REVIEW AND APPLICATION OF A SCORING MODEL FOR PUBLIC ADMINISTRATION PROCESS PRIORITIZATION IN GERMANY

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Abstract: *We apply the Information Systems Success Model to the domain of public administration in Germany to formulate a substantiated alternative approach as well as a matching scoring model to overcome the prevailing political prioritization of public service processes. The proposed score is evaluated in four different case settings, three administrative levels with the help of three different methods. The scoring models can be used consistently throughout the body of investigation. We discuss the results of the evaluation in the context of usability and usefulness and describe commonalities and variances. Guidelines, potential adaptions and future research suggestions frame the paper.*

1. Introduction

Digitalization is one of the major worldwide technological trends in the 21st century (e.g. Harwardt, 2022). Also Germany as the economically leading country in the European Union (International Monetary Fund. Research Dept., 2023) is following this approach. The pace of this transformation, however, is significantly falling behind several other EU countries (European Commission, 2022). This is especially true in the domain of public administration (Funke, 2022). Reasons could be complex decision processes due a historically motivated well-balanced administrative structure (Parlamentarischer Rat, 1949), a lack of IT professionals (McKinsey & Company, 2023) and the German Angst of (technological) change, especially in the political level (nextpublic, 2023). Though, there are some central legislative initiatives in order to accelerate the digitalization in public administration in Germany, the most prominent being the "Onlinezugangsgesetz" (OZG, Act for the Improvement of Online Access to Public Services, Bundestag, 2017) and its subsequent legislative amendments (Bundesministrerium des Innern und für Heimat, 2023), originally supposed to be fully implemented by the end of 2022. All in all, the Federal Ministry of the Interior and Community (Bundesministerium des Inneren und für Heimat, BMI) as OZG process responsible counts 1780 administrative services in Germany that potentially can be digitized, both facing the citizen and featuring internal administrative processes (Bundesministerium des Innern und für Heimat, 2023). The OZG refers only to service processes that directly affect the citizen and hence, 575 "OZG Processes" were defined. They are distributed among the federal, the state and the municipal level in Germany. Every OZG Process is organized and implemented by one leading federal ministry and as for the rest of the (internal) processes, the "Einer für Alle" principle (EfA, One for all) is recommended, 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 in the different administrative levels. The original distinction of OZG process priorities was aligned exclusively to the citizen's demand of the services – demand by the citizens in real life, via the central service phone line and out of the European regulation and guideline "Single Digital Gateway" (Stocksmeier, Hunnius, 2018, p. 15), which meant that every service process was

considered to be as “digital-to-be” important as the others, thus lacking a common sense on proper prioritization, because back then and still today (and despite the review of the OZG that is ongoing at the moment in Germany), the multitude of OZG services are prioritized only by political will. In September 2023, the federal government in Germany proposed to prioritize fifteen so-called “Focus”-Services (Bundesregierung, 2023); every state was entitled to fully digitalize one OZG Process for direct re-use by the other states and players. Previously in 2022 and in the light of the then coming deadline, thirteen so-called “Booster” OZG processes were defined and prioritized but unfortunately not implemented in their entirety. In the domain of Business and Administrative Informatics, it is very common to consider 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 (Grob, Reepmeyer, Bensberg, 2004). Thus, we used the common IS Success Model (DeLone, McLean, 1992) to describe Success Drivers and hence an approach for prioritization in the domain of public service in Germany (Pidun, Müller, 2023), originally focused to the citizen-centered OZG processes. In the following, we will briefly explain this approach and a proposal for a formula to calculate a score quantifying the priority of the respective process in Chapter 2, explain it by four examples in Chapter 3 and discuss results, extensions and future research in Chapter 4.

2. Approach

2.1. Political, administrative and user background

As mentioned before, all prioritizations of public services were mainly driven by political will, hence we retain this approach in the proposed scoring model with an “political” operator of importance, ranging from 0 to 2 as highest importance (all operators are listed in details in Table 1 on the following pages). Moreover, the amount of cases drove the importance of processes in the past, hence we also address the amount of annual cases as additional operator in logarithmic scale. From the political perspective, there is also no distinction into a higher importance to implement real digitalization than to put a simplistic digitization of public service processes in place. According to Bogumil et al., there are three different levels of process execution (Jörg Bogumil u.a., 2022) in public service: First, the mere electronification of analog documents and processes in a digital form (e.g. the offer of a web form or a PDF), second, the digitalization of service structures and processes to implement a fully digital communication (e.g. the application for and decision of a service), and third, a transformation of authorities by adaption of staff and qualification structures as well as full institutional cultural change.[1]

Though, the goal of digitalization (in the context of the industry roughly comparable to an automated process without basic action of a person) is favorable in our view and hence of higher priority because it fits the “Once Only” approach, coming from another legal requirement in Germany, the “Registermodernisierungsgesetz” (RegMoG, Law introducing and using an identification number in public administration and amending other laws, Bundestag, 2021). The RegMoG demands to re-use datasets of citizens instead of keeping multiple copies for different purposes, which would be the case if every public service process would require to fill in the same personal data into its own PDF. Hence, we assume a certain sustainability if the process contributes to the “Once Only” or the “One for all” principle. Moreover, we prefer the full digitalization as favorable “automation” of processes, comparable to the process flow featuring very few contact points to administrative officers or their personal work (cf. Chapter 4). If the process still is mainly covered by personal work of administrative officers, we assume the level of simplistic electronification.

[1] But as the transformative change level cannot be addressed predominantly by an information systems approach as used here, it will not be subject to further consideration in this contribution.

If the service process is coming from the citizen-centered OZG process set, a more detailed "maturity level for OZG service processes" from 0 to 4 can be applied, but we propose to evaluate every service process according to its "customer" (not only citizen) centricity, thus also considering other users of the service, if applicable. The importance of the process rises with its shift of maturity levels, hence a process that shifts an analog process to full-service automated communication with the citizen (to level 3) is of higher priority than a process that features the provision of a web page with information (to level 1).These thoughts also point to the need to consider two different levels of technology acceptance in public service: The organizational and the individual level (see also Wimmer, Codagnone, Ma, 2007), representing the professional users in administration as well as the citizen users. Hence, we claim to consider to expand the set of affected users: the professional user in public administration on the one hand (aka key users, public employees or officers) whose day-to-day tasks are about to be automated (and who are traditionally the only user group in information systems' design) and the citizen user that occasionally uses information systems to interact with the public administration. In this context, the professional users in administration need appropriate application systems and infrastructural Hard- and Software (technical systems), the citizen user needs appropriate and accessible infrastructure, e.g. their own mobile devices with access to the publicly available application systems.

2.2. Information Systems Success Model and Operationalization

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 seven papers which were containing an overview on the most common IS evaluation approaches used in public service. Summing up, most of the applications of IS evaluations in the public sector use the Information Systems Success Model (DeLone, McLean, 2003); therefor we also suggest to use the ISSM as validated theory transporting model. Moreover, in this previous research (Pidun, Müller, 2023) we also showed that our assumed selective aspects for Public Administration in Germany actually are driving the input as well as the output of IS Success (drivers) via generic intermediate Success Drivers (Petter, DeLone, McLean, 2013, p. 6). We therefor propose the following causal model, the original ISSM being outlined in light grey, the selective aspects in black (Fig. 1):

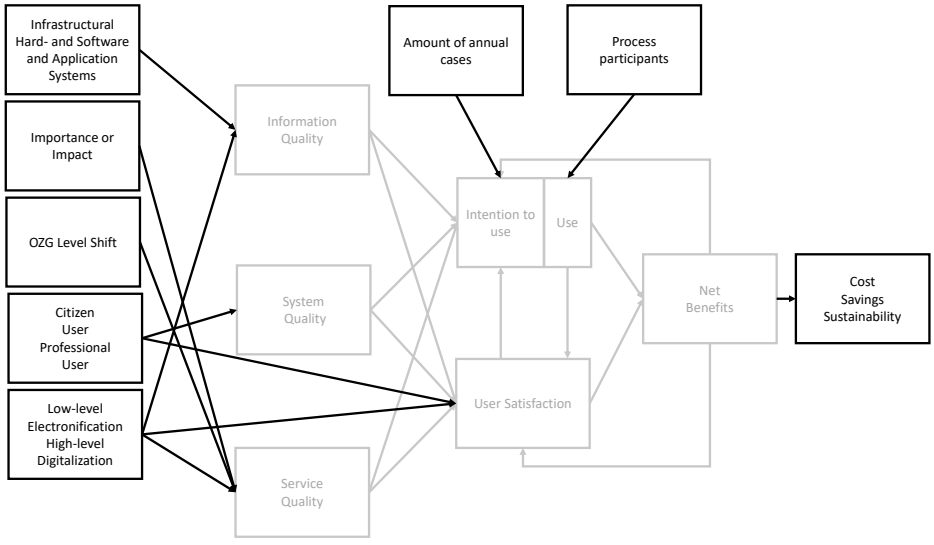

Fig. 1. Causal ISSM model for Public Administration in Germany

Moreover, we use the aforementioned selective aspects as operators to form a prioritization approach (Pidun, Müller, 2023, p. 8–10), combining the success dimension and drivers with the selective aspects.

IS Success Dimension (Petter, DeLone, McLean, 2013)	**IS Success Drivers** (Ibid., 2013)	**Explanation** (Ibid., 2013)	**Selective Aspects** in brackets: operator/formula sign
System Quality	Self-efficacy	Belief of Capability to be able to perform tasks with an IS	Citizen User as well as Professional User (u)
	Technology Experience	Capability to perform tasks with an IS	
Information Quality	IT Infrastructure	n/a	Low level electronification and high-level digitalization (d)
			Infrastructural Software, Hardware and Application Systems (t)
	Trust	n/a	
Service Quality	Ease of use (Al-Rahmi et al., 2022)	the degree of which an individual believes that using a specific system would be free of effort (Fred D. Davis, Richard P. Bagozzi, Paul R. Warshaw, 1989)	OZG Level shift (o)
			Low level electronification and high-level digitalization (d)
	Utility (Al-Rahmi et al., 2022)	the degree to which a user believes services were (…) beneficial (Ibid., 2022, p. 10)	Importance or Impact (i)
Intention to use	Extrinsic Motivation	Incentives or pressure by the organization to use the IS	Amount of annual cases (e)
System Use	Organizational Competence	The knowledge possessed by the management of a firm about IS	Process participants (p)
User Satisfaction	User expectations	n/a	Low level electronification and high-level digitalization (d)
	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 (u)
Net Benefit	Management support	The willingness to allocate time, resources and encouragement for the use of an IS	Cost (c), Savings (s) and Sustainability (y)

Table 1. Application of selective aspects to the ISSM Success drivers

The main goal of the prioritization approach 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 (that consists of the aforementioned operators – for further details please refer to Pidun, Müller, 2023):

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

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

$$Output = (s \cdot y)/c \quad (3)$$

3. Evaluation

3.1. Methodological Background

In a first step, we applied the Scoring model to one real and one potential case out of the administrative level of the municipalities in June 2023. One case referred to a rather urban area with many inhabitants and good infrastructure and the other case to a rather rural area with long ways to the central administration, both leading to meaningful results. As we only briefly mentioned the application and considered the concept as applicable in principle (Ibid., 2023), this contribution features the full process description as cases 1 and 2. Moreover, we projected the evaluation in practice in a next step, thus defining the frame for cases 3 and 4. We therefor adopted a data and method triangulation approach in order to generate diverse and individual results that can be considered as proof of concept and blueprint in both different administrative levels and applications or settings. Besides this simple application of the concept to two cases, we used the methods of Transdisciplinary Workshops and Expert Interviews.

A Transdisciplinary Workshop is defined as a workshop featuring both scientists as well as external experts that are practically applying the scientific results in their own setting of professional knowledge or discipline and according to their unique perspective to the scientific problem (Defila, Di Giulio, 2014, p. 71). If the external experts are either only object of investigation or audience, they are not part of a transdisciplinary workshop. The characterizing elements of a transdisciplinary workshop are: consent on the goals and the process of working together, the integration of individual contributions and obtained results into one common knowledge base and the diffusion of the results in an appropriate and usable way. Case 3 was compiled in a Transdisciplinary Workshop with 21 participants in November 2023 in Berlin, where practitioners from administration, business and science met for workshops in the context of eGovernment and Governance/ Administrative Informatics. The goal of the workshop was to evaluate the applicability and usability of the aforementioned scoring model. Some more hints on potential proof of concept/application were given in this workshop and will be discussed in Chapter 4 of this paper. The case points to a process on the state level of administration, thus expanding the data set to two administrative levels.

Finally, Expert Interviews use the method of a problem-centered interview to extract qualitative data from experts, whereas the definition of an expert ranges from rather vague to highly domain-specified descriptions. They demand a continuous reflection on the content and methodological approach to the body of investigation, the design and analysis of the questions and answers and the validation and modification of the results. Hence, the expert interview features an iterative way of exploring and interpreting insights (Jäger, Reinecke, 2009, p. 35). By performing a certain number of expert interviews, scientists may find common statements and consensual opinions of the interviewed community to some extent. In Case 4, we performed an expert interview with a leading responsible person for digitalization on the federal level, located at the Federal Ministry of the Interior and Community in Germany in December 2023. The case refers to a process that only addresses the federal level, thus embodying a service for all affected citizens.

3.2. Case 1: Dog license fee for the City of Munich

In this case, citizens are applying for a dog license via an online registration process on the city's web site. Using the usual internal process, the application regularly leads to a license notification that is being sent to the citizen in paper form. Hence, both citizen and professional users are affected, this u being set to 2. There are more than 40,000 dog owners in Munich (Wagner, 2022). About 2/3 of them used online registration in 2022, which results in about 26,000 online use cases. Hence, we should set e= int(lg(26,000))=4 for this huge amount. As relevant process participants, there is only the citizens of Munich and the municipality of Munich, being represented to one officer which is clearly less than 5. So, we set p=0. Evidently, d=2 has to be assumed because of a high-level digitalization implemented here due to the automation of the process input, coming only with a final check from the officer. The digitalization of dog fee processes is of a medium political importance, yielding i = 2. The OZG level will be shifted from level 1 to level 3. Previously, there was basic electronification with simple PDF documents. It will be level 3 but not level 4 (fully digital-both-way communication) since conventional postal service will still be required in exceptional cases like returning dog fee badges or communicating sensitive personal health data for registering assistance dogs. There is neither new hard- nor software required for the infrastructure, browsers supporting PDF are assumed being available. Only an app will be newly needed, both on the citizen and professional side. This gives a t=(0+0+1)×2 of 2. Hence, we obtain as input a value of (2×2×2)+(2×((4+0)+2)))=20.

As for the output side, cost is estimated to 1,000,000 €, and savings to 600,000 €. But due to the reusable contributions for input management and for electronic files ("E-Akte") (Ibid., 2022), sustainability is clearly given, yielding an effective doubling in savings. Hence, there is a usable output of (600,000×2)/1,000,000=1.2. The sum of input and output results in a score of 20+1.2≈21[2] for the dog license fee process in Munich.

3.3. Case 2: Car registration in the Uckermark district

In this case, we projected the potential digitalization of the registration process for cars in the rural Uckermark district, because in this largest region in Germany, citizens could better be supported by offering an online process in comparison to traveling to the central district administration in person. Both citizen and professional users are affected, hence u is set to 2. We estimated the number of annual car registrations in the Uckermark region to 8,000 based on 40,000 cars for the 120,000 inhabitants and an estimated change of ownership of a car every five years. So, an e=int(lg(8,000))=3 should be chosen. There are many participants on all levels of administration in the process of car registration, from the processing district officers, payment and production stakeholders to the license holder registration at the Federal Motor Transport Authority that holds a central database for severe traffic violations. We estimate this number to be 10 to 14, yielding the parameter p=2. The management of cars is considered critical in the political context of prioritization, so, the impact variable i is 3. In this case, we project a high-level digitalization with full process automation, hence d=2. The OZG level will be shifted from level 1 to level 3 because physical output is necessary and cannot be avoided. This gives o=2. We need new hardware, software and apps on the citizen and the professional side. Hence, t=(1+1+1)×=6. As input, we obtain (2×3×2) +(2×((3+2)+6)))=34.[3].

[2] Note that data on Cost and Savings is very difficult to obtain and, thus, only estimated. Due to this fact, it might be a good idea to round the scores to at least integer values or to multiples of ten (20 instead of 21.2) in order not to pretend a level of accuracy that is not achievable by this simplistic approach.

[3] Erratum: In the original publication (Pidun, Müller, 2023), this example contains a miscalculation of the input score with 58 due to a reference error in the spreadsheet calculation. As a consequence, the score was wrong, too with 59 instead of 35 points. Anyway, the qualitative statement that the car registration process in the Uckermark should be of higher priority than the dog license fee process in Munich still holds.

The output in this case is estimated with costs of 2,000,000 € due to necessary hard- and software investment, the savings could reach 1,000,000 €. Based on the fact that an electronic ID card is obligatory for this process on the citizen side, sustainability is clearly given. Hence, we obtain an output of (1,000,000×2)/2,000,000=1. Finally, the score as the sum of input and output is 34+1=35 for the Uckermark car registration.

3.4. Case 3: Issuing "Authorizations to examine Minors" in North Rhine-Westphalia

In Germany, the "Jugendarbeitsschutzgesetz" (Youth Labor Protection Law) requires that a minor has to be explicitly examined by a doctor to state his/her fitness to work, the cost for the examination being borne by the minor's state of residence. This Authorization to examine Minors ("Untersuchungsberechtigungsschein", UBS) states that the entitled person has the right to visit a doctor in this context and this doctor may bill the federal state for his service. Prior to the digitalization of the process, the minor applied in person for an UBS at his/her local municipality. After authentication with his/her ID document, the license was granted in paper form. The doctor filled in the license and billed the state. This process has been digitalized by the state of North Rhine-Westphalia as one of the OZG Focus Processes (every state had to implement one process for the rest of Germany). The amount of annual cases was well described with 30,000, thus e=int(lg(30,000))=4. The process stakeholders were the Federal Administration (the process being presented at the federal administration processes portal), the affected state and municipality as well as the applying person. After a review of the process documentation in the workshop, two additional participants were identified (>5): the doctor and the health billing company, thus resulting in p=1. The consideration of both professional as well as citizen users lead to u=2. As the basic design of the OZG Focus processes had to be fully automated, we set d=2. The OZG was lifted from level 0 to 4 (o=4) because as a result, only a unique UBS-ID is generated in a newly implemented database and no physical information carriers are needed. The Application issues an UBS-ID to the minor, the doctor checks the UBS-ID in the database, approves the examination of the connected person via updating the UBS-ID Status and bills the state of North Rhine-Westphalia via the billing company – finally the state checks the approval of the UBS-ID and releases the payment. The UBS-ID is set to be no longer valid. No new hardware is needed, only a new database and web application for the user side was generated, moreover a central identification component was used (t=3). The priority was assumed to be medium as previously generated technical components could be used and the implementation was rather easy (i=2). Summing up, the input score is (4×2×2) +(2×((4+1)+3)))=32.

The process implementation results in estimated savings of about 780,000 € with an invest of about 300,000 €. Thus, the Output score ((750,000×2)/300,000) is 5.

Finally, the score as the sum of input and output is 32+5=37 for the process. Though it was implemented for only one state, it could and should be used by all states as federal process due to the EfA requirement.

3.5. Case 4: Central federal "Application for an admission to an integration course"

Under certain circumstances, immigrants to and foreigners in Germany are entitled to attend an integration course that features language lessons as well as knowledge about culture and the political system. The Application has to be posed at the Federal Office for Migration and Refugees ("Bundesamt für Migration und Flüchtlinge", BAMF). Up to now, the application was available as paper-based or PDF Document at the BAMF offices and web pages as well as other sources, and had to be handed in/send to the local BAMF office according to the immigrant's state of residence in Germany. Hundreds of thousands of applications are reaching the BAMF every year, thus setting e=5 (<1M). During the revision of this process, the application was centralized into the federal administration portal that is hosted by the Federal Ministry of the Interior and Community. Avoiding a PDF form, the user keys in all relevant data of the application into one single web form directly, thus setting t=1 and o=1 as the Level shifts from 1 to 2 (featuring a digital application). After

submission, this dataset is sent to a central BAMF entry point where the application is reviewed and queued in to the regular, but subsequent internal process of admission and scheduling (which is not part of the process of application in this case), thus restricting p to 1 because only the BAMF is process participant as it was before and d=1 because the process input is processed manually, not automatically. y is set to 1 as the submitted data is not being used elsewhere. u is 2 because both professional and citizen users are affected of the process. i remains 1 as the process was not of high political priority. All in all, Input scores (1×1×1) +((2×((5+1)+1)))=14.

The relation of cost and savings of the process are not exactly quantifiable (technical cost of implementation was roughly in the five figure range), but they also of minor importance because the first and foremost focus of the process is the citizen user; efficiency gains are mostly on the side of the applicant and irrelevant to the subsequent administration process that basically stays the same. This process is unique and not re-usable, thus not promoting sustainability. Hence, there is no more output score to add to the final score of this entirely federal process, therefor it is set to 14.

4. Results, Discussion and Outlook

In the first place, we can conclude that the scoring model is consistently applicable in various applications and within the entire range of public administration levels in Germany: federal, state and municipal, thus demonstrating the usability of the approach to some extent. Experts and workshop participants stated their satisfaction with the proposed model in principle and discussed adaptions as well as potential applications, thus considering this tool as valuable and with a certain intention to use. It expands the knowledge on public service process digitalization, its drivers and emphases away from the political priority, which was the main leading indicator, and the OZG maturity level, which was the main lagging indicator of digitalization success in the past – into a multitude of aspects that describe different supportive views of prioritization, both from the input as well as from the output side. Though, the application in the three levels during the different evaluative approaches reveal a certain distinction between necessary and more or less optional viewpoints.

On the federal level, the output side of the scoring model which is measured in money is very hard to catch because the savings are not related to some benefit of the process owner or professional user compared to the cost of implementation, but rather to the citizen user due to its individual gain of efficiency by using the digital process. Hence, the output side in this level or in this case could be alternatively explained exclusively with the presence of process sustainability[4]. In general, the definitions of cost and savings were subject to discussion during transdisciplinary workshop and expert interview. Therefor we should specify “cost” as cost of implementation of the digital process and “savings” as cost that disappear permanently due to the implementation (because the focus of the prioritization is the (potential) implementation of processes, not daily business efficiency). Cost and savings should therefor not refer to the operation cost of the processes which can be explored better e.g. by comparing results of activity-based costing pre and post digitalization.

Originally, the scope of the score were OZG processes facing the customer, hence we added the OZG level shift as desirable and selective aspect. During the transdisciplinary workshop, the question was raised whether internal processes that not mainly face the customer can be assessed as well. We agree and propose to use the OZG level shift as well, but adapted to the context of back-end-digitalization where applicable – e.g. does the digital process feature a shift from paperwork to digital document transfer (Shift from 0 to 1) or from separated digital applications by the citizen user to automated processing between authorities (from 1 to 2). Alternatively, we recommend to use the high- or low-level-digitalization operator alone.

[4] We must mention that if such variations (as well as e.g. rounding conventions or estimations) are applied to the scoring model in the individual prioritization project, all processes in comparison have to use the same algorithm in order to be comparable and hence, to be sortable. Please document changes, adaptions and variations accordingly.

Discussions on the definition of the amount of needed Hard- and Software (hence technical systems) were also part of the evaluative process. The question about the borders of a technical system, or to be more precise "functional entities" can be answered by the taking the technical systems and infrastructure a citizen user needs to appropriately access public service application systems as an example. Considering the private mobile phone as one, but integrated device featuring infrastructural hardware and software, a separate app for the service in question would count as one more functional entity, the same would be true for a necessary external ID card reader. As professional information scientists, we explicitly refer to the advantages of integrated information systems on the back-end side in this context, e.g. by using workflow management systems that feature the digitalization of multiple service processes combined in one software suite, thus acting as one engine or functional entity for multiple software applications, just as one ERP System compared to many specialist applications.

In the ongoing evaluation of the model, the distinction of affected users was also challenged in favor of adding some more user groups. Examples were different generations of users ("Millennials" compared to "Boomers" because they were assumed to be more digital-centric) and companies as users of public services compared to persons (citizens) because of their different demand and scope. We respectfully reject this artificial distinction because these unquestionably existing different user groups still have the same basic demand – to get the service done. In this view, companies act just the same as "real life" citizen users on the front end side of the applications, whereas the professional users on the other hand are on the back end side setting up and administering the application.

As there were some valuable suggestions to further research out of the evaluation meetings as well as the discussion and development of the scoring model, we consider to apply the model in some given practical settings in the federal state of Brandenburg and Thuringia in the context of case studies, thus actually prioritizing a set of processes in one administrative level. Moreover, a comparative study of publicly available EfA-Processes (central service processes that can be used by other states or municipalities, cf. Chapter 1) vs. actually given processes and implementations in the various states could offer additional insights on applicability of success drivers and operators in different settings. We also experienced a certain demand for a software application to calculate the score. All in all, we again invite practitioners and scientists to evaluate and challenge the scoring model in order to refine and further develop it together, especially to use it in other countries.

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