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GOVERNMENT AS A PLATFORM? THE POWER OF PLATFORMS TO SUPPORT PERSONALIZATION OF PUBLIC SERVICES

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Digital platforms, by their design, allow the coordination of multiple entities to achieve a common goal. In the public sector, different understandings of the platform concept prevail. To guide the development and further research a coherent understanding is required. To address this gap, we identify the constitutive elements of platforms in the public sector. Moreover, their potential to coordinate partially autonomous entities as typical for federal organized states is highlighted. This study contributes through a uniform understanding of public service platforms by providing a framework with constitutive elements, that may guide future analysis.

Apart from the chance regarding coordination, platforms are well suited to support contextual eGovernment targets. Among them is service personalization. Highly individualized service offerings support targets such as No-Stop-government. To this end, the paper extends the framework for service personalization in the public sector and exemplifies related aspects using a reference case.

Keywords: Public Service Platforms, Digital Platforms, Government as a Platform, Public Sector, Platform Economy, Federal States.

1 Introduction

A central e-government objective is to make public services and contacts with administrations as convenient as possible for citizens and businesses. Without knowledge of official structures and responsibilities, requests should be able to be processed easily at a single point. This concept has long been discussed under the term one-stop government [1]. One-stop government creates the need for joint decisions and joint development efforts, especially, but not only, in federal states. The responsibilities are split between central and local authorities and the provincial diets have the constitutional right of legislation [2]. Previous articles have already drawn attention to the challenges arising from the claim to simplify access to public services regardless of the responsibilities in the federal state: The doctrines of federalism and separation of powers must be taken into account [3]. Holistic e-government offerings, whether in federal or centralized states, require the involvement of many different actors, which is reminiscent of digital platforms in the private sector. Digital

platforms, by their architecture and governance, allow the coordination of multiple entities to achieve a common goal [4]. Platforms are accompanied by a powerful ecosystem that involves various actors that participate on the platform. Platform users benefit from the combination of the functionality provided by the platform core itself and the contributed third-party functionalities [5]. Through the integration of third parties, platforms are able to provide more functionality than a single entity could realize [6]. Well-known examples are platforms for mobile devices such as Google Android or Apple iOS [5]. For multi-sided platforms, the coordination of multiple entities through standardization is fundamental to platform scalability and success [7].

Several structural similarities between digital platforms and service provision in the public sector exist. It seems worthwhile to transfer the organizational principles and technical elements that constitute a digital platform to the public sector and thereby aim to benefit from the effective and efficient organization that platforms allow for. Especially in federal systems, many different entities provide various services that need to be integrated to offer the citizens a one-stop-shop for their belongings [8]. E-Government has to promote the horizontal and vertical integration of the branches of government within the framework of the constitutionally guaranteed autonomy [3]. Whereby these specialized services are to be offered by the different entities to account for the government's organization and specialization, many services are needed throughout all processes. This corresponds to the idea of micro-services in the context of service-oriented platform architectures [5, 9]. The platform logic can be used to provide commonly needed features centrally (such as identification services or payments), which are supplemented by specialized services from local entities, as well as to link processes in the sense of a workflow. Thereby many of the aspired contextual targets such as one-stop-shop [8] could be achieved.

So far, different understandings of the platform concept in the public sector context exist [10]. Among these are the provision of single services and a holistic platform that orchestrates different services. Individual services are considered a platform since multiple players can participate. In contrast, the holistic concept of government as a platform describes the orchestration of services using digital technologies. The platform orchestrates the public service portfolio at a single access point [11]. We argue that individual services do not fulfil the platform concept's requirements. However, to guide future research, a consistent understanding is required. To shed light on this discussion, constitutive elements of a public service platform are identified by this paper:

RQ1: Which elements constitute a public service platform?

In addition to theoretic components, the status-quo concerning public platforms is of interest. Indeed, the UN E-Government Survey 2020 shows that some states and municipalities have included new principles and fields of action in their strategy papers, including the provision of services according to Government as a Platform [12]. The very broad and varying use of the term platform within the UN report (e.g., participation platforms, e-procurement platforms, or collaboration platforms) shows that a precise definition of the term is necessary to examine the specifics of digital platforms. We thrive to provide a first notion on the level of platform realization in public service provision. Using example cases, we aim to illustrate:

RQ2: Are constitutive elements of digital platforms recognizable in current digital government approaches?

This study contributes through a uniform understanding of the platform term in the public context. Despite constitutive elements, the proposed framework for public service platforms may guide the assessment of current concepts.

Up to this point, we have emphasized the role of platforms for the coordination of different organizations to provide e-government services in federal states. But platforms offer more than just assistance in coordination issues. From the user's point of view, they enable uniform access to services provided by different public administrations [1]. In addition, they also offer the possibility of far-reaching individualization or personalization for users. This covers various levels, including settings at the user interface level (for example, language, font size) and appropriate service offerings, depending on people's personal life situations (for example, starting a family). Platforms, therefore, also offer added value in terms of service quality. These added values are also addressed in this article. We will first examine the concepts of personalization and, based on the previously developed constitutive elements, examine the extent to which platforms can promote personalization. We will then demonstrate using a sample practical case. In this regard, the paper aims to answer:

RQ3: How can digital platforms support service personalization in the public sector?

To develop related artifacts, the Design Science Research Methodology (DSRM) is adopted [13]. The paper provides an extension of [2] regarding the aspect of personalization. First, a brief overview of recent research on digital platforms in the public sector is given in section 2, which identifies the problem in that different understandings prevail (problem-oriented). The design objective (section 3) is to conceptualize the constituting elements of public service platforms through the transfer of private platform research to the public domain. More than a definition, constitutive elements are operationalized in the public context. Section 4 serves as the demonstration in which federal platform approaches are evaluated against the conceptualized elements. Section 5 highlights the potential of platforms to support service personalization through a framework and reference case. Section 6 discusses the results, and section six concludes the paper.

2 Related Literature

Prior research did consider various aspects of digital platforms. Different research perspectives on digital platforms were highlighted by [14]. While the engineering perspective focuses on platforms as technical architectures, the economics perspective focuses on platforms as markets. Regarding the platform scope, [15] differentiate company-specific (internal) from industry-wide (external) platforms. Prior research analyzed different platform domains. In the context of software-based platforms, platforms for mobile devices, browsers, and enterprise software were considered [16, 17].

We consider the group of software platforms to be most similar to platforms for public service provision. Software platforms, such as platforms for public service provision, provide services for customers whereby multiple entities are involved in the provisioning process. Both platform types have similar characteristics (e.g., coherent infrastructure) and targets (e.g., single point of service access). The domain of software platforms is well-developed in research. This does not apply to public platforms. As such, the domain of software platforms is suitable to guide the conceptualization of public service platforms.

For problem identification as a first phase of the DSRM approach, we reviewed the literature on public sector and platforms. Literature was identified through database queries on Google Scholar, Web of Science, and JStor. To gather recent findings on public service platforms, we focused on sources from 2010 on. For this study, we focused on influential and important contributions. Completeness was not aimed for. For highly influential contributions, for- and backward searches were used to identify underlying principles and subsequent adoptions of the concepts.

2.1 Digital Platforms in Public Sector Service Provision

Given the different stakeholders being involved in the context of platforms and the surrounding ecosystem, governments may occur in different roles in the platform context [18]. These involve: as a user, as a platform provider, as a service provider, and as a regulator. Governments may act as a user if they purchase services over a platform [18]. Governments may act as service providers when they provide services for specific life events [19]. As regulators, states issue legal frameworks for platforms that are not bound to the public environment [20]. For instance, platforms related to the sharing economy received attention regarding regulatory aspects [21]. While previous studies predominately focus on the government as a platform provider, [18] discuss the advantages and disadvantages of governments in the different roles. This contribution focuses on the role of the government as a *platform provider.*

The concept of digital platforms gains importance in the public sector [11, 22]. The Government as a platform (GaaP) concept initially proposed by [11] incorporates the idea to integrate external parties in governmental processes. Seven guidelines are proposed to successfully support the GaaP approach using recent technology and related lessons. A definition is not provided.

While earlier studies focused on the conceptual development of platforms in the public context [11], more recent studies focus on concrete implementations. Thereby, platform concepts in different countries have been examined. Among these are the United Kingdom (UK) platform, the Estonian platform [23], the Italian platform [10], and the Finish platform [24] [25]. Furthermore, approaches in less developed countries are studied [26]. While different platforms (at least in terms of individual services) may exist within one state, the notion of the central platform (GaaP) focuses the platform with the broadest, integrated service portfolio available.

Different aspects of public platforms have been discussed. With a focus on the value dimension, [19] analyzed business models in four services domains of the Swedish platform. Thereby, the emerging view describes the incorporation of different stakeholders and new opportunities concerning the financing aspects for service provision. In the traditional view, service provision is financed by public agencies. The adoption of platforms is illustrated in different examples. Using the example of the American platform challenge.gov [27] identifies the drives and barriers of such solutions. Open innovation approaches aim to access the knowledge from outsiders, e.g., citizens, for the platform's advantage [28, 29].

Platform understandings.

Previous research has shown that there are different understandings of the platform concept in the public sector context (see Table 1) [10]. The most common is the provision of single services and the provision of a holistic platform (government as a platform) integrating different services – which we

use for this article. The holistic concept of the government as a platform focuses on the use of digital technologies to integrate different services. Thereby, the platform orchestrates the public service portfolio, whereby the government acts as a platform provider with the various authorities to provide different services. Basic services and the infrastructural environment are usually provided from a central instance (e.g., the government) whereby the individual services are provided by different actors (e.g., public authorities or NGOs) [11]. The platform provides a central access point for public services using digital technologies. Whereas [11] discusses success factors, a definition is not provided. However, [30] proposes a definition with a technical focus that fits the nature of software platforms: Reorganizing the work of government around a network of shared APIs and components, open standards and canonical datasets, so that civil servants, businesses, and others can deliver radically better services to the public, more safely, efficiently and accountably.

Table 1 Existing Platform Understandings in the Public Domain (own presentation)

Platform concept	Individual service platforms	Government as a platform
External innovation	Not necessary	Integrative aspect
Service orchestration	If any, within limited domain scope	Integration of service portfolio from different contexts
Platform rationale	Different players	Different services and their integration

Especially, two aspects are useful to differentiate between the understandings. First, the involvement of outsiders. While in the concept of service provision, the platform may serve as a technological infrastructure to coordinate processes, it is not required to involve external parties in the value provision. In contrast, the government as a platform concept requires the involvement of different authorities to provide various services. Second, the aspect of orchestration is useful to distinguish the approaches [31]. The government as a platform approach integrates the public services provided by the different authorities according to their responsibilities. The orchestration within a single technological infrastructure allows to achieve the benefits related to the platform concept and to fulfil underlying targets of e-government solutions as, for instance, a one-stop shop [8, 10]. Thereby, the value of the integrated solution is assumed to be more than the sum of the individual service values [31]. The single service approach does not fulfil the integrative aspect of the public service portfolio.

To guide future research, a common understanding of platforms in the public context is of great importance. [32] focus on the separation of platform architecture in core components and complementary peripherals to support variety and an overall evolvable system. The government as a platform approach provides the overall environment with core features and infrastructure whereby

2.2 Constitutive Platform Aspects

To guide further conceptualization, the question of which aspects are constitutive for a public service platform arises. We thrive to combine important aspects of previous platform research and adapt

them to the public context. Following [4], we consider the three aspects of the platform ecosystem, the technical platform architecture, and the platform governance as constitutive elements. The ecosystem encompasses the parties involved to provide services on the platform. The technical architecture specifies fundamental platform components. The governance covers mechanisms to govern related dynamics.

First, the group of parties involved in providing the platform is seen as crucial. To identify related parties, the concept of platform ecosystems is established. We follow the notion of a platform ecosystem as: "The network of innovation to produce complements that make a platform more valuable" [33]. The category of external platforms involves contributors from outside the provisioning entity (platform owner) [15].

Second, the platform architecture itself needs to fulfil the requirements. Following [4], a (software) platform is recognized as "The extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate". The platform itself provides core functionality in terms of centralized features that can be accessed by contributed modules. Related interfaces allow to use these features and interact with the platform (core). The extensibility through innovative contributions from the ecosystem is central.

Third, the dynamics that emerge from the external innovation need to be governed to ensure the desired interest of the platform owner. Platform governance subsumes the rules and policies to govern the platform and ecosystem operation [3]. For instance, mechanisms to ensure the quality of complements in terms of requirements and review processes of submitted modules are common in platform environments [4]. Related mechanisms allow the platform owner to control value creation and capture activity.

3. A Public Service Platform Concept

Following [4], we suggest three constitutive aspects for a public service platform: (1) the platform ecosystem that integrates different stakeholders, (2) the platform architecture that provides the technical foundation, (3) the platform governance to coordinate related activities. For each of the elements, respective concepts are identified, and important findings are discussed.

3.1 Platform Ecosystem

Software platforms involve a surrounding ecosystem that is composed of the different players that are involved in the value creation process [15]. Thereby, value creation is not limited to the platform owner as the provisioning entity but is a product of the group of stakeholders involved. Figure 1 depicts value creation in ecosystems. Thereby, the customer gathers functionality from the focal firm platform directly (e.g., basic services) but also benefits from complementary products offered by third parties. The platform itself may involve external components that are aggregated by the owner [36].

In the platform context, different stakeholders with respective roles are to be distinguished that are part of the platform ecosystem [34, 36] (see Figure 2). The platform owner is the entity that maintains and governs the platform. The group of contributors is the source of external innovation

and external input [4, 37]. For public service provision in the public context, the group of contributors can be distinguished between public and non-public contributors. Non-public actors such as private companies may provide additional services to enhance the platform utility for users. Finally, the group of users refers to the group of all those who use services in the public context.

The integration of external innovation distinguishes the holistic platform concept from the concept of individual services. External innovation in the form of added services may be provided by public institutions other than the platform provider or NGOs as well as private companies [5, 6].

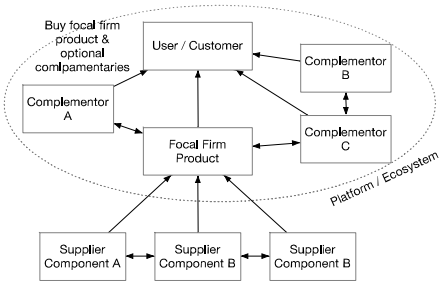

Figure 1 Ecosystem-based value creation [7]

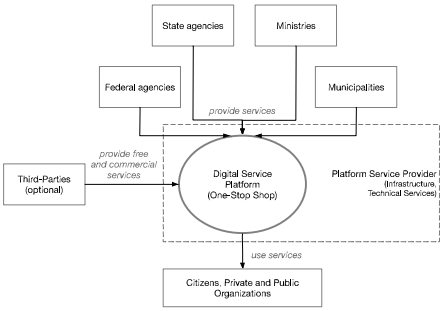

Figure 2 Public Platform Concept

The aspect of orchestration and integration distinguishes the platform concept from the provision of individual services. In this regard, the aspects of integration mechanisms and integration environment were identified as requirements for public sector platforms. First, the platform serves as an integration mechanism. Platforms with their inherent interoperability allow for the integration of external functionality [8] or services in the public domain [9]. Second, the platform provides an integrated environment. In contrast to stand-alone features, platforms aim to integrate functionality. Integration in contrast to stand-alone functionality is important to realize synergies from the multiple features available [10]. Correspondingly, the target of a one-stop shop in the public sector reflects the idea of integration [1].

Platforms typically provide a kind of service directory. Private platforms use marketplaces to categorize available functionality [11]. Marketplaces rely on a pre-defined set of categories to ease users' search process for the desired functionality. In a similar vein, public service offerings are typically structured according to life events [1].

A constituting element of multi-sided platforms is the integration of external innovation. The value of a specific platform is, to a large extent, determined by the ability and success to integrate external innovation [12]. While a high degree of innovation is not equally relevant as for private sector platforms, public platforms focus on providing necessary services in a resource-efficient way. Public service platforms need to fulfill the three ecosystem aspects. The platform needs to act as a central access point that provides integrated service functionality (integration mechanism, environment). The services provided should combine a portfolio to support a one-stop shop government approach (external innovation resp. contribution). Finally, a less decisive aspect is a service directory that allows navigating the available services (service directory).

Table 1 Platform Foundation & Ecosystem

Platform Concept	Related Findings	eGov. Platform Aspect
Platform as integration mechanism*	Platform interoperability forms basis for functional integration [13, 14]; Platforms serve as integration mechanism [10]	Central Access Point [9, 15]
Platforms as integrated environment*	Platforms serve as an integrated environment of platform (core) functionality and contributed third-party functionality [16]	Services are executed on the platform [1]
Platform marketplace as service directory*	Platform marketplace list available third-party functionality in predefined categorizations to allow for the identification of related services [11]	Service overview [1]
External innovation and contribution	Integration of external innovation to provide value on the platform [12] More functionality than a single entity could achieve alone [17]	Involvement of public third parties [18]

* *Relevance for personalization*

3.2 Platform Architecture

Concerning the technical architecture of the platform, two aspects are of importance. First, the platform itself needs to provide functionality in terms of basic features provided by the core [4, 32]. Second, to serve as an environment for external innovation and contribution, platforms provide boundary resources for external parties to provide complements and interfaces to access the core features [35].

Table 2 Platform Architecture

Platform Concept	Related Findings	eGov. Platform Aspect
Core features		
Account management	The platform provides central services for authentication of users. The platform provides the account management component. [11]	Citizen ID [14, 22]
Messaging	The platform provides a central messaging infrastructure. This allows services to provide messages, documents in the form of a messaging box.	Electronic Post Box [23]
Payment	The platform provides a central payment unit. Services can use the component to handle payments related to service requests (e.g. fee payment) [11]	Payment service [6, 24]
Data storage*	Data is a major resource on digital platforms. Data can be provided by the owner as well as complementors. [25]	Document storage, archive [23]
Boundary Resources		
Software Development Kit	Provide resources to develop applications [4]. SDKs develop over time [26]	Form templates [14]
Documentation	Documentation is important for third parties satisfaction and basis for scalability [20]	Resource documentation [14]
Learning material	Learnability of technical standards and technical documentation [21]	Documentation, online resources [14]

* *Relevance for personalization*

Software platforms provide basic functionality with their core features [19] (see Table 2). These allow for a more efficient contribution development than individual realization [13]. For instance, platforms provide account management functionality through a centrally managed ID. Many public services require citizens to identify themselves.

Platform owners provide boundary resources to allow for complements. To allow for contribution and effective development, platform owners provide software development kits [4]. Developers are keen on well-documented features to deploy related functionality and services effectively [20]. Moreover, the accessibility of learning material is important for new contributors to join the platform [21].

3.3 Platform Governance

Digital platforms show a dynamic development. The interest of the platform owner is to govern related dynamics to achieve its targets [35]. Thereby platform control refers to the formal and informal mechanisms to encourage desirable behaviors by module developers [4]. Related rules and mechanisms are defined by the platform owner (see Table 4). Given the regulated environment in that public platforms work, we see it as essential that platforms provide mechanisms for assuring service quality. The extent of rules and policies public platforms employ may vary according to their targets.

To ensure that applications and services are in accordance with the rules set by the platform owner, reviews are conducted before their release [16]. Reviews involve multiple aspects such as technical compatibility as well as content screening [49]. Security and privacy are of utmost importance on digital platforms [50]. Platform owners are highly interested to ensure a similar service quality throughout their platform. Typically, platform owners release detailed guidelines and requirements for contributions to ensure a uniform level of quality [49]. For the public context, related service quality in itself might be a target to provide such a platform environment [51].

Table 3 Platform Governance (Mechanisms for Quality Assurance)

Platform Concept	Related Findings	eGov. Platform Aspect
Application / Service Review	Usually, applications are reviewed prior to their release in the marketplace [11, 21] Platforms differ in their restrictiveness of review process and requirements [27]	Quality Dimensions in eGovernment Services [14, 28]
Security and Privacy*	Platforms use different methods to ensure security and privacy of customer data [29]. Moreover, users are provided with a control centre to decide which information (such as GPS or photo access) may be accessed by applications [29].	Legal Security and Privacy Regulations, Data Sovereignty [30]
Service quality*	Platform guidelines put platform constraints on developers' contributions. Guidelines ensure a uniform service quality throughout the platform and external contributions [9, 27].Templates as part of SDKs include elements for frontend design to ensure uniformity from a visual perspective.	Service Quality in Public Services [28]

* *Relevance for personalization*

4. Public Platforms in Federal States

This section examines the one-stop shops of federal states of the European Union and additionally of the United Kingdom. The question is to what extent they exhibit the characteristics elaborated above and thus correspond to the concept of a platform. While the study gives individual examples, it does not provide a comprehensive platform analysis. The aim is to identify different platform approaches.

First, the federal states of the EU were identified, with the UK still taken into account. Based on this categorization, we consider the national e-government platforms of Austria, Belgium, Germany, Spain, and the UK (https://op.europa.eu/s/oSHU). For identification of the e-government platforms, the e-government factsheets of the European Union were used (https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-government-factsheets-2019). Information on the ecosystem and the architecture was easy to identify in this way. Gaps remained with regard to governance. Therefore, in the third step, we consulted the EU eGovernment Factsheets again and included recent scientific literature. However, some aspects still remained vague. As we do not have access to user accounts, we could not check the exact implementation of concrete services. Thus, results are based on available information and should be regarded as preliminary accordingly. The German platform (named portal network) has not yet been fully implemented and is thus preliminary as well. However, it can be considered as an initiative to realize a government-as-a-platform approach. A table with the detailed results per country can be found in the appendix.

Ecosystem/Foundation. The general goal is to create a central access point despite the different responsibilities in the federal (multi-level) system. In the different platforms, not all services are made available directly in the central instance, sometimes only a small part. Austria and the UK have a clear leading role, as comparatively, many services can be carried out directly on the platform. Otherwise, the platforms offer life situation- or topic-oriented directories with information on the available services and links to the corresponding authorities. Users are forwarded to specialized services as required. In terms of third-party involvement, external partners are relevant as development contributors for all platforms. Especially in the UK, great importance is attached to open standards and clear specifications, which means that various development partners can participate, but quality requirements are ensured [31]. Furthermore, companies can act as advertising partners with personalized offers (e.g., in Austria).

Architecture. All platforms provide core features, including, for example, user accounts (with an officially recognized eID), search, messages, folders, and e-payment. Regarding boundary resources, the situation is different. Some platforms offer extensive and detailed resources. The UK, for example, uses GitHub to facilitate development processes and reuse. In some cases, there are complementary initiatives for joint development efforts that are not exclusively related to the One-Stop-Shops (e.g., G-Cloud in Belgium; central development of modules for online applications in Austria; eGovernment platform about the current situation and a directory of solutions in Spain). In Germany, no centrally provided resources for the development of specific services are provided. Only rough process models, for example, for user-centered design methods, are available.

Governance. Overall, the cooperation of the federal levels with their administrations within the platforms is characterized by diversity and voluntariness as well as multiple agreements between the players. Control is distributed among the participating units, which are equal partners and cooperate in

committees. Applications or standards, such as style guides or quality criteria to be applied, are jointly reviewed (Austria explicitly states this in the platform). However, there are deviating cases where the platform provider (central government) plays a stronger role (e.g., UK). Components or patterns are evaluated by a central unit in terms of usefulness and uniqueness (to ensure reuse). Yet there are gaps in the data on this point. It is unclear, for example, how decisions are made in the joint bodies.

5. Framework for Personalization

Platforms allow for the individualization or personalization of public service offerings through various aspects. First, we clarify the terms and concepts of individualization and personalization of services in general and specifically in the public sector. Individualization and personalization are often used synonymously but are also distinguished from each other (e.g., in the context of educational research) [32]. In Human-Computer Interaction, personalization means adapting to the needs and preferences of individuals in terms of interaction and content [33]. Therefore, personalization is based on specialization for individuals [34]. In the following, we speak of personalization.

Personalization focuses on the needs of individual users. This is done in two ways [35]: firstly, by offering customized services, i.e., services relevant to the users in their specific situation. This requires an analysis of the fit between needs and services. Secondly, it is about the users' preferences and having corresponding choices and control over the form of the services they perceive. Accordingly, personalized systems make assumptions about the goals and preferences of a person and, on this basis, design the content and interaction. Finally, the extent to which this is successful must be evaluated. The personalization process thus includes an analysis, adaptation, and evaluation phase [33].

In e-business, personalization is seen as an essential success factor in the business-to-consumer dimension, as it can generate additional value for e-business services. It is emphasized that personalization is not a purely technology-based task but rather permeates the areas of sales, marketing, and customer service as part of an overall strategy [36]. Spicker emphasizes the vital role of control over personalization, which must be based on user enablement. The overall aim is to ensure effectiveness, efficiency, and equity of need from the user's perspective. These goals align with the eGovernment goals but focus exclusively on the user side. The effect of personalization on these targets must be demonstrated in each case [35].

5.1 Personalization in the Public Service Context

This chapter highlights the potential of digital platforms to support personalization in the public service context. Therefore, the constitutive platform building blocks (from chapter 3) are reviewed regarding their potential contribution to personalization. Afterward, the link between dimensions of personalization and platform building blocks is highlighted. This leads to a conceptual merging of the platform concept with the personalization concept (cf. Figure 3), which is subsequently explained using the example of the United Kingdom (gov.uk).

Table 4 highlights the mechanisms of the platform building blocks to support personalization. The constitutive building blocks were reviewed concerning their potential contribution to support

personalization. The table explains the rationale in that the building blocks and aspects support the personalization of platform services.

Table 4 Platform Building Blocks to support Personalization

Building Block	Aspect	Support of Personalization
Platform Foundation & Ecosystem	Platform as integration mechanism	Through integration and uniform standards, platforms allow for personalization beyond individual services.
	Platforms as integrated environment	The integrated environment serves personalization of services in that related adoptions are achieved in a flexible, standardized manner.
	Platform marketplace as service directory	A wide service portfolio (service directory) serves as the basis for personalization in that relevant services are selected and tailored to the individual needs.
Platform Architecture	Account management	A central account management allows to identify and link relevant data across multiple services. Users are required to specify preferences only once.
	Data storage	Through data storage and integration, the reuse of information and linkage across services is enabled.
Platform Governance	Security and Privacy	Individual sovereignty is a central requirement. Platforms integrate security and privacy mechanisms. By that user a offered a central point for access.
	Service quality	Personalization requires the consistent use and consideration throughout different services on the platform. Related requirements are part of the service quality aspect.

While the former section highlighted the mechanisms of the platform building blocks to support personalization from a requirements perspective, the question of which aspects of personalization are addressed by the respective building blocks remains open and constitutes a challenge for platform design. To that extent, this paper proposes a first framework and the link between platform building blocks and their potential for personalization dimensions.

The *platform architecture* serves as the technical foundation for personalization in that the respective technical elements are provided. The platform architecture allows for the integration and reuse of that in the form of service and process information as well as the form to save personalized requirements and settings.

The *platform foundation & ecosystem* contributes to the *content dimension* of personalization. By implementing multiple services in a uniform architecture, citizens can access various services at a uniform access point. By that, the platform can personalize content, in that relevant content and services according to the individual circumstances (e.g., life situations) are selected. The architecture and data layer contribute by providing relevant information to support this process.

The *platform governance* contributes to the *interaction dimension* of personalization. Through specific requirements, the aspect of personalization is to be considered by the individual service contributors during service design. Through the platform architecture and related elements, related

mechanisms for personalization are standardized. Nonetheless, the use and consideration of related possibilities need to be done by the individual contributors on the platform. In that, the platform governance specifies which and how personalization is realized through third parties.

In the next step, the implementation of personalization is highlighted using the public service platform of the United Kingdom (gov.uk). Table 5 links the platform building blocks with the respective personalization dimensions and elements of the framework. Moreover, the realization and a preliminary assessment of the gov.uk platform is given. Different elements of personalization are recognizable. Furthermore, the personalization principle is recognized and part of the goals set by the platform owner.

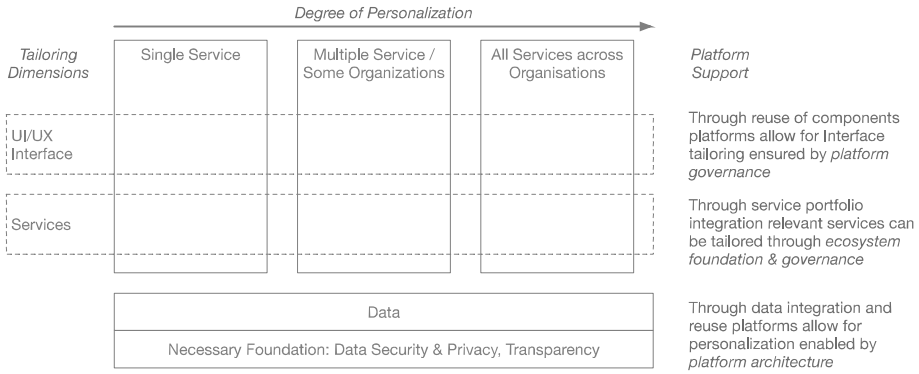

Figure. 3 Personalization based on the platform concept

Figure 3 shows the extent to which the platform concept enables personalization. To achieve personalization in terms of interaction according to user preferences and content, i.e., the compilation of services relevant to a person, the necessary information about the user must be available. This data is available through the platform architecture. The degree of personalization is higher the more services from different organizations are integrated. Concerning data protection and data sovereignty, users must be able to determine the extent of personalization themselves.

Table 5 Aspects of Personalization on the gov.uk Platform

Building Block	Personalization Aspect	Example gov.uk
Platform Architecture	Data	Through the provision of a central ID service as well as data storage service, the integration is support for *all available services on the platform*. As a result of some services to be not available on the platform not all services benefit from the platform environment.
Platform Foundation & Ecosystem	Content (Services)	Through the integration of various services, the platform provides a service portfolio for citizens. On the service portfolio level, citizens are provided citizens with tailored

		context according to the individual situation. In the within-service view, tailoring to the individual citizen situation can be identified, for instance, in the Brexit Checker where the solutions suggested depend on the requested information. Since not all services are integrated for which only links are provided to respective authorities, the personalization applies for *multiple services*.
Platform Governance	Interaction (User Interface UI/UX)	Through the provision of a uniform frontend with reusable components, a coherent design could be provided. Gov.uk uses styles, components, and patterns within their design system to achieve related similarities (https://design-system.service.gov.uk/). As a result, related personalization and configurations could be used across different contexts and services.

6. Discussion

Regarding digital platforms in the public sector, this paper provides various theoretical contributions. *First*, this paper highlights different prevailing understandings of the platform concept in previous literature. In this regard, individual service platforms are to be differentiated from the holistic government as a platform approach. We argue that only the holistic approach fulfills the requirements and matches the idea of platforms (GaaP). Especially the aspect of orchestration and involvement of contributors are key aspects for platforms. In this regard, this study contributes to a coherent understanding of the platform concept in the public sector.

Second, even though the idea of public service platforms has prevailed for a while [5], research yet misses a concrete understanding of what constitutes a public service platform. More recently, the first approaches to define public service platforms were made [6]. Faced with different understandings and a missing operationalization of public service platforms, this study contributes by conceptualizing the constituting elements of a public service platform. Through the operationalization of platform requirements, research question 1 is addressed. Thereby, three elements are essential: platform ecosystem, platform architecture, and platform governance and need to go together for an efficient public service provision [13] and to fulfill related eGovernment targets [6]. The results serve as a basis for future research to be based on a uniform understanding and for the assessment of existing solutions.

This study provides *practical implications* and contributes to the assessment of the state of the art. The results allow assessing platform concepts as well as existing implementations. Through the operationalization, the results enable an assessment of whether a particular solution meets the requirements of a public service platform. Concerning research question 2, this study contributes through the analysis of public service platforms of federal states. Concerning research question 3, the proposed framework highlights respective aspects to provide personalized services for citizens.

The results indicate that different eGovernment targets, such as one-stop shop and personalization, can be realized through a platform approach. In a similar vein, previous studies identified related potentials [5, 6]. For federal states in the EU, related platform approaches were identified. Whereas the approaches are similar in their fundamental idea, differences were found for platform architecture and governance approaches. Future efforts might be devoted to further develop the concept. Thereby, design choices that contribute to the success of government as a platform approaches are of great interest. In this regard, former research highlights the importance of a coherent design of architecture, governance, and the ecosystem [13]. While some aspects suggestions were made [5], their adaptation to government setup is missing. Except for individual approaches, platform initiatives exist on the European level, such as CEF Building Blocks [37].

From an overall perspective, it is important to highlight that the platform serves as the technical foundation to support personalization. However, given the distributed nature of authorities in federal states, the consequent use of related potential is subject to the rigorous application of platform governance. In this regard, the idea of personalization needs to be an integrated platform target to be fulfilled consequently.

Limitations of this study include the use of a few example cases in Europe and the limited data collection. To further detail the results, quantitative assessments should be conducted (e.g., number of services directly on the platform vs. linked services), and governance structures should be surveyed through interviews. The literature studied for the conceptualization is not exhaustive but focused on important contributions.

7. Conclusion

A central e-government objective is to make public services and contacts with administrations as convenient as possible for citizens and businesses. Thereby, the idea of a one-stop government allows handling all requests at a single point and ideally adapted to the individual needs through personalization. For federal states, joint decisions and development efforts are required to realize one-stop government. Digital platforms, by their design, allow the coordination of multiple entities to achieve a common goal. Through the proposed notion of public service platforms, known advantages of the platform economy shall be realized for the public sector. We identify the aspects of the platform ecosystem, platform architecture, and platform governance as essential for a holistic platform concept. Platform approaches were recognized for federal EU states and the UK (Austria, Belgium, Germany, and Spain). Whereas all approaches follow the platform idea, differences were found between their architectures and governance approaches. The examples show that there is still a need for research on the governance of ecosystems. How open should they be to externals? How can quality criteria be enforced effectively and efficiently? What effects do different governance models have on e-government progress? Further analyses, especially based on interviews and quantitative data, can provide important insights here.

Furthermore, platforms not only provide support for the organizational challenge of e-government development in federal states. They also assist goals being closely linked to e-government services. These include, in particular, the possibility for users to achieve their own goals as effectively, efficiently, and satisfactorily as possible. Further research is also needed to explore the impact of platforms in greater detail based on empirical studies.

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Appendix A: Exemplary Public Platform Assessment

Federal States; Platform/URL; Online Availability* (EU eGov Benchmark 2018/2019)	Ecosystem/Foundation (Central Access, Integration, Service Directory, Involvement, Third Parties)	Architecture (Core Features, Identification, Resources, Resource Reuse)	Governance (Governance Structure, Participation, Service Quality, Quality/Reviews)
Austria oesterreich.gv.at 97	Central access with linked websites and few direct services; Service directory for life events; Co-services for specific life events possible (e.g., NGO), advertising and secondary services (e.g., editorial office)	eID, mailbox, search, personalization (relevant services by region); Central development of modules for online applications (open source); Austrian Interoperability Framework for cross-border interoperability; Style guides	Federal government as drawing card [38]; Various participation options, partner from different governmental levels and areas ("active participation of all levels of Government by representatives")
Belgium belgium.be 88	Central access with linked websites and few direct services; Service directory for life events; G-Cloud uses services offered by private companies (beyond the platform); Third Parties not on service level, but according to secondary services (e.g., eID)	eID/single-sign-on (CSAM), mailbox (messages/postbox), search, account settings, assistance for users	All public authorities are equal partners with various participation options; Partly comparable activities (Platform Ecosystems) at regional level – fragmentation in the eGov field [39]; Application review (security, privacy, service quality, compatibility)
Germany portal network –in progress – verwaltung.bund.de 90	Central access as portal network (regional, local and federal network of different portals); All online services can be accessed via any portal or on a separate (linked) website; Service directory for life events; Participation through development of portals and online services through public administrations and consultancies	Minimum requirements for the portals involved: eID, mailbox, search, payment; Interoperable user accounts; Assistance for the creation and integration of services hardly standardized, mainly individual cooperation; In several portals technical components are reused	All participants in the portal network are equal partners; Various options for the Länder to participate in the portal network; Integration of the regional portals is the responsibility of the Länder; Recommended standards in the federal portal (e.g. comprehensible language, accessibility), no corporate design
Spain aministracion.gob.es 96	Central access with most frequent electronic services and linked websites; Service directory for life events	eID, mailbox, search, citizen folder, online webchat; Separate eGovernment Portal as information point about the current eGov situation, directory of applications and solutions to encourage reuse	Ministry of Territorial Policy and Civil Service owns the General Access Point; Various options for participation
United Kingdom	Central access with many	eID, search, payment; GOV.UK	Multiple governance

gov.uk 93	direct services; Service directory for life events; Contribution by proposing a new component or pattern or developing a component or pattern; Open standards and interoperability to create competition and drive innovation [31]: companies, charities and so on can use the same infrastructure to set up additional services	styles, components and patterns	arrangements between central and other administrations; Community-oriented (research, design and development form across government); Reviews by the Design System working group: components and patterns have to be useful and unique

* Online availability: the extent to which selected services are provided online, and via a portal (0 for not online, 100 for online via portal and for automated) – https://digital-strategy.ec.europa.eu/en/library/egovernment-benchmark-2020-egovernment-works-people