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# The Priority of Factors of Building Government as a Platform with Analytic Hierarchy Process Analysis

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**Abstract:** Nowadays, the Government as a Platform (GaaP) based on cloud computing and network, has come to be considered a new structure to manage efficiently data-driven administration in the public sector. When the GaaP concept was first introduced, the ICT infrastructures that could underpin GaaP were not sufficiently developed. However, the recent digital transformation has transformed the previous electronic government, which was system- and architecture-oriented. As part of the next generation of government models, GaaP may reinvent the government at a lower cost but with better performance, similar to the case of electronic government two decades ago. This study attempted to determine the priority of factors of GaaP by using the analytic hierarchy process (AHP) methodology. Because of the GaaP characteristics, we drew the main components for building GaaP from previous studies and a group interview with experts. The study results show that experts tend to prefer publicness in terms of building GaaP. Most of the factors that the experts weighed with the highest importance are related to the public sector, which revealed that governments should focus on their primary duty, regardless of the origin and characteristics of the platform in GaaP. However, since GaaP allows governments to be more horizontal and innovative, the platform approach can fundamentally shift the existing processes and culture of the public sector. The enhanced activity of citizens with ICT can also accelerate the introduction of GaaP. Finally, the study showed that a data-driven GaaP is necessary to efficiently handle big data, contract services, and multiple levels of on-line and off-line channels. In this public platform, government, citizens, and private sector organizations can work cooperatively as partners to seamlessly govern the hyper-connected society.

**Keywords:** government as a platform; e-governance; information policy; AHP analysis

## 1. Introduction

Since the tide of the Fourth Industrial Revolution permeated all dimensions of our society, intelligence information technologies such as the Internet of Things (IoT), cloud, artificial intelligence (AI), big data, blockchain, and mobile have led the Fourth Industrial Revolution age. Intelligence information technology has been trying to change the paradigms of economy, labor, social culture, politics, and even public services.

At present, because of low growth, low birth rate, aging, and deflation, many leading countries are confronted with a zero-growth economy, as is the case in Japan. These countries are focusing on investment in intelligence information technology, which is one of the leading national strategies to overcome economic depression. Except for these financial issues, other factors including pervasive low public trust in governments, limits of representative democracy, and rapid growth of civil society have accelerated the transformation of governments. Notably, little public trust in governments has been a

painful issue among liberal and developed countries. According to the 2019 Edelman Trust Barometer report, most developed countries, including the US, UK, Germany, France, Japan, South Korea, and so on, were classified as countries distrusting their government [1]. The redesign of a public agency by intelligence information technology is also the central theme in the strategy. These trends have been transforming the fundamental structure of a government into Government as a platform (GaaP) among ICT-developed countries once the platform strategy has been utilized in the private sector such as club, credit card, information communication technology (ICT) devices. The platform strategy has been considered a method capable of solving the crisis in the public sector.

The concept of GaaP was derived from O'Reilly's article "Government as a Platform". So GaaP is not a new term in the public sector literature. When the concept was initially introduced, the ICT infrastructures that could underpin GaaP were not sufficiently developed. Because of dramatic ICT development, digital transformation has leveraged businesses across all industries and governments across all policy areas [2]. Due to increasing interest in the platform model, researchers have dealt with how this model transforms the public processes, including public services, policy decision making, citizen participation, and value creation [2–6].

Governments should focus on the platform model derived from computing architecture because such platforms allow governments to orchestrate the interaction within such an extended network or ecosystem at lower risk and with a higher degree of innovativeness [7]. As a result, governments can increase public value (efficiency, transparency, democracy, citizen participation, etc.), but also create and support innovative business models in the private sector. The most applicable example of GaaP is the open government data platform, which was introduced by significant ICT-developed countries. The open government data platform's notion shows that the stakeholders access data from public agencies on the standard digital platform. Then they exploit the acquired data for various purposes [8]. Above all, the implementation of GaaP in the public sector is one of the critical factors to shift from e-government to a digital government approach in digital transformation, which pursues fundamental changes in diverse areas by using digital technologies [9,10].

In terms of the next generation of government model, we recognize that GaaP can reinvent all fields from the public and private sectors. This paper will shed light on the priority of factors of GaaP by using the analytic hierarchy process (AHP) methodology.

## 2. Literature Review

### *2.1. Concept of GaaP*

The history of platform began with computing history in the 1990s. Software developers began to conceptualize their offerings as more than just narrow programs, but rather as flexible platforms [11,12]. Although the concept of platform was introduced from a technical perspective, nowadays it has expanded into various other areas. According to researchers' definition of platform, the platform as a useful tool can reduce cost and increase value with a tangible or intangible base connecting providers and users [13–18]. Because of the ambiguity of the word "platform", the concept of platform is utilized in various academic fields [19].

Platforms have been given much attention in the private sector and can be defined as "products, services, or technologies that connect different types of customers" [20,21]. Cennamo & Santalo mentioned the importance of network effects in platform competition, where consumers place a higher value on platforms with a more significant number of users. As a result, such platforms will offer a more extensive number of complementary products and services [22]. The World Economic Forum (WEF) argued that the new platform business model would transform people, culture, and make organizational forms more dynamic with innovation and disruption [23]. Van Alstyne et al. also showed how to platform business can overwhelm traditional business "pipeline." Yang et al. mentioned that platforms that disrupt existing industry structures can create new markets, new demand, new supply, and unique value [24].

Due to the platform strategy's origin, we have to understand the platform business that stems from the private sector before dealing with GaaP. A platform business is defined as a public or private organization that enables value-creating interactions between participants using a standard technology platform [2]. Platform players is a meaningful basis for understanding the platform strategy. Each of the four leading roles (producers, consumers, providers, owner) in platform ecosystems may shift rapidly from one task to another. Understanding the relationships both within and outside the ecosystem is central to the platform strategy [25]. The four players that participate in the digital platform are shown in Figure 1.

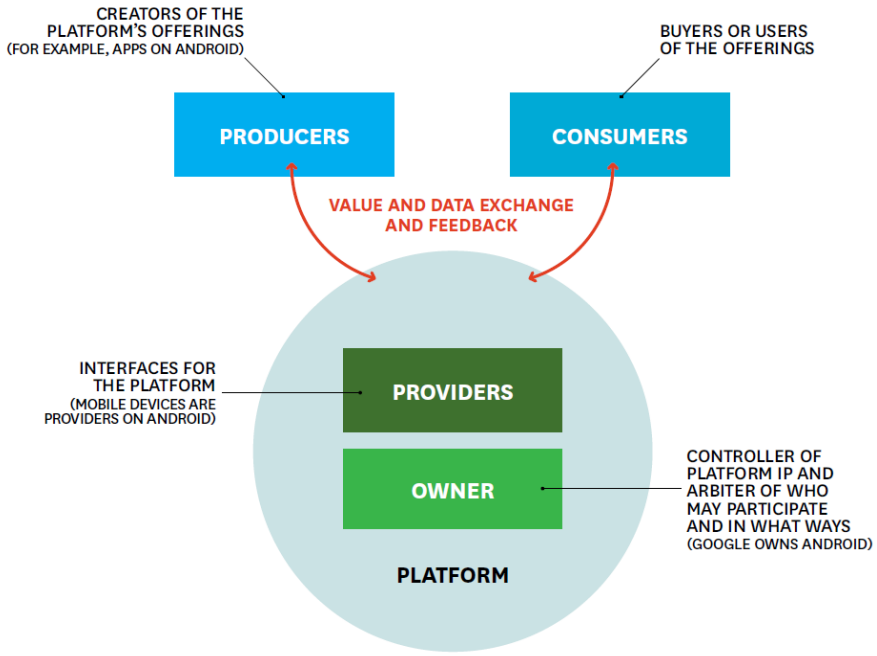


**Figure 1.** Participants of a platform. Source: van Alstyne, et al. [25]

GaaP adopted the concept of a platform from platform business in the private sector. As the first-time adopter, O'Reilly mentioned that GaaP would be the ideal direction for Government 2.0 based on Web 2.0 technology [26]. He suggested Apple's success with the iPhone and applications as an excellent example of the platform strategy. Apple provided a platform that could connect users and app developers, creating tremendous application developments with the platform strategy compared to other competitors. O'Reilly argued that governments should turn to GaaP as a vending machine or bazaar marketplace. Table 1 shows the definition of GaaP from researchers.

Researchers on information policy have focused on the transformation of the existing government to GaaP. Janssen et al. argued that as a new government infrastructure, ICT continues to be a platform that provides facilities, not only for voting, distributing new regulations, customs, or taxation, but also for gaining policy-making information and dealing with crises [27]. Janssen & Estevez mentioned that an emerging trend toward greater collaboration and co-creation in an ecosystem is governments introducing platforms [21]. GaaP increases the efficiency of public agencies for the following reasons [5]. First, GaaP enables other actors to participate in creating public services with lower investment and more value. Second, the platform can support the evolution of public services with third-party applications and reduce the complexity of cooperation. Third, the platform can be easily accessed and simplifies the modification and creation of services. Finally, the trends of open data can promote cooperation related to GaaP policy.

Following the ecosystem of the platform strategy, the role of the provider (government) and consumers (citizens) can be shifted based on the issues and the situation [18]. Masson & Ward suggested four platform models (the government platform, peer platform, ecosystem platform, crowdsourcing

platform) of public services that utilize communication channels and ecosystems [28]. According to Gartner's report, more than 80% of digital government implementation is not built on a technology platform that will fail to meet its objectives by 2023 [29]. GaaP can also help citizens improve productivity, decision making, and well-being. The government is not responsible for the results of their activities but can leverage its platform and influence to foster higher public value [30]. Gansen et al. suggest four types of participants in the platform governance model [2]. Figure 2 shows the three platform governance models based on the structure of four stakeholders: Decentralized, Centralized, and Hybrid Federated.

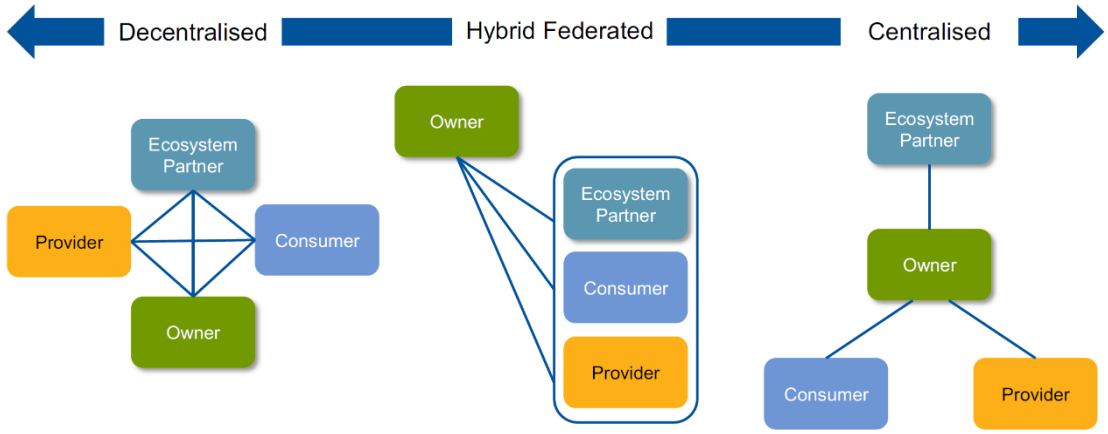


**Figure 2.** Platform governance model. Source: Gansen et al. [2].

**Table 1.** The literature definitions of Government as a Platform (GaaP).

| Resources | Definition of GaaP |
| --- | --- |
| O'Reilly [26] | An open platform allows people inside and outside government to innovate and evolve the outcomes through interactions between government and its citizens. |
| Myeong et al. [16] | Users (citizens, customers) can access the field established by government, create new services, and increase add value. |
| Linders [30] | GaaP can enable governments to make their knowledge and IT infrastructure available to the public with the near-zero marginal cost of digital data dissemination and computer-based services. |
| Janssen & Estevez [21] | GaaP can be viewed as a kind of infrastructure used by different actors to develop all types of applications and make them available to the public and the government itself. |
| Lee [17] | A win-win ecosystem that creates added value that stakeholders seek in a framework made by the government. |
| Kim et al. [31] | GaaP as a government that can create a new ecosystem by providing a platform that can make value and innovation with private participation. |

**Table 1.** *Cont.*

| Resources | Definition of GaaP |
| --- | --- |
| Gansen et al. [2] | The platform governance model defines the decision rights and accountabilities empowering the set of rules concerning who gets to participate in the platform and its ecosystems. |
| Masson [32] | A foundation that allows government and non-governmental organizations to deliver next-generation public services. |
| OECD [10] | The extent to which governments use technologies (and data) to harness the creativity of people in groups and create collaborations to address policy challenges jointly. |
| Pope [33] | It is reshaping governmental affairs through a network of shared APIs and components, open standards, and standard datasets. It provides better services that are more efficient, responsible, and safer for the public. |
| National information strategy committee [34] | GaaP can encourage citizen participation and internal or external cooperation and create added value with the culture of open government data by using ICT. |
| Shin [18] | The government that pursues participation and communication with the private sector increases the added value of the public sector by platforming all public administration resources. |

The WEF mentioned that platforms would increasingly enable citizens to engage with governments, voice their opinions, coordinate their efforts, and even circumvent the supervision of public authority disruption [23]. The UK government mentioned that GaaP was essential to better service delivery, civil service reform, and reinventing procurement for the digital age, and GaaP makes it easier to procure and use third-party providers [35]. Malhotra et al. argued that digital citizen engagement platforms could improve decision making through more active citizen participation, representation, and expression with the case of MY Gov of India [36]. Owen argued for the value of a platform governance approach that provides a framework through which to connect a wide range of social, economic, and democratic harms; it brings together public policy areas and the issues into a comprehensive governance plan. It also helps all stakeholders to solve open problems in the age when governments jeopardized due to emerging complicated and widespread agendas [37]. Huang & Karduck suggested the advantages of the introduction of GaaP. Researchers and citizens can get public sector datasets to improve the efficiency of government in GaaP. GaaP can allow public organizations to fulfill their mission and vision. The government can also increase their business capability with a platform-based transformation that can provide private business with useful information by advanced technology [38]. According to the EU's report, it predicted possible and plausible future scenarios. One of the situations is the DIY (do-it-yourself) democracy. In a DIY democracy, citizens themselves create DIY public services and knowledge-sharing platforms against the weak government and the low quality of public services [39]. Therefore, GaaP might reverse the power balance between citizens and the government in some respects. To sustain GaaP and make it successful, however, checks and balances should be required among citizens and government. On the one hand, GaaP will be useful not only for central governments but also for local governments. The Minister of Economic, Education and Digital Society of Thuringia state government in Germany introduced a digital platform that focused on small and medium-sized companies facing the challenges of digital economy, as shown in Figure 3. The platform encourages collaboration between formerly isolated actors, the ensuing results are distributed, and the learning effects are stimulated [3]. GaaP includes not only infrastructure but also structure,

value, and government organization, so it needs to reinvent governments fundamentally. O'Reilly argued that the openness of the public administration instigated by US president Obama could be key to facilitating GaaP. The critical method is open data, which can lead to transparency and even innovation [26]. In Gaap, governments exclude top-down policy and make cooperative circumstances with a platform that aggregates citizens, experts, and non-experts. The disrupting characteristics of GaaP can affect the work of the government [40]. With GaaP, the government can be converted into a manager of the marketplace, stimulating, enabling, and organizing the government assets. Therefore, governments change their strategies that encourage and facilitate peer production instead of having all the services provided only by the government itself [3]. Governments should consider not only the efficiency of production and delivery of public services but also public value that involves the effect of public services when they try to introduce GaaP for citizen satisfaction [5]. Lee suggested a shared mind, cooperative relationship, and a productive ecosystem among inter public agencies as a role of governments towards building GaaP [17]. Suh and Shin argued that governments would change into an enabler and facilitator from a provider and controller when GaaP is implemented [41]. Shin suggested a supportive organizational culture of public agencies and institutional support of governance with stakeholders like citizens as preconditions of building GaaP [18]. To sum up the previous studies, GaaP fosters unprecedented government evolution, which does not follow path dependence, casting a new way of managing the public sector that will be better for citizens.

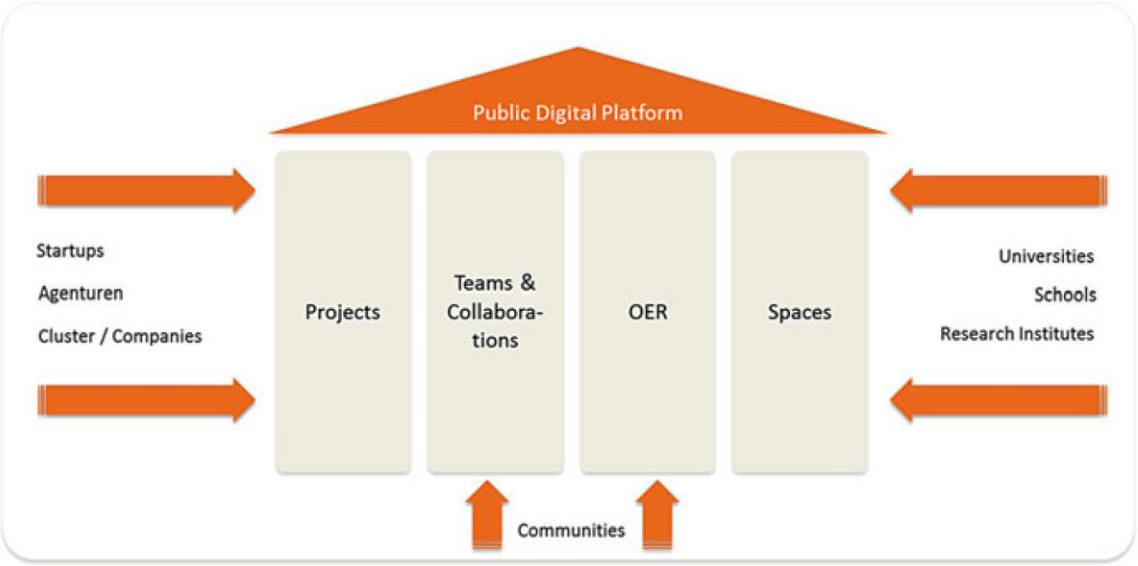


**Figure 3.** Concept view of the digital transformation platform of the state of Thuringia, Germany. Source: Al-ani [3].

### 2.2. *Characteristics and Components of GaaP*

The characteristics of a platform include efficiency for lower cost and less human resources, trust for quality and security of data, speed for quick services and feedback, openness for participation, balance for digital exclusion class, and convenience for user centricity [41]. Platforms with algorithms, cloud computing, and big data become more valuable if more people use them. The critical element for a platform is connections among consumers through interactions [39]. Myeong et al. suggested three capabilities of a platform: interconnection among already linked subjects, interconnection among non-linked issues, and creation of economic and social added value [16]. Because the platform has various characteristics and factors that stem from computer architecture, it is difficult to suggest the components of GaaP.

Due to the complexity of platform characteristics, GaaP involves various factors to build and sustain the platform. Mukhopadhyay et al. suggested modularity and openness as characteristics of GaaP. Modularity is one of the leading technical assets that can be critical for scalability. Modular architecture

can reduce the cost of governance and modification and can increase resource specialization. Openness, including technical and organizational perspectives, can affect engagement with the ecosystem. An open platform can lead to innovation [7].

Cordella and Paletti mentioned three technical components of GaaP to create public value: Decomposition, which is the feasibility of decomposition that can minimize the complexity of GaaP and interdependency among components; Modularity, which holds that each modular part should be independent of the subsystem to avoid being affected by other modular components; and Design rules, which holds that all modules should interconnect with the platform according to rules and standard, which are documented and predefined. Cordella and Paletti suggested that the organization and technical characteristics of the GaaP organizational dimension and architectural (technical) dimension are orchestrated in the platform to create and deliver public value, enabling a new path for service production and delivery [5,42].

A national informatization strategy committee sorted infrastructure, governance, and services as components of GaaP. Infrastructure involves a cooperative culture of public officers, fundamental technology for platforms, and open data utilization, while governance comes up with policy suggestions and policy decision-making processes. Services include major subject area platforms and services for the private sector [34].

According to Suh and Shin's topic modeling analysis concerning keywords of 215 GaaP articles, GaaP-related keywords in the growing period include PC, technical innovation, ubiquitous, digital, democratic governance, and e-governance. GaaP-related keywords in the mature period include smartphones, ICT, IoT, public data, innovative governance, citizenship enhancement, and coexisting with the regional community. The trend of user-centricity was more remarkable, as it reaches closer to the mature period via the topic modeling analysis [41].

Shin suggested an open standard, the protocol made by participants, autogenic power of platform, availability to access platform and express opinion, and enhancement of the platform through the integration of inter-ministerial systems as the factors for building and operating GaaP. Although the GaaP's owner plays the primary role during the initial establishment of GaaP, the purpose of other participants in GaaP is necessary for sustainable development [18].

Linders suggested the main elements of the three-step process for cooperative production of GaaP. First, informing that it enables citizens to access information and nudging that it is related to behavioral economics to encourage optimal choice in the design step. Second, ecosystem embedding means that the government should make an informed contribution as a part of the community to ease the environment for peer production in the execution step. Third, open book government that proactively opens information to citizens regardless of requests is imperative in monitoring the stage [30].

Lee mentioned technical components, including hardware, software, architecture, and network, and the services components, information and contents components, and cultural components as components of GaaP. All ingredients should work together mutually to maintain GaaP. To fulfill 3A (access-attract-achieve) of GaaP, stakeholders and the elements should organically cooperate [17].

Gansen et al. argued that a digital platform is supported by five convergent, integrated, and horizontal technical systems from a technical perspective, as shown in Figure 4. User experience technology deals with customer-facing components, while ecosystem technology supports the creation and connection of external ecosystems, the marketplace, and the community. Data analytic technology includes information management and artificial intelligence. Finally, IoT connects physical assets for monitoring, optimization, control, and profit. Information systems support the operation of the back office, enterprise resource planning (ERP), and core systems [2].

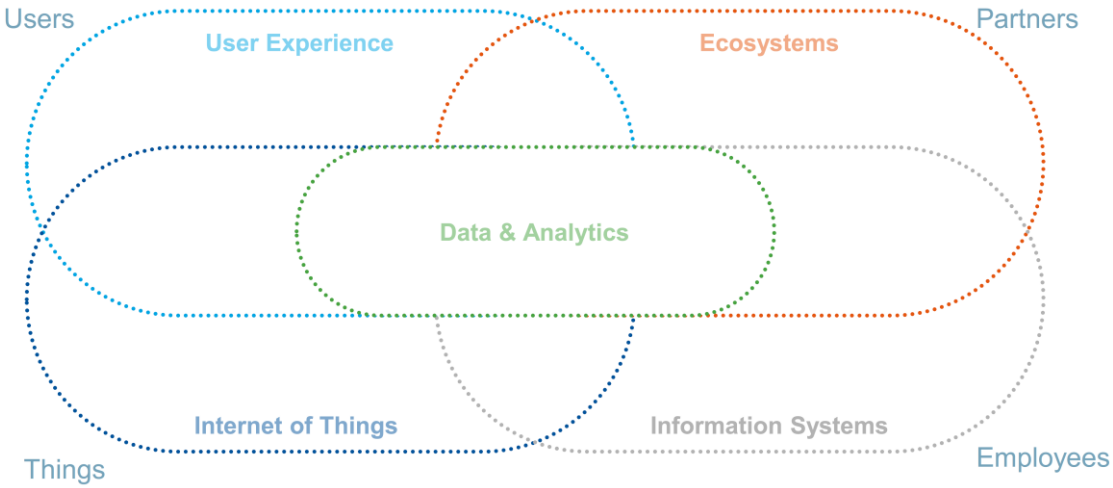


**Figure 4.** Five horizontal digital technology systems that support a digital platform. Source: Gansen et al. [2].

To summarize the GaaP literature, the technical component has the highest priority in establishing GaaP. It depends on the origin of the platform and the succession of e-Government. O'Reilly, the initiator of GaaP, already argued that web 2.0 technology was the key to GaaP. The main impact of technology in realizing GaaP remains valid. To respond to the various demands from stakeholders, GaaP has to utilize advanced technologies, including IoT, AI, cloud, and big data. Because of the trends of digital transformation that have arisen from the blending of all aspects of society and IT environments with new digital technologies [9], governments among developed countries have regarded advanced technology as a potential innovating and facilitating tool of the public sector.

In contrast, researchers have focused on the inherent characteristics of a platform to make GaaP. It is related to the platform structure that includes ecosystems and openness to foster participation. Companies with a platform strategy dominate the market because they have already understood and leveraged the platform architecture. Due to the platform structure, stakeholders who enjoy freedom in the platform can fulfill their needs, which generates enormous gains. Although this lesson can also be adapted to GaaP, public administrations are usually more inflexible, and there is more red tape, which makes it challenging to adopt GaaP in the public sector. Therefore, the introduction of GaaP can encounter many more challenges than faced during the previous introduction of e-Government with just computerization. If the governments consider a transformation to GaaP, they should fundamentally redesign public organizations.

### *2.3. Application Cases of GaaP*

Due to the emergence of digital transformation in the public sector, many public administrations worldwide have made an effort to implement a platform approach in their open process. The UK is one of the leading countries that are converting to digital governments. Government Digital Services (GDS), a part of the Cabinet Office, has initiatively driven the digital transformation of the public sector involving open data policy and types of GaaP in the UK. Many governments of other countries have referred GDS as a good role model for the next generation of e-Government. GDS have established various digital components shown in Table 2 based on GOV.UK, which is an integrated platform that is used by hundreds of government departments and agencies. According to written evidence by the Cabinet Office in 2018, more than 400 services use these components across more than 100 public sector organizations. The Cabinet Office mentioned that adoption of these platforms had increased substantially over the past year, and it could accelerate further over the coming years as the services become mature and are adopted by more organizations outside the central government [43]. The UK government announced the 'Government Transformation Strategy 2017–2020' for a better digital platform until 2020. Under the

strategy, existing platforms such as GOV.UK expect to improve their capability and to broaden their roles. The most critical point in the policy is that the strategy emphasized cooperation between the public and private sectors with mediating open data [35]. The UK government precisely recognizes that a successful GaaP approach can be achieved depending on the engagement of multiple stakeholders

**Table 2.** Various components of Gov.UK.

| Components | Contents |
| --- | --- |
| GOV.UK Verify | A secure way for citizens to prove their identity to the government online |
| GOV.UK Notify | A way for service teams across the government to keep people updated by sending text messages, emails or letters |
| GOV.UK Platform as a Service | Hosting for services on a government cloud platform so departments are not duplicating digital infrastructure |
| GOV.UK Pay | A secure way to pay for government services online |
| GOV.UK Registers | Helping the government design and build services on consistent data infrastructure |

Source: House of Commons [44].

Italian public administration launched the Agenzia per l'Italia Digitale (AgID) plan in 2015, a digital government strategy, referring to the GDS case in the UK. The government designed the AgID's platforms to avoid duplications of investments for similar services at the local level. And platforms can support the development of ecosystems where public and private actors can produce new services. Platforms as a modular structure promote the innovation of public services and reduce the complexity of the coordination among stakeholders related to service production processes and delivery [5]. The following platforms are now available: CIE (electronic identity card), SPID (public identity system); PagoPa (electronic payment management to the public administration); electronic invoicing; and ANAR (national register of the resident population). And additional platforms are under design and testing. Figure 5 describes the GaaP model of the Italian public administration as an information system detail map. The detailed map shows how to consolidate the long-term vision for the evolution of the public administration's information systems, and provides a framework for identifying and steering new strategic actions [45].

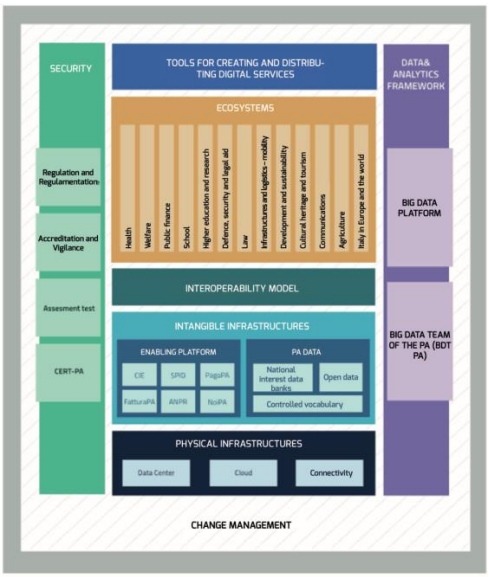


**Figure 5.** Public administration information system's strategic evolution model detail map. Source: Italia [45].

Estonia decided that the online economy and massive technological innovation were the way to move on with no natural resources and low population in the 1990s. Estonia has now occupied a rank as a small but influential country of the information society due to this effort. Estonia is considered the first country to realize GaaP on account of using X-road that has contributed to building a digital community of Estonia (Figure 6). X-Road is a system of registries whereby each has an authorized owner of the data responsible for its maintenance and security. The system relies on a unique 16-digit personal identifier for every person to retrieve personal data from any registry and several other identifiers for businesses, properties, vehicles, and so on. The result is similar to a peer-to-peer network [46]. After Estonia's experience with the 2007 cyber-attacks from Russian hackers, X-road adopted blockchain technology to ensure data integrity in government repositories and to protect the country's data [47]. Now more than 1000 organizations and enterprises in Estonia are using X-road daily in more than 1700 services. With the introduction of X road, 99% of state services are online, and 844 years of working time have been saved thanks to data exchange. Based on the GaaP, Estonia can provide various public services, including e-Police and e-Business that links to a data registry of all legal entities registered in Estonia. For example, an Estonian government portal allows online company registration for new businesses and non-profits. The I-Voting portal enables voters to cast ballots online from any location, while e-Health integrates data from different healthcare providers to provide a comprehensive record for each patient that can be viewed by both doctors and patients; there is also e-School, and so on [46].

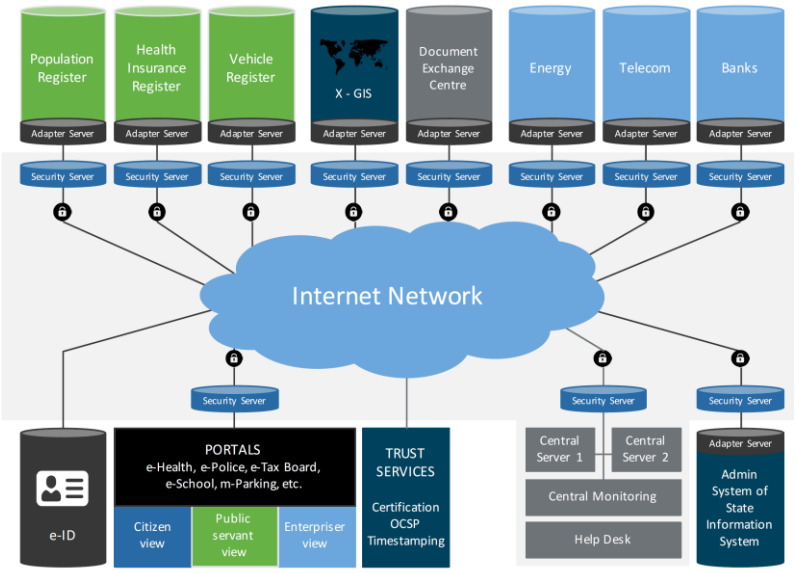


**Figure 6.** X-road concept. Source: e-Governance Academy [48].

## 3. Research Design

### *3.1. Research Method*

Saaty introduced the AHP as a multi-criteria decision-making approach in the 1970s. The AHP is a decision-support tool which can be used to solve complex decision problems [49,50]. AHP uses a hierarchical structure of goal, objective, sub-objective and alternative, as shown in Figure 7 [51,52].

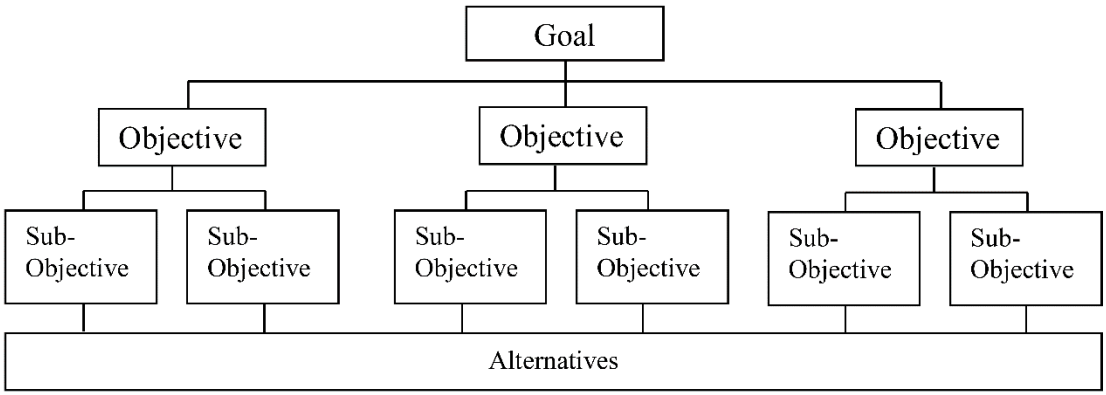


**Figure 7.** AHP hierarchical structure. Source: Saaty [51].

AHP has been applied in studies with small sample sizes to solicit and determine the hierarchical analysis, typically based on experts' opinions. Kil et al. stated that previous studies with AHP suffered from limited participant numbers (6–25) [53].

Among the advantages of using AHP is that AHP provides a useful mechanism for checking the consistency of the evaluation measures and alternatives suggested by the team, thus reducing decision-making bias.

HP allows organizations to minimize common pitfalls of the decision-making process [54]. When constructing a hierarchical framework, we asked respondents to set up a pairwise comparison matrix at each hierarchy and compare them using a scale pairwise comparison, as shown in Table 3 [55].

**Table 3.** Scale for pairwise comparisons.

| Intensity of Importance | Definition | Explanation |
|---|---|---|
| 1 | Equal importance | Two requirements are of equal value |
| 3 | Moderate importance | Experience strongly favors one requirement over another |
| 5 | Strong importance | A requirement is strongly favored and its dominance is demonstrated in practice |
| 7 | Very strong or demonstrated importance | The evidence favoring one over another is of the highest possible order of affirmation |
| 2, 4, 6, 8 | For compromise between the above values | Sometimes one needs to interpolate a compromise judgment numerically because there is no good word to describe it |
| Reciprocals of above | If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i | A comparison mandated by choosing the smaller element as the unit to estimate the larger one as a multiple of that unit. |

Source: Saaty [55].

According to the scale, the available values for the pairwise comparisons are members of the set: {9, 8, 7, 6, 5, 4, 3, 2, 1, 1/2, 1/3, 1/4, 1/5, 1/6, 1/7, 1/8, 1/9}. Psychological experiments by Miller have shown that individuals cannot simultaneously compare more than seven objects (plus or minus two). It is the main reason why Saaty established nine as the upper limit of the scale [50,51,56]. On the one hand, the AHP has the following limitations. When applying the relative importance of the evaluation

criterion, AHP does not consider the unit of measurement for each criterion. Due to ambiguity in evaluation measurement, the evaluation measurement's interpretation might be different from each decision-maker. Because of relying on a subjective judgment of decision-makers, it might cause an error of evaluation. Therefore, it is recommended that a questionnaire study or Delphi survey are combined with the AHP methodology [57].

Nevertheless, the AHP is a reliable tool to reinforce logical and reasonable decision-making processes and determine the importance of criteria and sub-criteria and reduce bias in decision making [53,54]. Currently there is not enough literature on building the concept of GaaP, as, usually, the concept of the platform has been considered as technical infrastructures. Therefore, it is hard to make someone, even experts in the public sector, accept the use of GaaP. This study aims to broaden the concept of GaaP as a policy tool. While the concept of GaaP was not established, we utilized the AHP method that contributes to simplifying the survey of GaaP by using pairwise comparison. As demonstrated in explanatory studies, the AHP method is applicable to determining the key factors of GaaP. In this study, we used seven scales for pairwise comparison.

### *3.2. Data Collection and Measurement*

AHP questionnaires of the paper, based on the literature of GaaP and expert advice, were administered to professors and researchers who had the expertise for the public sector and information policy. Through the Korean Association for Policy Studies, which is one of the significant academic associations dealing with public administration and policy studies in Korea, the questionnaires were distributed from 31 March 2020 to 10 April 2020, via e-mail. Because members of the Korean Association for Policy Studies have professional knowledge, we sampled the academic association population. A total of 32 experts agreed to participate in the survey, and their responses were collected and analyzed. Usually, there is no need to select more than 30 samples in AHP because the error term of the AHP model does not follow a normal distribution, assumed in statistics. To further enhance the weight's robustness by reducing the deviation of variance is more essential than the accuracy of the weight [58,59]. The total sample size of this study was reasonably stable. Table 4 shows the demographic profile of respondents.

**Table 4.** Demographic profile of respondents (total N = 32).

| Items | Index | Frequency (No. of Individuals) | % |
|---|---|---|---|
| Age | 30s | 1 | 3.1 |
| | 40s | 8 | 25 |
| | 50s | 22 | 68.8 |
| | 60s and over | 1 | 3.1 |
| Occupation | Academic | 26 | 81.3 |
| | Public officials | 2 | 6.2 |
| | Researchers | 4 | 12.5 |
| Major | Natural Science | 3 | 9.4 |
| | Social Science | 27 | 84.4 |
| | Humanities | 2 | 6.2 |
| Education | Master's degree | 1 | 3.1 |
| | PhD Candidate | 3 | 9.4 |
| | PhD | 28 | 87.5 |
| Career | Under 5 years | 1 | 3.1 |
| | 6 to 10 years | 1 | 3.1 |
| | 11 to 20 years | 12 | 37.5 |
| | 21 to 25 years | 10 | 31.3 |
| | Over 26 years | 8 | 25 |

In AHP, the decision-maker should choose each choice that is a linguistic phrase. Some examples of such linguistic phrases are: "A is more important than B", or "A is of the same importance as B", or "A is a little more important than B", and so on [50].

The AHP verifies a consistency ratio (CR) to measure the consistency of judgments arranged in pairwise comparisons to guarantee the reliability of the result [53]. CR is the ratio of the consistency index (CI) to the random index (RI) shown in the Table 5 for the same order matrices [54]. To calculate CR, CI needs to be estimated. The CI value is calculated by using the formula: CI = ($\lambda$max − $n$)/($n$ − 1) [50]. RI is the average CI depending on the order $n$ of the matrix. The RI generally utilizes the value given by Saaty, shown in Table 5 [51,53]. The CR can be calculated by following the formula: CR = CI/RI [55]. On condition that the value of CR for all sub-criteria and alternatives is less than 0.1, the judgements are acceptable [54]. If the CR value is more than 0.1, then the problem needs to be studied further and the pairwise comparisons should be re-evaluated [50].

**Table 5.** Random consistency index (RI).

| N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| RI | 0 | 0 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 |

Source: Saaty [51].

In this study, we used the Excel 2016 program for AHP. With 7-point scales, we coded the data from the questionnaires at: {7, 6, 5, 4, 3, 2, 1, 1/2, 1/3, 1/4, 1/5, 1/6, 1/7} and calculated the CI and CR. We exploited the geometric mean for summation of each question and calculated the total weights by using the geometric mean value.

## 4. Factors of Building GaaP

As mentioned above, GaaP has various definitions and components due to the complexity of platform characteristics. Although the platform has proven to be a useful business tool, the private sector success does not guarantee the success of GaaP in the public sector. In the light of GaaP characteristics, we drew the main components for building GaaP from previous studies and the experts' group interview. Consequently, we could exploit the four top factors and three sub-factors of each of the four top factors for the AHP hierarchical model shown in Figure 8.

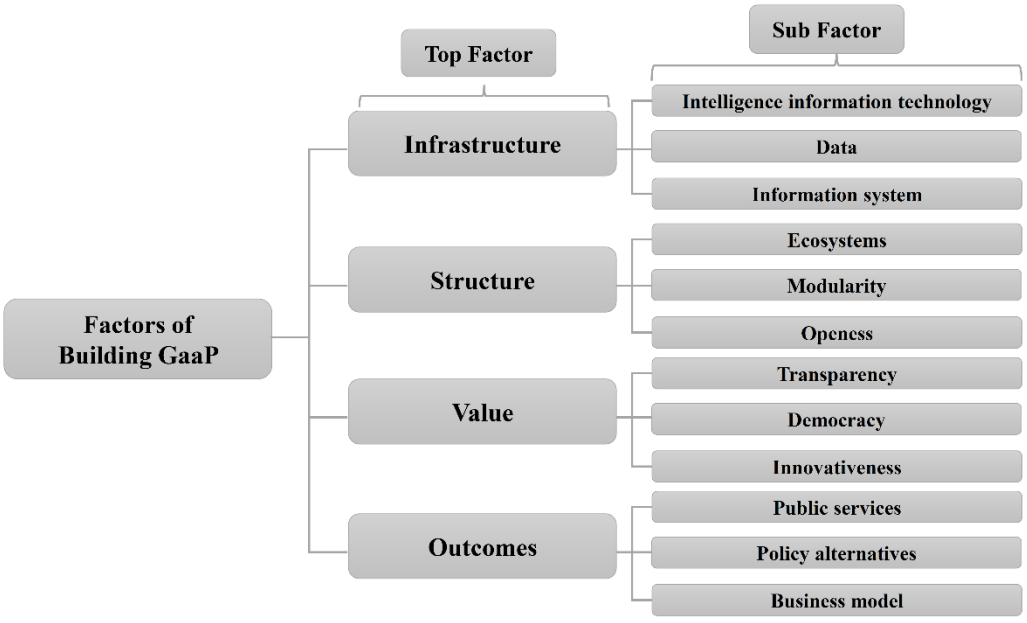


**Figure 8.** Research model for factors of building GaaP.

### *4.1. Infrastructure*

Infrastructure is the technical component of GaaP. Since the concept of a platform is based on computing history, the technical component can be the key factor that operates GaaP. GaaP is recognized as a kind of next-generation e-Government, so it has inherited considerable parts of e-Government. Generally, all sorts of innovative governments like digital government and smart government suggest that ICT is the essential component [35,39,60]. The platform strategy allows stakeholders to interconnect with each other. The networking ability of ICT enables everyone and everything to be reached. ICT can not only enhance the connectivity of existing stakeholders but also allow connections among stakeholders who had no relationship with each other [16]. In this paper, we suggest intelligent information technology (IIT), data, and information systems as infrastructure factors.

#### 4.1.1. Intelligent Information Technologies (IITs)

IITs, which are the components of the progressive ICT that is called the core technology of the Fourth Industrial Revolution, are generally listed as artificial intelligence technology, big data, Internet of Things, cloud computing, and mobile. After the Alphago Go event in 2016, people have been concerned about the economic, social, and political impact of IITs. O'Reilly suggested that Government 2.0 based on Web 2.0 technology could be GaaP with the relationship between ICT and GaaP [26]. Efforts have made using progressive ICT for public services and policy decision-making processes among developed countries, as found in GaaP studies. They have emphasized the role of ICT, indicating that IITs can contribute to reinventing a government with hyper-connection and hyper-intelligence. Because of IITs, GaaP can enhance the network effect and promote the flow of information, thereby gathering more stakeholders in the platform and contributing to the sustainability and success of GaaP.

#### 4.1.2. Data

Data are considered an essential good, which is the crude oil in the digital society. The importance of data can be applied to GaaP. The introduction of IITs enhances the utilization and value of data. It is related to the use of unstructured data such as behavior and location. The collection, analysis, and processing of data make or break businesses in the private sector. Primarily, public administrations have a tremendous amount of public data, which are sleeping and it has thus raised calls for open data among ICT-developed countries. Most representative examples are data.gov of USA and data.gov.uk of the UK, which are portal sites for public data [8]. Open data, which requires the same openness that enables transparency, also enables innovation, as developers build applications that reuse government data in unexpected ways [26,61]. The convergence of public and private data can also result in a synergy of outcomes. Data are the input of goods, services, and even policies for stakeholders with creating added value in GaaP. Nowadays, however, calls have been made for barriers in terms of personal data usage like GDPR in the EU. Improving the possibility of data usage raises the social value for all participants in the platform.

#### 4.1.3. Information Systems

GaaP uses existing information systems of each public agency since it is a sort of next-generation e-Government. Information systems include the level of each organization, local government, and even smart cites. GaaP can be defined as an integrated information system. Whereas integrated information systems merely gather information from each public agency and provide integrated information to citizens, GaaP not only provides integrated information but also creates value for citizens [18]. Suh and Shin's literature analysis with topic modeling, which is a kind of related search words tool, revealed that information systems were the main keyword with GaaP in maturity [41]. Existing information systems have worked as an internal platform for work processes and even as an external platform for other stakeholders. Since GaaP is the platform of platforms [12], each information system can interact with other systems. Citizens feel more comfortable and useful to access GaaP compared to accessing

separated information systems. Furthermore, public officers can cooperate with other departments because removing barriers can smoothen the flow of information.

### *4.2. Structure*

The structure of GaaP is the conceptual and inherent attribute based on the verbal origin of the platform. A platform is generally defined as a base or framework that can gather stakeholders. In addition to physical components, intangible components are necessary for the operation of a platform. It is a sort of protocol that can allow the platform to be sustained and grow. Traditional supply chain-based enterprises have encountered failure of platform business without understanding the interaction, network, engagement, and ecosystems that are attributes of a platform [25]. In terms of the success of GaaP, it is more challenging to apply the platform strategy to the public sector than to the private sector. Since the public sector is vertical and inflexible, it is hard to deal with the platform, such as for a social welfare department. Adopting the structure of a platform depends on how public administrations are reinvented. The structural attributes of a platform make GaaP an innovative government model beyond e-Government. In this paper, we suggest intelligent ecosystems, modularity, and openness as factors of structure.

#### 4.2.1. Ecosystems

Ecosystems are the identity of the platform that features autogenous operation by multiple stakeholders. Ecosystems can encompass any set of interacting stakeholders that shape a collective outcome. In designed ecosystems, stakeholders come together by co-specializing with each other, thereby creating bonds that engender collaboration, without excluding competition [62]. The establishment of ecosystems is a crucial factor commonly mentioned in the platform literature [16,17,26,30]. Thus, GaaP should utilize ecosystems with voluntary covenants rather than a hierarchical control system. But in the early stage of GaaP, the government should be the leader who facilitates platform development. Only if the government as a moderator builds cooperative governance that includes an interdepartmental partnership, public-private partnership, and support for law and systems of the platform, will ecosystems be operated by stakeholders {18}.

#### 4.2.2. Modularity

To implement the platform strategy, the premise that the core and peripheral parts should be freely separated and combined must be satisfied [63]. The key prerequisite emphasizes the importance of modularity, which is derived from computer science. Modularity can also be considered to be the platform's most pressing technological property [64]. Modularity also allows the services being provided to evolve following the market response while managing the overall stability [7,65]. Due to its effective portioning of the complexity, a modular architecture can reduce coordination and governance costs while increasing resource specialization [7,66]. In modularity, each modular component must be independent of the rest of the subsystem, which increases the flexibility of the public administration. Modularity allows the reconfiguration of the service production to accommodate emerging public needs [5,42]. In brief, the modularity of GaaP can contribute to sustaining the ecosystem and being more responsive to stakeholders.

#### 4.2.3. Openness

The more stakeholders participate in the platform, the better the platform can be operated. Therefore, openness that pursues no limitation is essential to encourage anyone to access the platform. O'Reilly suggested that openness has the priority to build GaaP based on the case of the Obama Open Government Initiative [26]. Suh and Shin suggested an open structural platform design that can guarantee convenience and variety of engagement. The openness of GaaP involves technical and organizational aspects. Notably, the organizational aspect means that an open culture of the public sector is necessary [41]. However, existing governments have not regarded other stakeholders as

partners due to the lack of open-mindedness. Accordingly, innovative thinking that opens almost all public sector fields to stakeholders is required to build GaaP [7,16,41]. Google's Android platform has allowed even more innovation to flourish by being more open at the provider layer. Therefore, Google's market capitalization surpassed Apple's in early 2016 [25]. However, adverse effects arise, such as the low quality of trust and output in a completely open platform [7]. Therefore, the government needs to take proper control and manage the coordination of the platform while prioritizing openness as the owner of GaaP.

### *4.3. Value*

Values mean the ideological intention of GaaP. Usually, the values that GaaP pursues are profoundly relevant to public values. Based on the relationship between entrepreneurs and shareholders in the private sector [5], Moore suggested the concept of public value that public administrators can create with political authority and public assets [67]. As GaaP belongs to the public sector, citizens have expected the creation of compulsorily public value. E-Government, partly a former body of GaaP, perceived that public value is the key factor [68]. Accordingly, many studies have been conducted in terms of what kinds of public values e-Government can draw [69,70]. In addition to public value, due to the origin of the platform strategy in the private sector, GaaP can create unexpected value that existing governments have not considered with dynamics. In this paper, we suggest transparency, innovativeness, and democracy as the factors of values.

#### 4.3.1. Transparency

Transparency is an essential rule for operating a platform [62]. Transparency in a platform can be explained as a window through which it is clear to see what all participants work [17]. The characteristics of a platform include openness, horizontal structure, and engagement, and these three features enhance transparency. Transparency is related to open government that is mentioned in the building of the digital government. Although there are many different views on whether transparency is an independent variable or a dependent variable for GaaP, many researchers agree with the relationship between GaaP and transparency [2,10,26,39]. Myeong suggested transparent government as a part of GaaP. According to the reference, the transparency of GaaP can build a virtuous circle that leads to increased communication, engagement, and trust based on an interactive relationship [60]. However, in the platform strategy, a higher level of transparency may have adverse implications for the platform itself. A requirement of transparency may lower innovation incentives, and transparent systems are more susceptible to gaming by users [62].

#### 4.3.2. Innovativeness

Innovativeness is the ultimate value of the platform strategy that can create new ideas, products, and services. The inherent characteristics of a platform enhance innovativeness [2,5,41]. Usually, the lack of control is precious to enable and foster innovation [5]. Only a horizontal interaction of multiple stakeholders enables innovative outcomes in open spaces like a platform [62,71]. In the past, innovativeness was considered as an exclusive value of the private sector. Still, nowadays, the public sector has adopted innovativeness to respond to rapid changes in the external paradigm [16]. According to an Accenture survey of 1000 start-ups/entrepreneurs globally, about 70% of respondents agreed that collaboration with public agencies is key to their innovation activities [32]. Since start-ups might be grown as unicorns, platform government can more effectively support these start-ups. GaaP can provide a valuable framework for innovative and open processes, which are needed to enhance the value that public services generate and deliver [5]. The innovativeness of GaaP can be understood as a broad concept that converts the whole society beyond creating the newest products and services.

#### 4.3.3. Democracy

Through GaaP, the enhancement of communication and the participation of stakeholders can promote democracy. Democracy is pushed back in the priority list in the private platform strategy, but GaaP in the public sector has to pursue traditional public values. GaaP increases democracy for the following two reasons. First, on the technical side, the utilization of advanced ICT like IIT in GaaP can easily encourage citizens to access the government, leading to the achievement of direct democracy. E-voting is the key factor concerning direct democracy. Although e-voting that stemmed from e-government was considered the key to open digital democracy in the past, it was not used in formal processes due to technical limitations, including hacking and forgery. But nowadays, blockchain cryptocracy technology can guarantee security, confidentiality, and trust, which has raised the feasibility of e-voting [59]. Second, on the structural side, GaaP based on the engagement and communication of multiple stakeholders enables collective democracy with public dialogue that urges citizens to participate in public processes, including policy decision making and other public work [6,16,72]. It leads to empowerment and decentralization, which are related to strengthening democracy [59,73]. In conclusion, GaaP can deal with the principal-agent problem that causes moral hazard and adverse selection in representative democracies, and can ensure citizen rights [60,74].

### *4.4. Outcomes*

Outcomes refers to everything that is produced by GaaP. The platform's purpose encourages stakeholders to make products and services on their own by connecting. In 2007, Apple utilized the platform strategy to overwhelm other competitors. Apple joined a two-sided market that included app developers and app users, which increased the number of apps by several orders of magnitude by spontaneous developments [25]. The platform strategy can induce user-demanded and innovative outcomes. The introduction of IITs on the platform enables multi-item mass production beyond small-item mass production and multi-item small production to fulfill the numerous users' various needs. As it belongs in the public sector, GaaP can provide exclusive outcomes such as public services and policy alternatives, compared to the private sector platforms. GaaP pursues a two-way provision with stakeholders, in contrast to the one-way rule of existing governments. Therefore, it can change the types and delivery of public services and urge citizens to participate in the policy decision-making process [16,60]. In this paper, we suggest public services, policy alternatives, and business models as factors of outcomes.

#### 4.4.1. Public Services

Public services are defined as goods or services exclusively presented by public agencies. Since existing public services have low responsiveness to citizens, they struggle to fulfill multiple needs. But in GaaP, citizens can contribute to the development and delivery of public services by engaging various stakeholders on the platform [5]. It encourages public and private actors to make a cooperative system of public services. As a result, innovative public services can establish cooperation between public and private actors [17]. It is especially necessary to provide personal information about user-demanded public services, but collecting and utilizing individual information is extremely sensitive. However, due to spontaneous engagement, it is easier to use personal information for tailored public services [16]. With the platform strategy, the government can improve the delivery of services by driving an innovative and collaborative ecosystem with citizens, NGOs, and businesses to co-create, co-design, and co-deliver [32].

#### 4.4.2. Policy Alternatives

The policy decision-making process of GaaP can draw better policy alternatives compared to the existing government. The policy decision-making process will be open to other stakeholders in GaaP rather than maintaining a monopoly status. It is possible to reflect the opinion of citizens in the policy decision making of GaaP rather than decision making by only a few decision-makers. Because many stakeholders participate in the decision-making process, the policy alternative can gain legitimacy and

acceptability of policy to attain a positive evaluation of the system related to trust in government. GaaP can also utilize tremendous data from the public and private sectors by using IIT, which will allow the public administration to choose policy alternatives close to the rational model developed by Simon with enough information. IIT can help decision-makers choose a more rational and optimal policy alternative by searching the data of policy agendas, which are visible or invisible [74,75]. In compliance with the platform strategy, more stakeholders participate in platform government, leading to the gathering of more data and the determination of a more rational and balanced policy alternative.

#### 4.4.3. Business Models

A platform business model is a business design structure that leverages network effects among providers and consumers and ecosystems of a platform to match, create and exchange assets such as goods, services, information, or currency [2]. Platform businesses have disrupted traditional industries through the potential of network effects. The power of platform owners is comparable to that of factory owners in the early industrial revolution [39,76]. Additionally, GaaP can support new business models involving the promotion of job creation and new industries against low birth rate, aging population, and low growth [18]. Especially data on platforms is considered a crucial driver in the Fourth Industrial Revolution as they can contribute to making new business models. By following a platform approach, governments can enable data infrastructures by drawing upon the value of data as an asset for business models from the private and social sectors [10].

On the one hand, whereas GaaP can reflect the opinion of stakeholders concerning the creation of business models with public processes, reforming the law and systems might impede innovative behavior. In Korea, the Korean version of Uber, called 'Tada', raised social issues such as conflict of existing law and other stakeholders. If GaaP had been operational, this issue might have been dealt with proactively with less friction.

## 5. Analysis Results

### *5.1. Measurement Validity*

Table 6 shows the CR of each of the four top factors of GaaP in the hierarchical structure. The CR values of all criteria are satisfied with CR < 1.0, which means that the responses of the pairwise comparisons have sufficient consistency; therefore, we utilized the data from 32 experts.

**Table 6.** Consistency ratio (CR) values of the analytic hierarchy process (AHP) model.

| Table | Sub-Factor |
|---|---|
| Infrastructure | Intelligence information technology<br>Data<br>Information systems<br>CR of sub-factor: 0.006 |
| Structure | Ecosystems<br>Modularity<br>Openness<br>CR of sub-factor: 0.000 |
| Value | Transparency<br>Innovativeness<br>Democracy<br>CR of sub-factor: 0.001 |
| Outcomes | Public services<br>Policy alternatives<br>Business model<br>CR of sub-factor: 0.008 |
| CR of the top factors: 0.006 | |

### 5.2. Top Factors

Table 7 shows the AHP model results of the four top factors. Value has the highest priority with a weight of 0.298, followed by outcomes (0.266), infrastructure (0.225), and structure (0.212). The experts attached more importance to value in order to build GaaP. Although the platform stems from technology and business fields that are slightly separated from the public sector, the experts prioritize the nature of the public sector. These are the characteristics that differ from the platform in the private sector and show the identity of GaaP. The results revealed that publicness has remained unchanged even with the arrival of the new paradigm.

**Table 7.** Weights of the four top factors.

| Variables of Top Factors | Weights | Rank |
|---|---|---|
| Value | 0.298 | 1 |
| Outcomes | 0.266 | 2 |
| Infrastructure | 0.225 | 3 |
| Structure | 0.212 | 4 |
| Consistency index: 0.006 | | |

### 5.3. Sub-Factors of Infrastructure

Table 8 shows the priority of the sub-factors of infrastructure. Data has the highest priority with a weight of 0.461, followed by intelligence information technology (0.313) and information systems (0.226). The experts commonly regard data as an essential factor of infrastructure, since the weight of data is almost double that of information systems. As societies have gradually digitized, the value of data is becoming ever more imperative. The literature of open data argues that data are crude oil for all aspects like businesses, public administrations, and smart cities. O'Reilly already connected GaaP with open data initiatives. Data were heavily related to transparency due to the closeness of governments in the past. Many citizens and NGOs previously only needed data for monitoring what governments do. But nowadays, data can create opportunities, including new business models and better policy alternatives. The position of data has changed from a passive role to an active role. IT-developed countries like the US and the UK have been focusing on how to open and use data to create more added value as the primary growth engine [8,77]. With these trends, data can be designated as playing a significant role in GaaP.

**Table 8.** Weights of sub-factors: infrastructure.

| Variables of Sub-Factors: Infrastructure | Weights | Rank |
|---|---|---|
| Data | 0.461 | 1 |
| Intelligence information technology | 0.313 | 2 |
| Information systems | 0.226 | 3 |
| Consistency index: 0.003 | | |

### 5.4. Sub-Factors of Structure

Table 9 shows the priority of the sub-factors of structure. Ecosystems have the highest priority with a weight of 0.451, followed by openness (0.333) and modularity (0.217). In computer history, the ecosystem of participation could lead to innovative things. The World Wide Web (WWW), the global internet standard, was created by ecosystems of The European Organization for Nuclear Research (CERN). Tim Berners-Lee is a British computer scientist who invented the Hypertext Transfer Protocol (HTTP) that is the basis of WWW. He only needed a more convenient tool for information sharing with other colleagues. The motivation did not stem from the order of top-line managers but spontaneous needs. The platform strategy can operate without understanding the ecosystems that

allow stakeholders to behave themselves with no common dominator. Given that GaaP is a sort of platform of ecosystems, the government should act as a driver and facilitator, not a ruler [5,78].

**Table 9.** Weights of sub-factors: structure.

| Variables of Sub-Factors: Structure | Weights | Rank |
|---|---|---|
| Ecosystems | 0.451 | 1 |
| Openness | 0.333 | 2 |
| Modularity | 0.217 | 3 |
| Consistency index: 0.001 | | |

### 5.5. Sub-Factors of Value

Table 10 shows the priority of the sub-factors of value. Transparency has the highest priority, with a weight of 0.399, followed by democracy (0.335) and innovativeness (0.265). As they belong to the public sector, the two factors that are related to public value are ranked first and second, which is possibly connected with the result of the top factors that revealed value as the first factor. According to the former US president Obama, transparency promotes accountability and provides information for citizens about what their Government is doing [79]. Transparency is closely intertwined with government trust, so developed countries have been trying to connect with citizens as far as possible with open governments. A high trust in a government can increase the acceptance and appropriateness of government behavior [80,81]. In terms of GaaP, higher transparency entices more participants who can create innovation, thereby ensuring the success of GaaP [26]. As the owner of GaaP, the government should open its resources and protocol to all stakeholders in GaaP as far as possible.

**Table 10.** Weights of sub-factors: value.

| Variables of Sub-Factors: Value | Weights | Rank |
|---|---|---|
| Transparency | 0.399 | 1 |
| Democracy | 0.335 | 2 |
| Innovativeness | 0.265 | 3 |
| Consistency index: 0.001 | | |

### 5.6. Sub-Factors of Outcomes

Table 11 shows the priority of the sub-factors of outcomes. Public services have the highest priority with a weight of 0.481, followed by policy alternatives (0.285) and business models (0.234). Public services are remarkably higher than the other two sub-factors. The experts might regard the creation and delivery of public services as the main role of GaaP, which shows the public administration identity. Considering that the public services are a kind of similar consumer goods in the public sector, they have a closer contact point than policy alternatives. GaaP can make it easier to connect government agencies with other government agencies or private stakeholders, which leads to peer creation or co-creation of public services [2,21,30]. Hence, citizens can participate in the platform, suggest their opinion, and even create public services in GaaP like Apple's app development. The adoption of the platform approach in the public sector can reform public administrations such as the adoption of Taylorism and new public management, with the private sector models being useful to improve public services [4]. Uniquely, the utilization of data enables more efficient creation of public services. In GaaP, the nature of public services using data can offer various benefits, as this can create tailored public services specific to citizens' needs [2]. Due to the introduction of data-driven administration, the government can preemptively recognize the issues and provide timely public services even before the citizens voice their needs.

**Table 11.** Weights of sub-factors: outcomes.

| Variables of Sub-Factors: Outcomes | Weights | Rank |
|---|---|---|
| Public services | 0.481 | 1 |
| Policy alternatives | 0.285 | 2 |
| Business model | 0.234 | 3 |
| Consistency index: 0.005 | | |

### *5.7. Policy Implication*

We derived some implications as follows to promote the GaaP approach.

First, from a public value perspective, GaaP should embrace all kinds of stakeholders regardless of the public and private sectors. It might be hard for even public officers to understand and utilize GaaP due to the technology-oriented bias and tendency of the private sector. Therefore, policymakers should be educated on what the GaaP is and how GaaP can innovate our society, including public interests. Above all, alienated information groups, including disabled people, immigrants, the elderly, and people with low income, could go through a difficult time with adapting to GaaP. It is one of the most adverse effects of the utilization of advanced technology. Even if nowadays, most information is digitalized and connected with ICT, there are still blind spots of ICT among alienated information groups. This causes inequality in using public services, civil engagement, and even quality of life without considering the digital divide. Before designing GaaP, the government should foster participation and social inclusion and reduce digital inequalities in GaaP [39].

Second, data is the critical resource of GaaP, but governments should focus on double-sidedness of data usage. Usually, it causes conflict between personal information protection and efficiency of government. China's government established Social Credit Systems, to determine the grade of citizens with various data, including the public and private sectors. Advocates of the systems argued that it could contribute to increasing trust in China, but the opponents' concern is that the system might change as a tool of citizen control. In Korea, the government has tracked people infected with the Coronavirus disease 2019 (COVID-19) with various data, including location information, credit card information, and so on, to protect additional spread. The issues have resulted in the social discourse of which value is more critical in data usage. The government should make transparent GaaP to avoid this social conflict of data usage that can be monitored by participants of GaaP and ensure citizens' informational self-determination. The EU announced the General Data Protection Regulation (GDPR) to protect privacy in a digital society in 2018, due to increased personal data utilization from multinational corporations.

Third, the technical infrastructure is not the first consideration, but it is crucial for building GaaP. The advanced technologies involving IoT, cloud, big data, AI, and blockchain should be combined to embody and operate GaaP. IoT can be used as a collector of data with sensing and communication technology in GaaP. Big data and AI can support automation, create new services, and make decision-making with data analysis skills in GaaP. Primarily, GaaP should work on cloud computing that can provide excellent storage and data analysis base. Cloud can reduce the investment in IT infrastructure and improve the velocity and efficiency of business due to flexibility. Thanks to these benefits, not only private industry but also the public sector around the world have been introducing cloud computing into their infrastructures [82].

Although technological determinism has limitations due to the exaggerating effect of technology, we can witness the social change that stems from advanced technologies. For example, blockchain, one of the leading technologies of the Fourth Industrial Revolution, has changed not only private business models but also the public sector, including public services, policymaking, and voting. With the technology of distributed ledgers, a blockchain as security technology can increase security, transparency, and even trust in government [59]. The blockchain system is distinguished from the

current system due to the distributed ledgers which can provide GaaP with flexibility (Figure 9). With blockchain embedded, the public process can be more efficient, convenient, and transparent to citizens. As citizens are gradually satisfied, it is certain that the enhancement of government trust can contribute to building governance. Besides blockchain, various technology can affect our society, and everyone, even policymakers, may expect some impact. Therefore, ICT engineers consider the social implications of GaaP with people in non-technical fields.

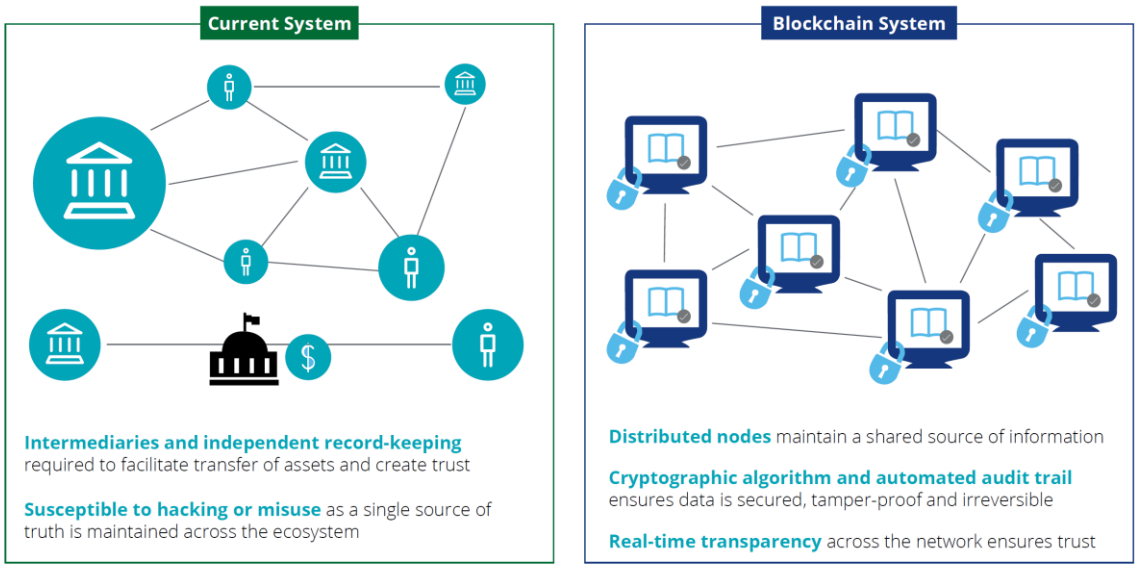


**Figure 9.** Traditional database vs. blockchain-based distributed ledger. Source: Delloite [83].

Fourth, the government should settle chronic regulation issues before adopting GaaP. Most laws and institutions were based on them before the age of the Fourth Industrial Revolution. The regulations have hindered new technology, new business models, and other innovative things. In Korea, the government have sued Tada, the car-sharing start-up similar to Uber, for violating the Passenger Transport Service Act. This shocked other start-ups and reminded them that innovative business is still tricky in Korea. On the one hand, recently, there have been inspiring situations. The Korean government introduced a regulatory sandbox that is the sort of negative regulation to innovative ecosystems. The government has encouraged public agencies to adopt private cloud platforms with alleviating rules to activate the private cloud market. Moreover, three data acts, including the Personal Information Protection Act, the Information and Communication Network Act, and the Credit Information Act, were revised to promote data usage related to a new business model and new technology after intense conflict among politicians, NGOs, and other stakeholders. But laws and institutions cannot yet catch up with the advance of social changes. In consideration of the establishment of GaaP, there might be various hurdles due to the broad scope of convergence.

## 6. Conclusions and Policy Suggestions

This study aimed to determine the priority of building and sustaining GaaP. We may mistakenly consider GaaP as merely a highly advanced e-Government that has digitalized the public sectors. However, GaaP is more comprehensive and innovative than any concept of reinventing government. Even private businesses struggle to establish and operate a platform strategy, which often leads to failure of the platform business. Therefore, it is a challenging mission to introduce a platform approach to the public sector. For this reason, we have conducted a descriptive analysis of what governments should consider before building GaaP with AHP analysis.

As demonstrated by the results of this study concerning the hierarchical model of GaaP, the highest priority is value (0.298) among the four top factors, data (0.461) among the sub-factors of infrastructure, ecosystems (0.451) among the sub-factors of structure, transparency (0.399) among the sub-factors of

value, and public services (0.481) among sub-factors of outcomes. Overall, the study results show that experts tend to prefer publicness in terms of building GaaP. Most of the factors that the experts weighed with the highest importance are related to the public sector, which revealed that governments should focus on their primary duty, regardless of the origin and characteristics of the platform in GaaP. However, since GaaP allows governments to be more horizontal and innovative, the platform approach can fundamentally shift the existing processes and culture of the public sector. The enhanced activity of citizens with ICT can accelerate the introduction of GaaP. Previously, governments had limited opportunities to fulfill each citizen's needs.

This study has limitations regarding the following. Although we drew key factors from literature and brainstorming with experts, it is possible to miss some key elements. Furthermore, AHP depends on closed questionnaires due to pairwise comparisons that ease the survey but cannot deal with more detail in depth. Even if experts have professional knowledge for GaaP, they cannot represent users of GaaP. The reason we confined the survey target to experts is that the concept of GaaP is not yet familiar to citizens and even some public officers. Therefore, attention needs to be paid to applying the results of this study to other GaaP cases. In case of fulfilling the circumstance for GaaP, a follow-up survey of GaaP should consider more stakeholders, including citizens, entrepreneurs, public officers, and others. It might draw different results compared to this study.

We draw the following policy suggestions based on our AHP results.

Although GaaP stems from advanced technology and private business models, publicness as a distinctive aspect of the public sector, including public value, public services, and policy alternatives, should be the first consideration. Despite the disruptive characteristic of GaaP, publicness is an unchangeable component of governments. Most studies of GaaP highlighted that building GaaP mainly focuses on the ICT basis [2–7,16,26,39], but an excessive emphasis on technology as a component of GaaP is not appropriate. Besides, the platform strategy favors more flexible and innovative behavior like a private business, but governments cannot blindly adopt the private sector's strategy and organizational structure. If public administrations follow a radical platform approach without considering publicness, they might lose the fundamental goal of the public sector with ensuing confusion and disorder. Even though GaaP enables more citizens to participate as a partner of general processes, it does not mean that governments are sidelined in GaaP. Only the public administration can take accountability for the results in the process and even in terms of governance [60]. Primarily, most stakeholders, who usually pursue individual benefit and not public interest, are not aware of publicness, which may lead to negative contributions and negative impacts on public value [5]. Therefore, governments should educate participants of GaaP about publicness and monitor whether participants comply with publicness. The introduction of GaaP must be preceded by awareness and internalization of publicness in GaaP.

Second, data are a valuable resource to operate GaaP. Although infrastructure, which is the top factor of data, exhibited relatively low importance compared to the other three top factors, data was the highest sub-factor of support. Above all, some of the 32 experts who participated in the AHP survey also argued that governments should open more public data to build GaaP. With the coming of the age of the Fourth Industrial Revolution, the value of data has increased due to the rapid development of data technology involving collection, analysis, and processing [74]. GaaP researchers also emphasized that open data are the key to GaaP in terms of more added value [2,4,5,7,26,61]. The WWW Foundation, founded by Tim Berners Lee, publishes an annual report for global open data status. It has argued that open data initiatives can benefit not only public agencies that can collect and releasedata but also citizens, enterprises, and other general fields [84].

On the one hand, the collection and analysis of data require a well-established IT infrastructure of e-Government, while, on the other hand, all public information, including paper documents, must be converted into machine-readable materials in computing devices. Open data initiatives include the reformation of the organization and the culture of public agencies. In Korea, although the government has already instigated an open data portal accessible to everyone who wants to utilize

data, traditional apathetic attitudes and provider-centric delivery continue to hinder the utilization of open data. Therefore, the governments that mistakenly regard GaaP as merely a form of progressive e-Government may fail even when using the infrastructure of e-Government. As mentioned above, data contribute to the creation of new ideas, goods, and services that are the outcomes of the platform by platform participants. If tangible and intangible components for open data basement are ready, GaaP can entice stakeholders and create added value [61].

Third, governments should develop an environment of autogenous participation for stakeholders. Most platform studies emphasize the importance of ecosystems in developing a platform strategy. Some private enterprises encountered failure of their platform strategy when they underestimated or were not sufficiently aware of the value of ecosystems. Considering the inability of individual platform cases, adopting ecosystems into GaaP could be a more challenging mission due to the traditional characteristics of the public sector. Hence, a new way for the public sector to allow governments to be more open-minded to participation should be implemented in terms of governance. One of the feasible methods is digital social innovation (DSI) introduced in the mid-2000s in Europe to deal with social issues. DSI, which is a social and cooperative innovation, allows user, innovator, and community to commonly find solution and knowledge with digital technology [85]. The DSI approach involves grassroots network and bottom-up community intertwined with spontaneous citizens [86]. The Ministry of Public Administration and Security (MOPAS) in Korea has promoted the DSI project called Gong-Gam e Ga-Deug in Korean since 2018. Following the project, residents autonomously find and solve their local issues with digital technologies, including IoT, big data, blockchain, and community mapping. In this project, public officials and experts support residents, and are not merely directing them [87]. Although these cases have not yet permeated all open fields, the accumulated experience of spontaneous participation can contribute to building and sustaining GaaP.

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