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A Scoring Model for Public Administration Process Prioritization in Germany

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Abstract. The German public administration still struggles on becoming digital though considerable effort has been made by accompanying laws and institutions and a good will to digitalize all user-centered processes. But still there is no structured prioritization of processes, and Stakeholders fear the ongoing rather ad-hoc processing of their digitalization tasks. This contribution aims to construct a suitable prioritization score by deriving domain-specific selective aspects along an IS evaluation approach and formulation of a score that relates to the priority of the service process. It can be used to sort a given amount of processes independently of the administrative level.

Keywords: Public Administration, Priority, Information Systems, Processes, Public Service, Score

1 Introduction

In Germany, there are some federal laws in place that demand the public administration to become more and more digital. The most prominent regulations are the "E-Government-Gesetz" (Law on the promotion of electronic administration, [Bu13]), the "Registermodernisierungsgesetz" (RegMoG, Law introducing and using an identification number in public administration and amending other laws, [Bu21]) and the "Onlinezugangsgesetz" (OZG, Act for the Improvement of Online Access to Public Services, [Bu17]). The EGovG obliges public administration internally to provide electronic access channels and payment, accessible ("open") data, the documentation of processes, fully digital promulgations as well as to replace the written form with digital documents, using digital input as well as output methods. The RegMoG is also an internal set of rules to install a central and common ID for most databases in public administration as well as the Once-Only principle, which stands for the demand to re-use datasets of citizens instead of keeping multiple copies for different purposes. Apart from that, the

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OZG takes the view of the user; it is designed to empower citizens to interact with public administration in a digital way. Originally supposed to be fully implemented by the end of 2022, its regulations included the obligation for federal and state administration to offer administrative services online through a portal according to the "Einer für Alle" principle (EfA, One for all), which means that a public service process that has been set up already must also be re-used and not be set up again in different formats or instances. Due to the fact that in Germany constitutive law ("Grundgesetz", [Pa49]) separates administrative responsibilities very strictly, every cooperation between the federal level, the sixteen states and the executing 11,000 municipalities below has to be negotiated and put down to legal regulations individually. Hence, the implementation was rather slow and by October 2022, only about 6% of the service processes (33 of planned 575) were available fully digital. Hence, the OZG is currently subject to revision in order to overcome the drawbacks and implement the lessons learned, which were mainly the complicated coordination of all players, missing standardization and a lack of liability [Na22], p. 5. Moreover, every service process was considered to be as "digital-to-be" important as the others, which means that there was no common sense on prioritization and is still not yet addressed in the drafts of the OZG 2.0. Players and affected parties again are afraid of a failure [MF23, Me21, Se21]. In the domain of Business and Administrative informatics, it is very common to consider these service processes as well as their technical implementation as Information Systems (IS) in the meaning of a sociotechnical system that is built to automate tasks [GRB04]. In this domain, there are even more well-established evaluation approaches that could be used to prioritize the digitalization of public services, e.g. the Technology Acceptance or the IS Success Model.

Hence, this contribution aims to build an easy-to-use prioritization score aligned to the specific demands of public service in Germany along a well-established transporting evaluation approach in order to quickly gain an overview of the different priorities in a set of public service processes. The remainder of the paper therefore is as follows: Chapter 2 discusses the problem Background from the governmental, administrative and user perspective, Chapter 3 frames the search for the appropriate evaluative approach as well as the demands of the domain and the proposal of a score calculation. Chapter 4 concludes, reviews the results and gives outlooks for future research and evaluation.

2 Background

2.1 Governmental/political perspective

Germany is a strong country in terms of economy with industrial companies belonging to worldwide leaders in mechanical engineering, automotive and chemical industry. The German economy according to the metrics GDP (PPP), i.e. gross domestic product based on purchasing power parity, is the largest in Europe and ranks in the 5th place behind China, US, India and Japan in the world [In23]. On the other hand, in terms of degree of

digitalization, Germany is only ranked in the midfield of EU countries [Eu22]. Since the digitalization is widely considered as a key factor for future economical and social development, this discrepancy casts a shadow on the future development of Germany. Recent cases illustrating some problems are a 2-day delay of some final exams (Abitur) in the state North Rhine-Westphalia due to an insufficiently dimensioned server [Se23], the discontinuity of media sometimes increasing instead of decreasing the effort [Ti23], and a tiny online percentage of 0.6% in 2021 for online motor vehicle licensing [Ch23], a huge service with >20m annual cases. Reasons are an inadequate infrastructure, a narrowed view on processes intermixing real digitalization with simplistic digitization, and a lacking focus on cornerstones like digital identity cards for citizens with typical hurdles like usability and extra costs.

In this context, it is worth noting that the political institution "Normenkontrollrat" (regulatory control council) that reviews and controls the effectiveness and efficiency of laws and regulations in Germany strongly recommends timely and swift OZG review and execution [Mi23a] and even the German CIO, located at the Federal Ministry of the Interior and Community doubts the effectiveness of digitalization in case of lacking prioritization [Mi23b]. Taking these different viewpoints on "digitalization" into account, three different levels of execution can be addressed [Jö22]: First, the mere electronification of analog documents and processes in a digital form without adaption of organizational or process structures, thus just addressing the citizen as user of the service, second the digitalization of service structures and processes to implement a fully digital communication with the citizen, thus addressing both internal and citizen participants of the processes, and third a transformation of authorities by adaption of staff and qualification structures and institutional cultural change. As the transformative change level cannot be addressed mainly by an information systems approach, it will not be considered further in this contribution.

Hence, it is of importance to what extent digital change is desired and to what extent the "success" of the IS is defined: either the goal of electronification of access and administrative objects (as low level-objective) or the goal of digitalization, hence the offer of more or less fully digital citizen-faced-processes (as high level-objective). The biggest problem though - with interaction to all mentioned phenomena - is the expected lack of 140,000 IT specialists in Germany's public service in 2030. 1.5m IT workers will retire until 2030. Only part of their knowledge might be transferred to their successors. The total manpower shortage then might sum up to almost one million people [Mc23].

2.2 User(s)/working perspective

One of the key problems for the shortage of staff are the rather unattractive conditions in public administration compared to the private sector [HP22], p. 25 and the common notion of a rather bureaucratic, rigid, security-driven work structure [Fu22], p. 23. These obstacles are of organizational and legal shape, both formally and informally, [Pe17] p.

159 and hence cannot primarily be addressed by digitalization and appropriate information systems. Though, the same source also names technological and technology-acceptance-related obstacles and thus, this leads to the claim of a rather user-centric design of information systems in public administration [Pe17], p. 163 and the use of evaluation schemes such as [Pa85]. In Funke [Fu22], p. 23, the importance of a general public-service culture to motivate the user as well as the actual intention to use, supported by a user-centric design of public service processes is demanded. With the first again being rather of political-organizational quality (and therefore not in the scope of this contribution), the second claim is also backed up by Einhaus [Ju19] who highlights direct user participation to foster acceptance and usage. These thoughts point to the need to consider two different levels of technology acceptance in public service: The organizational and the individual level (see also [WCM07]), representing the professional users in administration (synonymously organizational key users, employees, officers) as well as the citizen users. Parasuraman et al. [Pa85] point to the individual level as the end-users/citizens need to evaluate the service, whereas common IS Success models do not distinguish between professional and citizen users; given the fact that traditionally, information systems are designed to automate the working tasks of the professional users.

In Germany, a maturity level for OZG service processes exists that also takes the perspective of the citizen user. It consists of five levels from 0 – no information available, 1 – service description and application form is available online as PDF (starting the electronification level, see Chapter 2.1), 2 – online application possible, documentations and notifications are being sent via mail (starting the digitalization level, see Chapter 2.1), 3 – application, document supply to as well as notifications from the authority all run fully digital and 4 – application via data supply according to the Once-Only-principle [Bu23].

Hence, it could be of specific interest if an analogue process should be initially lifted to level 1 first or if it would be of bigger impact to shift a process from level 2 to 3 to avoid mail traffic and gain time. Hence, we use two different user concepts in order to categorize the addressees of Information success; the professional user in public administration whose day-to-day tasks are about to be automated and the citizen user that occasionally uses information systems to interact with the public administration.

2.3 Administrative/service perspective

Whereas Ganswindt [Ti23] claims that one of the key problems of digitalization in public services would be the technical adaption and execution, most sources confirm the above-mentioned lack of staff as a key obstacle for successful digitalization, e.g. [RH20], p. 10. Though, the technical part of information systems (besides task and human [GRB04]) must not be unattended; both professional and citizen users rely on information technology to user public services. In this context, the professional users in administration should run appropriate application systems and infrastructural (Platform-) Hard- and Software, the latter comprising all classic architectural levels (Presentation, Business Logic and Data

Layer). The same is true to citizen users; they need appropriate and accessible infrastructure, e.g. their own mobile devices with access to the presentation layer of the publicly available application systems. Key drivers in this context could be the cost for administration and the citizen user, the savings related to time and money when digital services are being used, as well as a certain consideration of sustainability by means of fitness for multi and re-use of IT and IS systems.

Hence, the technical infrastructure/platform availability and usage of appropriate application systems must be taken into consideration when it comes to evaluating Information systems from the professional users' view. The citizen user needs private infrastructure and accessibility/usability of the public service presentation layer, which finally drives its recognition as successful Information system.

2.4 Summary

Summarizing the three perspectives of public service digitalization and adapting the problem to the IS model, following selective aspects for appropriate IS Success approaches can be stated (Table 1): The different concepts that need to be considered in the evaluation as well as potential prioritization drivers.

Application perspective	IS Structure	Selective Aspects					
		Considered concept			Prioritization drivers		
User(s)	Human	Process Executive					
		Citizen User	Professional User		Amount of annual cases	Amount of process participants	
Govern-mental	Task	IS Success Objective					
		Low-level electroni-fication	High-level digitalization		Importance or Impact	OZG level shift	
Adminis-trative	Tech-nology	IT Systems					
		Infra-structural Hardware	Infra-structural Software	Applic ation Sys-tems	Cost	Savings	Sustain-ability

Tab. 1. Selective aspects for IS evaluation approaches

3 Investigation

3.1 Review of Evaluation Approaches

From April to June 2023, we performed a structured review in multiple databases along the search terms (“IS” or “Information Systems”) and (“success” or “evaluation”) and (“public” or “administration”) that resulted in 29 papers which were supposed to give us an overview on the most common IS evaluation approaches used in public service. In a first review round, we screened the papers according to their abstracts and filtered seven matching contributions that could be considered as not too much specific by means of application of an evaluation approach to a specific country and administration domain. These seven papers were thoroughly reviewed according to their content and this resulted in a total of three studies that may act as reviews themselves, hence giving a good overview of the body of investigation.

The first meta study from 2021 [St21] features a review of 28 studies in which the type of evaluation model was determined. They found that in 55% of all cases, the DeLone and McLean IS Success (ISSM, [DM92]) was used; 4% (one occurrence in Gambia) used the Technology Acceptance Model (TAM) by Davis et al., [FRP89] 41% used combinations or refinements of ISSM and TAM and again 4% were represented by (one) new model from Turkey. A second review from 2023 [Vu23] found 72 papers with confirmatory results (ISSM 52%, TAM 1%, combined models 43% and new ones 4% along with their own setup that will be discussed a little later on). Nkanata [Nk13] also advocates the use of ISSM in public service. Summing up, most of the applications of IS evaluations in the public sector used the ISSM; we support this view and hence use the ISSM as model for further investigations and adaptions.

3.2 Application of Selective Aspects

The original edition of the ISSM [DM92] featured two, the latest updated model three success dimensions and all in all six success dimensions [DM03]. Its overall validity and reproducibility has been proved for many years. In this model, System, Information and Service Quality drive Intention to use and tightly connected, Use as well as User Satisfaction that ultimately contribute to Net Benefits. They are considered to act as dependent variables [DM92] and are driven themselves by success metrics according to the IS they are applied to. In the context of public administration, Nkanta investigated 34 Studies and found that most applications of ISSM in public service were not connected to all of the six dimensions as DeLone and McLean demanded, but would rather be restricted to Information and Service Quality as well as User Satisfaction constructs [Nk13, S. 299]; we therefore stick to the ISSM recommendations and keep on considering the entire set of success dimensions. The above-mentioned success metrics for the success dimensions have explicitly been described by Petter, DeLone and McLean ten years later as 43 independent variables or determinants of IS success that can be put down to four

categories: Task, User/People and Structure (which is divided into Project and an Organizational) [SWE13]. The categories are derived from the IS definition of Leavitt [LE65] and drive IS System Success on the right. Moreover, the categories directly match the model of the Information System [GRB04] and their structure of human, task and technology.

17 of the success metrics consistently relate to all the six success dimensions and therefore are considered to represent the connection clearest. The extent to which they contribute to the specific success dimensions is categorized into strong (90% of all 450+ cases) and moderate support (67-89%). [SWE13, S. 39]. We therefore limited ourselves to these strong supportive determinants in a first step (Explanations are from Petter et al.'s paper unless otherwise stated). If no direct or only moderate supporting determinants from the table on page 39 were noted, we retrieved all supported relationships from the extended tables A1-A5 on pages 54 to 61 in a second step and filtered them according to their strong impact on the overall IS Success according to Table 9. Results are shown in Table 2 on the following page. Due to space restrictions, exhaustive explanations and a derived causal ISSM model for public administration in Germany are given in [PM23].

In a last step, the resulting drivers were compared to the selective aspects in Table 1 along with the consideration of the generic explanations. Summing up, every success driver out of the literature could be backed up by one or more selective aspects of the considerations in Chapter 2.4. We therefore suggest using the ISSM as validated transporting model as well as the selective aspects to explain the input to as well as the output of IS Success (drivers) in the case of Public Administration in Germany.

3.3 Prioritization Approach

To form a prioritization approach, we operationalize the above collected selective aspects in order to evaluate their occurrence (cf. Table 3 on the following page). The aspects are abbreviated with single characters that are the variables of the calculation for the Indicator of Prioritization (Prio).

Success Dimension [SWE13]	Success Drivers [SWE13]	Explanation [SWE13]	Selective Aspects
System Quality	Self-efficacy	Belief of Capability to be able to perform tasks with an IS	Citizen User and Professional User
	Technology Experience	Capability to perform tasks with an IS	

Information Quality	IT Infrastructure	n/a	Low level electronification and high-level digitalization Infrastructural Software, Hardware and Application Systems
	Trust	n/a	
Service Quality	Ease of use [Al22]	the degree of which an individual believes that using a specific system would be free of effort [FRP89]	OZG level shift Low level electronification and high-level digitalization
	Utility [Al22]	the degree to which a user believes services were (…) beneficial [Al22, S. 10]	Importance or Impact
Intention to use	Extrinsic Motivation	Incentives or pressure by the organization to use the IS	Amount of annual cases
System Use	Organizational Competence	The knowledge possessed by the management of a firm about IS	Process participants
User Satisfaction	User expectations	n/a	Low level electronification and high-level digitalization
	Attitudes towards technology	user characteristics (…) toward technology (…) that can be influenced through setting proper expectations	
	Task compatibility	The consistency of the technology with the work processes or work styles	Citizen User and Professional User
Net Benefit	Management support	The willingness to allocate time, resources and encouragement for the use of an IS	Cost, Savings and Sustainability

Tab. 2. Application of selective aspects to the ISSM Success drivers

Considered Concept	Selective Aspects	Explanation	Proposed value
Input values			
Process Executive	Citizen User and Professional User (u)	If an IS is designed to serve the citizen user as well as the internal professional user, the impact and visibility of the process is much higher and hence the priority should rise	If only Professional User: multiply by 1. If Citizen Users affected: multiply by 2
	Amount of annual cases (e)	The more cases the process needs to cover, the higher the importance and automation potential of the process	Below 10: plus 0. Below 100: plus 1 etc. (e= int(lg(cases))).
	Process participants (p)	The more process participants, the more complex the process will be and hence the more potential for optimization and automation rises. This also covers processes that interact between state and federal level	Below 5: plus 0. Below 10: plus 1, below 15 plus 2, below 20 plus 3, above 20 plus 4
IS Success Objective	Low level electronification and high-level digitalization (d)	If the process is just set up to imitate the common analogue process, the effort and success are lower than the digitalized, customer-faced process	If only electronification: multiply by 1. If digitalization approach: multiply by 2
	Importance or impact (i)	This is the political adjusting screw that can be used to prioritize manually. It should be used in a conscious manner and only a balanced set of processes should be of high or critical prioritization	Normal: multiply by 1. High: multiply by 2. Critical: multiply by 3
	OZG level shift (o)	The delta between the initial OZG level of the process and its level after implementation	Add 0-4
IT Systems	Infrastructural Software, Hardware and Application Systems (t)	If infrastructural Soft- and Hardware as well as new Applications are needed, the project complexity rises, even more, if Hard- and Software for the citizen user is necessary.	Every functional entity: Add 1; if citizen users are involved: multiply by 2

Output values			
Prioritization drivers	Cost (c)	The projected (ex ante) or real cost (ex post) of the project implementation. Cost and Savings must both be compared from the same perspective and including all cost categories such as material, labor etc.	Amount in €
	Savings (s)	The projected (ex ante) or real savings (ex post) of the project implementation.	Amount in €
	Sustainability (y)	Does this project contribute to the "Once Only" or the "One for all" principle?	If yes, multiply savings by 2

Tab. 3. Proposed operationalization of process prioritization

The main goal of the prioritization is to form an indicator that can easily be put into an order to be compared to other processes. Hence, we argue to rise the indicator if input complexity rises as well as the ratio between savings and cost; both as addition put down to following formula:

$$Prio=Input+Output \quad (1)$$

$$Input = ((e + p) \cdot u) + (o \cdot i \cdot d) + (t \cdot u) \quad (2)$$

$$Output = \frac{s \cdot y}{c} \quad (3)$$

To initially test the plausibility of the prioritization approach, we performed two example calculations for typical administration processes in Munich and the Uckermark region. Due to space restrictions, they are set out in an accompanying document [PM23].

4 Conclusion and critical review

This contribution aimed to construct a prioritization approach that can be used to put specific public service digitalization projects in Germany into a meaningful order. To do so, we collected selective aspects of public service digitalization in Germany and performed a structured review for IS evaluation approaches from the domain of Business and Administrative Informatics with special consideration of their applicability to the set of aforementioned public service processes. We then operationalized the so found success drivers aligned to the success dimensions of the host success model and proposed a simple formula to calculate a prioritization score. We are clear that this model is designed especially for Germany, but the same approach can be used for other countries as well.

The main difference might be the application of different laws, resulting in the use of different selective approaches and drivers. The calculation of the score is our first attempt; we therefore welcome its review and challenge in practice.

Our next scientific approaches are the evaluation of the approach in real life along a process catalog and hence we are welcoming offers from public service. Furthermore, we will compare the success drivers that we claim to foster IS success to the success factors that Escobar et al. collected in their 2023 Study on Success drivers [EAV23]. These approaches could unfortunately not be included in this publication for reasons of space.

All in all, we rather gave preference to the relevance of the reviewed literature strongly related to public service instead of an exhaustive theoretical foundation [vo15]. Hence, we preferred the discussion of rather few specific contributions to a sensitive research with a high amount of relevant studies, but time-consuming selection [PR06] Moreover, due to still open license negotiations, it is still not possible to assess publications from Science Direct or Elsevier in various parts of Germany and so during this research, literature dating from 2019 on could not be retrieved from these publishers.

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