Value	Coef.	t-Value	
(Constant)	3.76	127.4 ***	3.81	132.12 ***	3.84	144.6 ***	
Independent variable	Sharing	0.04	0.59	0.03	0.47	0.02	0.37
	Adjustment	0.05	0.47	0.10	0.71	0.26	1.94
	Relation	0.26	2.87 **	0.18	2.16 *	0.07	0.98
	Rapidity	0.19	2.15 *	0.17	1.53	0.28	3.13 **
	Accessibility	0.07	1.03	0.03	0.29	0.00	0.04
	Richness	0.28	3.11 **	0.29	2.89 **	0.24	2.53 *
Moderating variable	Co-workers IIT	0.09	1.97 *	0.10	2.17 *	0.05	1.24
Interaction term	Sharing \times Co-workers IIT	−0.01	−0.2	−0.01	−0.21	0.01	0.26
	Adjustment \times Co-workers IIT	0.20	1.47	0.27	1.97 *	0.23	1.83
	Relation \times Co-workers IIT	−0.12	−1.03	−0.12	−1.32	−0.08	−0.88
	Rapidity \times Co-workers IIT	−0.18	−1.14	−0.20	−1.21	−0.31	−2.58 *
	Accessibility \times Co-workers IIT	0.02	0.17	0.04	0.23	0.05	0.47
	Richness \times Co-workers IIT	0.10	0.93	0.05	0.32	0.16	1.59
Wald chi-squared	398.48		328.48		552.58		
Pseudo R-squared	0.41		0.39		0.41		

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

First, co-workers IIT positively affected cooperative GaaP and intelligent GaaP. Maybe, because both dependent variables are strongly connected to work method, co-workers' IIT directly affects perception of benefits from GaaP in terms of how to increase work performance. The results support the previous studies that emphasized the social influence of adopting new technologies and innovation [50,53–55]. In previous studies, co-workers

belong to social influence, including leaders. However, the effect of co-workers and the effect of leaders should be separately handled. Since co-workers are closer to most public officials than leaders of organizations or top of government, public officials can be mainly influenced by co-workers.

Secondly, in terms of the moderating effect, two interaction terms with co-workers IIT showed positive and negative effects for the dependent variables. The interaction term with adjustment positively affected intelligent GaaP, and the adjustment had no significant effect for each dependent variable in the prior multiple regression analysis in Table 7. Because adjustment is described as the ability to search for and filter information [22], co-workers IIT might influence the work skills of respondents, including the source of useful information and innovative data mining tools. As we mentioned, the case of the US Southern Nevada Health District is a good example of this moderating effect. The public officials who have a positive experience supporting IIT for their work will allow other colleagues to use new technologies [62]. Ultimately, it can bring about innovative work methods.

On the other hand, the interaction term with rapidity negatively affected transparent GaaP, despite the positive effect of rapidity and co-workers IIT on transparent GaaP. We postulated that although new technologies can improve work performance, high rapidity might cause a high burden of work, especially in the form of demands from external stakeholders. Since e-government was adopted in the public sector, many governments have established online communication platforms to reflect citizens' opinions. Due to ICT development, online communication platforms have evolved from one-way and provider-driven to two-way and user-driven. This is beneficial to citizens, but public officials' workloads could rise to respond to citizens' various needs. Chadwick indicated the lack of ability to respond to various civic participants as one of the main reasons for the failure of online civic engagement [68].

5. Discussion and Implications

In the age of digital transformation, this study aimed to reveal the determinant factors for the expectations in public officials of the benefits from GaaP. Nowadays, many ICT-developed countries have focused on the platformization of the public sector beyond e-government to respond to the digital paradigm shift. However, due to a lack of empirical studies on GaaP, this study unavoidably referred to a research framework from existing informatization. Concretely, we utilized the application of information as an independent variable, the perception of IIT as a moderating variable, and the beneficial effects from three types of GaaP (as identified by Myeong et al.) to establish the dependent variable in our research model [9].

Based on the empirical results, we drew the following policy implications for establishing GaaP in the public sector.

First, it is necessary to promote favorable circumstances for using information. Satisfaction of individual needs through the provision of information strongly relates to the expectation of benefits from GaaP. Richness even proved robust effect in some moderating effect models despite including moderating variables and interaction terms compared with other independent variables. Information has been used to improve job performance, quality of life, and even self-accomplishment, so searching for more and better information is necessary nowadays.

Furthermore, a favorable attitude toward the application of information strongly relates to open and innovative thinking due to the characteristics of information [34,35,38,45,46]. Since the value of information has rapidly changed, public officials who have high richness can be inclined to accept a new way of reinventing public organizations (such as GaaP). Governments should encourage public officials to utilize various information to increase job efficiency and a sense of accomplishment. When public officials perceive that information is a useful tool in their lives, it will contribute to the diffusion of a positive effect from GaaP.

Second, public officials should get used to using IIT in their jobs in order to build a next-generation government model. Individual IIT proved to be the main independent variable—rather than a moderating variable—for the expectation of benefits from GaaP. Individual IIT had a direct positive effect on cooperative GaaP and intelligent GaaP. This result supports previous GaaP studies that claimed advanced technologies are necessary as the main infrastructure for building GaaP [8,9,11,14,17,18]. Nowadays, there are many efforts among ICT-developed countries to implement IIT in the public sector to increase the efficiency of public processes and the quality of life for citizens. Hence, public officials who agree with the usefulness of IIT could have a positive expectation for the benefits from GaaP driven by IIT. However, in terms of a significant moderating effect, although independent variables' applications of information and the moderating variable of individual IIT belong to informatization, application of information is a common ability these days when older people search for information with an ICT device. This means that the application of information is no longer progressive behavior. Accordingly, we assumed that the gap between the independent and moderating variables did not significantly affect dependent variables. Therefore, governments should encourage public officials to utilize IIT to be aware of the usefulness of IIT when they seek information from raw data. For instance, big data can catch a pattern and discover valuable information from meaningless and unstructured data.

Third, because strong leadership is a double-edged sword, leaders need to be careful when considering a top-down approach in the public sector. Leadership IIT proved to be the only positive moderating variable with a direct effect on all dependent variables and adverse moderating effect variable between the independent variables and intelligent GaaP. The results support previous studies that revealed the effects of top management in organizations when adopting new technologies (or innovation) [50,53–55]. In particular, the hierarchical culture of the public sector leadership IIT can extend their leverage for perception, behavior, and even resources. According to Fan and Zhao, public pressure like promoting open data initiatives from a high level of government positively moderated the relationship between institutional capacity and the quality of information application [40]. However, the interaction term with richness positively affected intelligent GaaP, and transparent relation negatively affected intelligent GaaP. The results proved that leadership would fail to bring innovation and cause resistance by public officials without considering fundamental problems, including the institution and culture of public organizations. However, most top-down innovative strategies have mainly focused on bringing innovation benefits rather than solving these inherent and underestimated problems. Hence, because the attention on IIT from leaders has a two-sided effect, the leaders of public organizations should embrace the various aspects of the usefulness of IIT. Fundamentally, this shift in thinking by leaders can contribute to reinventing the public sector with the implementation of GaaP.

Fourth, the government should adopt the bottom-up approach for adopting IIT or innovation. Although the top-down approach is a meaningful method, co-workers and IIT showed significant effects as the independent and moderating variables. Because the ideology of GaaP pursues autogenous power and an ecosystem by stakeholders, it applies to public officials, who can be platform operators or participants. Since Venkatesh et al. mentioned that social influence is an important factor in the early stage of individual experience with new technologies [42], it is necessary to create good ambience of rank-and-file public officials before adopting GaaP. In order to increase the use of IIT, the government should offer incentives and benchmark cases of IIT. In South Korea, the Ministry of Public Administration and Security annually hosts local informatization dinner parties to share ideas or cases among public officials who work in local informatization. Nowadays, since the use of IIT is not just exclusive property of the department of informatization, it is necessary to promote the use of IIT in their work regardless of a digital transformation gap to establish a next-generation model.

6. Limitation of Research

In this study, there are two kinds of limitations. First, due to the lack of empirical studies on GaaP, we referred to previous informatization studies to utilize a framework including research variables. Even if Seo and Myeong revealed determinant factors on the adoption of GaaP in their empirical study [21], they could not provide enough supportive background for building a GaaP research model, and the research purpose of our model is slightly different from their approach. GaaP involves more recent trends in internal and external environments, so previous informatization studies that have usually focused on e-government might not describe facilitators for the expectations of benefits from GaaP well enough. Nevertheless, by establishing an academic background, we adopted information in independent variables. Accordingly, more empirical studies on GaaP need to be conducted to discover more factors and frameworks.

Second, this study focused on Korean public officials due to cost limitations. However, the results might have been affected by the cultural background or the level of ICT development. For example, the organizational culture in Korea tends to be hierarchical and vertical. That might affect a result showing that the organization's leadership has only a significant moderating effect. Moreover, we should consider that Korea is one of the leading ICT-developed countries. Other ICT-developing countries might reveal different results despite adopting this same research model. Hence, future studies should be conducted for global comparative research to verify whether the results of this research model would be equivalent, regardless of the research subjects.

Third, most of the respondents belonged to younger people in their 20s to 30s because we adopted an online survey platform, and the research topic, which related to advanced ICT, led to sample bias based on age. Younger people tend to utilize new technology and prefer an innovative work environment that is open and horizontal. Therefore, the results of our study might reflect mainly the recognition of young people. However, because middle-aged and older people are usually decision makers or leaders in their organizations, their opinions can determine the success or failure of GaaP. Hence, future studies should consider age distribution for GaaP research to avoid selection bias.

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References

1. Ismail, M.H.; Khater, M.; Zaki, M. Digital business transformation and strategy: What do we know so far. *Camb. Serv. Alliance* **2017**, *10*, 1–35.
2. WEF. Digital Transformation Initiative in Collaboration with Accenture. 2017. Available online: <http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/dti-executive-summary-website-version.pdf> (accessed on 21 March 2021).
3. Kim, J.; Oh, J. *2019 ICT Industry Outlook of Korea*; Korea Information Society Development Institute: Sejong, Korea, 2019.
4. Huang, Y.; Yao, J.; Huang, G. Application of Intelligent Information Technology in the Reform of Hybrid Teaching Courses in Colleges and Universities. In *Journal of Physics: Conference Series*; IOP Publishing: Lijiang, China, 2021; Volume 1852, p. 022065.
5. Im, I.; Shin, D.; Jeong, J. Components for smart autonomous ship architecture based on intelligent information technology. *Procedia Comput. Sci.* **2018**, *134*, 91–98. [[CrossRef](#)]

6. Seo, H. A Preliminary Discussion on Policy Decision Making of AI in The Fourth Industrial Revolution. *Informatiz. Policy* **2019**, *26*, 3–35.
7. Eggers, D.W.; Schatsky, D.; Viechnicki, P. *AI-Augmented Government Using Cognitive Technologies to Redesign Public Sector Work*; Deloitte University Press: Westlake, TX, USA, 2017.
8. O'Reilly, T. Government as a Platform. *Innov. Technol. Gov. Glob.* **2011**, *6*, 13–40. [[CrossRef](#)]
9. Myeong, S.; Hwang, S.; Hur, C. *Government of Smart Society: Focusing on Platform Government Model*; Korean Association for Public Administration Winter Conference: Seoul, Korea, 2011.
10. Seo, H.; Myeong, S. The Priority of Factors of Building Government as a Platform with Analytic Hierarchy Process Analysis. *Sustainability* **2020**, *12*, 5615. [[CrossRef](#)]
11. Gansen, K.; Van Valayer, C.; Allesie, D. *Digital Platform for Public Services, European Union Report*; DG Joint Research Centre: Brussels, Belgium, 2018.
12. Linders, D. From e-government to we-government: Defining a typology for citizen coproduction in the age of social media. *Gov. Inf. Q.* **2012**, *29*, 446–454. [[CrossRef](#)]
13. Janssen, M.; Estevez, E. Lean government and platform-based governance? Doing more with less. *Gov. Inf. Q.* **2013**, *30*, S1–S8. [[CrossRef](#)]
14. Brown, A.; Fishenden, J.; Thompson, M.; Venters, W. Appraising the impact and role of platform models and Government as a Platform (GaaP) in UK Government public service reform: Towards a Platform Assessment Framework (PAF). *Gov. Inf. Q.* **2017**, *34*, 167–182. [[CrossRef](#)]
15. Margetts, H.; Naumann, A. *Government as a Platform: What can Estonia Show the World*; Research paper; University of Oxford: Oxford, UK, 2017.
16. Shin, Y. The Case Study of Platform Government Building: Focusing on Corporation Certify One-Stop Service and Registration. *J. Audit.* **2017**, *29*, 101–126.
17. Cordella, A.; Paletti, A. Government as a platform, orchestration, and public value creation: The Italian case. *Gov. Inf. Q.* **2019**, *36*, 101409. [[CrossRef](#)]
18. Mukhopadhyay, S.; Bouwman, H.; Jaiswal, M.P. An open platform centric approach for scalable government service delivery to the poor: The Aadhaar case. *Gov. Inf. Q.* **2019**, *36*, 437–538. [[CrossRef](#)]
19. Seo, H.; Joo, Y. Informatization Case against to COVID-19 in Korean Government with Perspective of Government as a Platform: Focusing on ICT and Data Usage. *Korean Public Adm. Q.* **2020**, *32*, 759–779. [[CrossRef](#)]
20. Styrin, E.; Mossberger, K.; Zhulin, A. Government as a platform: Intergovernmental participation for public services in the Russian Federation. *Gov. Inf. Q.* **2021**, *39*, 101627. [[CrossRef](#)]
21. Seo, H.; Myeong, S. Determinant Factors for Adoption of Government as a Platform in South Korea: Mediating Effects on the Perception of Intelligent Information Technology. *Sustainability* **2021**, *13*, 10464. [[CrossRef](#)]
22. Lee, B.; Myeong, S.; Kwon, Y.; Park, J. Factors Influencing on Information Use Behavior of Different Generations: Focusing on Seoul, Gyeonggi, and Incheon. *J. Korean Assoc. Reg. Inf. Society* **2019**, *14*, 55–85.
23. Gorwa, R. What is platform governance? *Inf. Commun. Soc.* **2011**, *22*, 854–871. [[CrossRef](#)]
24. Van Alstyne, M.W.; Parker, G.G.; Choudary, S.P. Pipelines, platforms, and the new rules of strategy. *Harv. Bus. Rev.* **2016**, *94*, 16.
25. OECD. *Digital Government Review of Sweden*; OECD: Paris, France, 2018.
26. Bartlett, D. Government as a platform. In *Opening Government: Transparency and Engagement in the Information Age*; Wanna, J., Vincent, S., Eds.; Australian National University Press: Canberra, Australia, 2018; pp. 37–44.
27. UK Government. *Government Transformation Strategy 2017 to 2020*; UK Government: London, UK, 2017.
28. Huang, J.; Karduck, A. A methodology for digital government transformation. *J. Econ. Bus. Manag* **2017**, *5*, 246–254. [[CrossRef](#)]
29. Al-Ani, A. Government as a Platform: Services, Participation and Policies. In *Digital Transformation in Journalism and News Media*; Friedrichsen, M., Kamalipour, Y., Eds.; Springer: Berlin/Heidelberg, Germany, 2017; pp. 179–196.
30. Kato, A. Local government as a platform for altruistic microbusiness: A case study of a children's cafeteria in Japan. *J. Int. Coun. Small Bus.* **2021**, *2*, 55–66. [[CrossRef](#)]
31. Oates, W.E. *Fiscal Federalism*; Harcourt Brace Javanovich: New York, NY, USA, 1972.
32. Welch, E.W.; Hinnant, C.C.; Moon, M.J. Linking citizen satisfaction with e-government and trust in government. *J. Public Adm. Res. Theory* **2005**, *15*, 371–391. [[CrossRef](#)]
33. Tolbert, C.J.; Mossberger, K. The effects of e-government on trust and confidence in government. *Public Adm. Rev.* **2006**, *66*, 354–369. [[CrossRef](#)]
34. Hossain, M.D.; Moon, J.; Kim, J.K.; Choe, Y.C. Impacts of organizational assimilation of e-government systems on business value creation: A structuration theory approach. *Electron. Commer. Res. Appl.* **2011**, *10*, 576–594. [[CrossRef](#)]
35. Baldwin, J.N.; Gauld, R.; Goldfinch, S. What public servants really think of e-government. *Public Manag. Rev.* **2012**, *14*, 105–127. [[CrossRef](#)]
36. Jun, K.N.; Wang, F.; Wang, D. E-government use and perceived government transparency and service capacity: Evidence from a Chinese local government. *Public Perform. Manag. Rev.* **2014**, *38*, 125–151. [[CrossRef](#)]
37. Myeong, S.; Kwon, Y.; Seo, H. Sustainable e-governance: The relationship among trust, digital divide, and e-government. *Sustainability* **2014**, *6*, 6049–6069. [[CrossRef](#)]

38. Stefanovic, D.; Marjanovic, U.; Delic, M.; Culibrk, D.; Lalic, B. Assessing the success of e-government systems: An employee perspective. *Inf. Manag.* **2016**, *53*, 717–726. [[CrossRef](#)]
39. Porumbescu, G.A. Linking public sector social media and e-government website use to trust in government. *Gov. Inf. Q.* **2016**, *33*, 291–304. [[CrossRef](#)]
40. Fan, B.; Zhao, Y. The moderating effect of external pressure on the relationship between internal organizational factors and the quality of open government data. *Gov. Inf. Q.* **2017**, *34*, 396–405. [[CrossRef](#)]
41. Berlilana, B.; Hariguna, T.; Lai, M.T. Effects of relationship quality on citizen intention use of E-government services: An empirical study of e-government system. *Int. J. Electr. Comput. Eng.* **2018**, *8*, 5127. [[CrossRef](#)]
42. Nam, T. Examining the anti-corruption effect of e-government and the moderating effect of national culture: A cross-country study. *Gov. Inf. Q.* **2018**, *35*, 273–282. [[CrossRef](#)]
43. Liang, Y.; Qi, G.; Zhang, X.; Li, G. The effects of e-Government cloud assimilation on public value creation: An empirical study of China. *Gov. Inf. Q.* **2019**, *36*, 101397. [[CrossRef](#)]
44. Lee, T.; Lee, B.K.; Lee-Geiller, S. The effects of information literacy on trust in government websites: Evidence from an online experiment. *Int. J. Inf. Manag.* **2020**, *52*, 102098. [[CrossRef](#)]
45. Zhenbin, Y.; Kankanhalli, A.; Ha, S.; Tayi, G.K. What drives public agencies to participate in open government data initiatives? an innovation resource perspective. *Inf. Manag.* **2020**, *57*, 103179. [[CrossRef](#)]
46. Jeon, S. The effect of information system utilization and education and training on organizational innovation in public social welfare officers: Focused on the moderating effect of organizational trust. *Asian Soc. Work Policy Rev.* **2020**, *14*, 45–52. [[CrossRef](#)]
47. Zurkowski, P.G. *The Information Service Environment: Relationships and Priorities*; National Commission on Libraries and Information Science: Washington, DC, USA, 1974.
48. Davis, F. User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *Int. J. Man-Mach. Stud.* **1993**, *38*, 475–487. [[CrossRef](#)]
49. Hung, S.Y.; Chang, C.M.; Kuo, S.R. User acceptance of mobile e-government services: An empirical study. *Gov. Inf. Q.* **2013**, *30*, 33–44. [[CrossRef](#)]
50. Nam, T. Determinants of local public employee attitudes toward government innovation. *Int. J. Public Sect. Manag.* **2019**, *32*, 418–434. [[CrossRef](#)]
51. Santa, R.; MacDonald, J.B.; Ferrer, M. The role of trust in e-Government effectiveness, operational effectiveness and user satisfaction: Lessons from Saudi Arabia in e-G2B. *Gov. Inf. Q.* **2019**, *36*, 39–50. [[CrossRef](#)]
52. Venkatesh, V.; Morris, M.; Davis, G.; Davis, F. User Acceptance of Information Technology: Toward a Unified View. *MIS Q.* **2003**, *27*, 425–478. [[CrossRef](#)]
53. Karahanna, E.; Straub, D.W.; Chervany, N.L. Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Q.* **1999**, *32*, 183–213. [[CrossRef](#)]
54. Alraja, M.N. The effect of social influence and facilitating conditions on e-government acceptance from the individual employees' perspective. *Pol. J. Manag. Stud.* **2016**, *14*, 18–27. [[CrossRef](#)]
55. Soong, K.K.; Ahmed, E.M.; Tan, K.S. Factors Affecting Malaysia's SMEs in Using Public Electronic Procurement. *J. Inf. Knowl. Manag.* **2020**, *19*, 2050008. [[CrossRef](#)]
56. Huber, P.J. Robust Regression: Asymptotics, Conjectures and Monte Carlo. *Ann. Stat.* **1973**, *1*, 799–821. [[CrossRef](#)]
57. Verardi, V.; Croux, C. Robust regression in Stata. *Stata J.* **2009**, *9*, 439–453. [[CrossRef](#)]
58. Hayes, A.F. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*; Guilford publications: New York, NY, USA, 2013.
59. Bae, B. *Analyses of Moderating and Mediating Effects with SPSS/Process*; Chungnam Publishing: Seoul, Korea, 2021.
60. Kaiser, H.F. An index of factorial simplicity. *Psychometrika* **1974**, *39*, 31–36. [[CrossRef](#)]
61. DeVellis, R.F. *Scale Development: Theory and Applications (Applied Social Research Methods)*; Sage Publications: Thousand Oaks, CA, USA, 2011.
62. Sadilek, A.; Kautz, H.A.; DiPrete, L.; Labus, B.; Portman, E.; Teitel, J.; Silenzio, V. *Deploying nEmesis: Preventing Foodborne Illness by Data Mining Social Media*; AAAI Conference: Phoenix, AZ, USA, 2016; pp. 3982–3989.
63. Warshaw, P.R. A new model for predicting behavioral intentions: An alternative to Fishbein. *J. Mark. Res.* **1980**, *17*, 153–172. [[CrossRef](#)]
64. Bozeman, B.; Kingsley, G. Risk culture in public and private organizations. *Public Adm. Rev.* **1998**, *58*, 109–118. [[CrossRef](#)]
65. Janssen, M.; Charalabidis, Y.; Zuiderwijk, A. Benefits, adoption barriers and myths of open data and open government. *Inf. Syst. Manag.* **2012**, *29*, 258–268. [[CrossRef](#)]
66. Seo, H. An Empirical Study on Open Government Data: Focusing on ODB and OUR Index. *Informatiz. Policy* **2017**, *24*, 48–78.
67. Tesluk, P.E.; Vance, R.J.; Mathieu, J.E. Examining employee involvement in the context of participative work environments. *Group Organ. Manag.* **1999**, *24*, 271–299. [[CrossRef](#)]
68. Chadwick, A. Explaining the failure of an online citizen engagement initiative: The role of internal institutional variables. *J. Inf. Technol. Politics* **2011**, *8*, 21–40. [[CrossRef](#)]