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Imparting Electronic Government Competences

Requirements, Concepts, and Tools

Nadine Ogonek

Münster 2019

Inauguraldissertation zur Erlangung des akademischen Grades eines Doktors der Wirtschaftswissenschaften durch die Wirtschaftswissenschaftliche Fakultät der Westfälischen Wilhelms-Universität Münster

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Foreword

The ever more increasing pace of technological advances has left its traces on the way businesses are operating today with new business models emerging that had been unimaginable just years ago. It is also fundamentally transforming the way human beings interact with each other, even beyond the borders of time and place, thus continuously changing the society as a whole. This phenomenon called digitalisation is what individuals, businesses and governments alike increasingly try to exploit, harvesting the ascribed efficiency and effectiveness gains.

Despite these advantages, the use of ICTs by governmental institutions – commonly denoted as *e-government* – is not a self-fulfilling prophecy, as can be seen by the high number of failed e-government initiatives. Besides factors like ongoing low adoption rates or implementation issues, a major hindering factor is the lack of appropriate competences within the public sector workforce. While the accrued body of knowledge on e-government in general is large, the topic of e-government competences received limited attention. Only few studies exist that exhibit a detailed analysis of needed e-government competences.

With her thesis, Nadine Ogonek addresses this particular gap in e-government research and provides a holistic overview on the composition of necessary e-government competences. She also identifies relevant roles in public administrations that need to be equipped with these competences. Based on the Design Science Research Methodology, this thesis shows how an innovative blended learning approach, a simulation game, that meets the demands of public servants on a targeted competence delivery and offers an up-to-date solution in terms of digitally supported learning can improve the overall competence delivery.

The chosen approach in this thesis highlights the importance of interdisciplinary research and yields results that are valuable for both academics and practitioners.

Münster, December 2019 Prof. Dr. Dr. h.c. Dr. h.c. Jörg Becker

Acknowledgements

For data protection reasons, the acknowledgements that appeared in the printed version of the dissertation have been removed in this file.

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List of Abbreviations

ANZSOG	Australia and New Zealand School of Government
CIO	Chief Information Officer
DSR	Design Science Research
DSRM	Design Science Research Methodology
e-CF	European Electronic Competence Framework
EC	European Commission
EGRL	Electronic Government Reference Library
eID	Electronic Identification
ELT	Experiential Learning Theory
EQF	European Qualifications Framework for Lifelong Learning
EU	European Union
HR	Human Resource
ICT	Information and Communication Technology
IS	Information Systems
IT	Information Technology
LDA	Latent Dirichlet Allocation
LSA	Latent Semantic Analysis
NPR	National Performance Review
O*NET	Occupational Information Network
OECD	Organisation for Economic Co-Operation and Development
PLS	Partial Least Squares
SEM	Structural Equation Modelling
SFIA	Skill Framework for the Information Age
TAM	Technology Acceptance Model
U.S.	United States
UN	United Nations
UTAUT	Theory of Acceptance and Use of Technology

Part A

"Everything is going to be fine in the end. If it's not fine, it's not the end."

Oscar Wilde

1 Exposition

1.1 E-Government Success as Self-Fulfilling Prophecy?

> "[P]olicy makers face a race between technology and education, and the winners will be those who encourage skill upgrading so that all can benefit from digital opportunities" World Bank (2016, p. 23)

This race is triggered by the ever more increasing pace of technological advances that transform businesses and societies worldwide. Summarised under the term *digitalisation*, it denotes "the manifold sociotechnical phenomena and processes of adopting and using these technologies in broader individual, organizational, and societal contexts" (Legner et al., 2017, p. 301). Individuals, businesses and governments alike increasingly make use of those new technologies. Especially governments because of their traditional aspiration to excel in "what government can properly and successfully do, and [...] how it can do these proper things with the utmost possible efficiency and at the least possible cost either of money or of energy" (Wilson, 1887, p. 197) have started their endeavour into the digital world. Their commitment to efficiency and effectiveness as well as a vision of an innovative *virtual state* (Fountain, 2001) has turned governmental institutions at all levels into adopters of Information and Communication Technology (ICT). However, it is still the private sector that is seen more progressive and a forerunner with regard to the exploitation of technological advancements (Sethibe et al., 2007; Halvorsen et al., 2005). The fact that the public sector repeatedly adopted Information Technology (IT) solutions that previously had been developed in the private sector (Dufner et al., 2002; Bozeman and Bretschneider, 1986; Cordella and Iannacci, 2010) adds to this image.

The use of ICT by any kind of governmental institution to enhance public services, democratic processes and public policies is referred to as the concept of *electronic government (e-government)* (European Commission, 2006). If comprehensively applied,

ICTs are ascribed manifold benefits (Sabbagh et al., 2012). They are also particularly apt to help reducing complexity where increasing governmental requirements and public expectations due to an enforced service delivery beyond national borders have particularly struck public administrations as government's executive authority and 'face' to the outside world.

E-government in this regard is oftentimes seen as a panacea to all existing governmental challenges, since it is equated with enormous efficiency and effectiveness gains (e.g. Deng, 2008; Córdoba-Pachón, 2015). Therefore, the extensive implementation and use of this concept is highly promoted by policy makers such as the European Commission (EC) or the United Nations (UN) (European Commission, 2015; United Nations, 2014) and even partly enforced by law. National regulations such as the act to promote electronic government in Germany (Bundestag, 2013), European initiatives like the e-government action plan 2016–2020 to facilitate cross-border e-government services within the European Union (EU) member states (European Commission, 2016c) or global e-government benchmarking studies such as the e-government survey to assess the global e-government development within the UN member states (e.g. United Nations, 2018) are some of the major political efforts to be named in this context.

Yet, to fully make use of the potentials technical innovations in the domain of e-government are said to bring, and to actually transform the government, it takes more than just the mere technical transition from offline to online processes. It has been widely acknowledged that the introduction of ICT also implies far-reaching organisational adjustments to become successful (Gascó, 2003; Robey et al., 2013), with education and training being one of the decisive pillars for their success. According to Nordhaug (1993), who presents survey findings conducted by the Norwegian Central Bureau of Statistics on participation in adult education and personnel training, an array of benefits is associated with training. Increased interest in the subjects of the course, self-actualisation and an increased desire to participate in training are the three most often mentioned benefits in this regard.

However, despite this realisation, many e-government projects do not live up to their expectations and have to be considered failed investments in the end (e.g. Dada, 2006; Heeks, 2003; Puron-Cid, 2013). Among the hindering factors of successful e-government are ongoing low adoption rates (e.g. Akkaya et al., 2013; Hofmann et al., 2012) or issues regarding the implementation of e-government (Rose and

Grant, 2010). Another factor that is considered to be a major obstacle is the lack of the appropriate competences within the public sector workforce (Heeks, 2003; Fountain and Osorio-Urzua, 2001). This is obviously not only a problem that applies to the public sector, but that is a matter of concern in any organisational context (e.g. Michelacci, 2003; Leiponen, 2005). It is therefore pivotal to educate the organisation's employees who embody the organisation's core competences (Prahalad and Hamel, 1990).

1.2 Problem Statement and Research Objective

Despite the widely acknowledged importance of employee *competences* for efficient and effective e-government, there is a clear gap regarding the detailed scientific discourse on this topic. Research contributions exhibiting a differentiated examination of necessary employee competences in the domain of e-government (in the following labelled as *e-government competences*) on the one hand and governments' current demands and challenges in relation to equipping their employees accordingly on the other hand is rare. Although being postulated by policy makers around the globe, e-government study programmes and vocational training initiatives do not seem to cover the full array of competences that are needed by today's public workforce.

Both topics, competence development via e-government study programmes and competence updates for current public servants by means of vocational training have not yet been extensively considered in research. This is equally true for the way on how to best teach these competences. It is important to acknowledge that the omnipresence and widespread use of technologies of any kind is not an end to itself. It can create an added value, if it is implemented by professionals who have been trained for this use and thus, can act responsibly and competent in the sense of an efficient and effective e-government service delivery (Grönlund, 2002; Hunnius and Schuppan, 2013). Considering that public servants work in an environment, spanning across a variety of disciplines, a diverse set of professional competences as well as technical knowledge is indispensable.

> "[P]rojects need to develop and use 'hybrid' professionals, who understand both perspectives. We might even call them 'tribrids' because they combine three aspects: understanding the technology and the business of government and the role of information in government." Heeks (2003, p. 11)

Another factor that aggravates the current situation and underlines the need for continuous training and education is the elevated age of today's public workforce, which is about to experience a major generation change, because many public servants are close to their retirement (Lewis and Cho, 2010; Liu and Fidel, 2007). Therefore, tools have to be developed that on the one hand limit the danger of competence loss, and on the other hand support the continuous imparting of e-government competences adjusted to the various public sector needs.

In their data review covering 291 study programmes on e-government in 60 countries, Sarantis et al. (2019) find that there is a huge variety concerning the contents that are taught, which demonstrates that there is not *the one* understanding of what e-government is and involves. They identify programmes with a very narrow focus as well as multidisciplinary programmes that span various fields. Besides this variety in focus and a postulate for continuously updating the programmes in line with technological advances, they constitute the lack of a proper definition of e-government-related roles and competences in order to be able to cover training needs. Moreover, in their study they provide a global perspective on the competence delivery, which – according to their findings – is still mainly instructed in a traditional classroom format (91 of 119 programmes). Only a minority of the total sample adopts e-learning or blended-method approaches.

In order to address this gap, the overall objective of this thesis is *to design a tool for imparting electronic government competences*.

This imparting of competences is geared towards future public servants in the form of higher education programmes as well as towards today's public servants with vocational training efforts. Thus, it offers contributions to theory by advancing the body of knowledge in the e-government domain, providing a holistic overview of the competences needed. It equally contributes to practice by designing instruments that support the competence identification and documentation as well as a simulation game that enables a more targeted and realistic imparting of competences.

Higher education institutions as well as any kind of institutional education providers can make use of these tools for addressing competence needs. The decision on whether to 'make' or 'buy', i.e. to provide training internally or outsource these efforts depends on each single institution, its strategic orientation and existing resource base (Nordhaug, 1993). Since this objective entails in-depth knowledge of

a variety of different aspects, several individual research steps are needed for its accomplishment.

First of all, the required e-government competences need to be identified and classified accordingly. This is done to provide a full picture of all competences needed, since most of the research contributions in the field have focused on a sub-set of these competences by limiting their research to prominent roles in governmental institutions, such as the Chief Information Officer (CIO) (e.g. Iwasaki, 2014; Greger et al., 2014). In order to create a holistic overview of the competences, three literature reviews are conducted, two qualitative and one quantitative literature review.

Based on this competence inventory, in a second step the roles in public administrations need to be identified and described, as different roles need different competences depending on their position and corresponding tasks. For this reason, expert workshops with representatives from public administration as well as academia are conducted.

In a third step, in order to find out whether the current competence delivery in the form of higher education study programmes is sufficient, a content analysis of the e-government study programmes in Australia is conducted to compare these with the German e-government programmes. Hunnius et al. (2015) investigated 91 German higher education study programmes in the area of e-government. A comparison between the two countries is used to derive implications in terms of competence delivery/teaching approaches from a country that repeatedly has been voted world's second in terms of e-government development (United Nations, 2014; United Nations, 2016; United Nations, 2018).

Moreover, current competence and training needs in governmental institutions are investigated by means of two qualitative interview studies in German public administrations and a quantitative survey on European level amongst public sector professionals. One of the qualitative studies compares the training provision regarding employee needs in the digital age between the private and the public sector, because of the private sector's reputation of being a first mover. The other qualitative study investigates the training needs of public servants in a digital transformation phase and their provision in public administrations. This survey sheds light on the competence needs for the public sector on a European level.

In a final step, all the previously gathered insights on competences and their delivery are used to design a simulation game. The game is implemented and evaluated in the context of a Master's programme with focus on e-government. An adaptation of this game for the use in public administrations makes it applicable in daily public sector life.

> "As a pracademic field, public administration is based on the integration of academic concepts with its practical applications, as its boundary and scope are increasingly expanded in an ever-complex world." McQuiston and Manoharan (2017, p. 174)

In line with McQuiston and Manoharan (2017), it is therefore important to not only consider this topic from a theoretical perspective, but also integrate the requirements mandated in practice.

Given the complexity of the topic and the overall objective of designing a tool for imparting e-government competences to close the gap of fragmented and single-sided e-government competence consideration, different qualitative and quantitative research methods need to be applied in order to not only explain the phenomenon at hand, but to design actionable solutions. For this reason, the Design Science Research Methodology (DSRM) serves as methodological framework. Design science is particularly useful, since it "creates and evaluates IT [Information Technology] artifacts intended to solve identified organizational problems" (Hevner et al., 2004, p. 77). In accordance with the design science cycle, as proposed by Hevner (2007), multiple iterations within this cycle do not only constitute a natural element in Design Science Research (DSR), but are also crucial to incorporate latest findings that add to its relevance for practice.

In addition to extending theoretical insights into the topic and thereby advancing the e-government domain, this thesis offers a holistic overview on the needed competences and provides a simulation game as tool for practically imparting those competences. In doing so, it can benefit all involved stakeholders: on the one hand, the public sector receives tools that help to identify, document and safeguard necessary e-government competences. On the other hand, institutional education providers can use the simulation game as a tool to enrich their current training offer by implementing a game-based approach.

In general, e-government is largely bound to national characteristics, i.e. culture, political system and bureaucratic regulations shaping its implementation (Akkaya

et al., 2011; Ali, 2009). Although the majority of the presented results reflects the German perspective, accounting for the peculiarities of its public sector, the designed tools can be used in any governmental context regardless of the country-specific instantiations made in this thesis. All elements need to be adapted to the specific context involving the necessary stakeholders and respective constraints. Nevertheless, the presented results can serve as blueprint, offering workable starting points for an individual context-specific development of the tools and concepts.

1.3 Thesis Structure

This cumulative thesis is divided into two parts. The first part, *part A*, provides a synthesis of the published research contributions, which are listed in the second part, *part B* (see Figure 1.1).

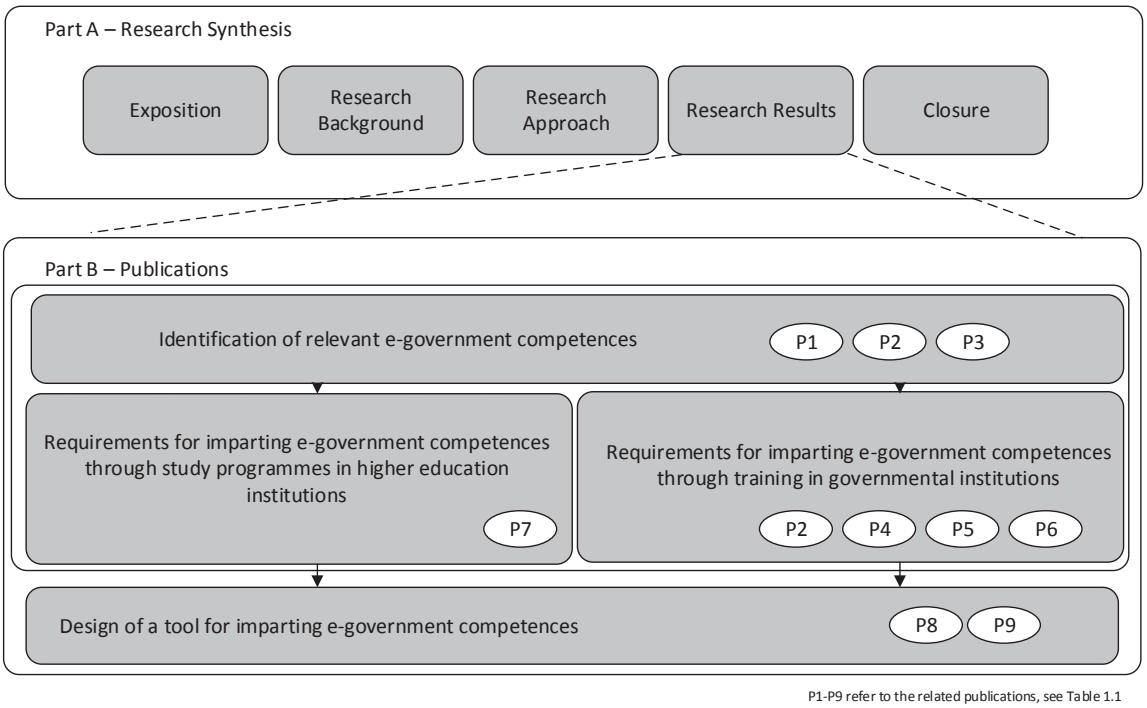


Figure 1.1: Thesis Structure

After having outlined the motivation for this research endeavour, stating its relevance as well as a research gap in this chapter, the following Chapter 2 contains an overview of the important concepts and state of the art in the e-government domain

with regard to the thesis topic of *imparting electronic government competences*. Chapter 3 presents the research approach of this thesis. The overall research paradigm *Design Science Research (DSR)* as well as the herein applied qualitative and quantitative research methods are introduced in this chapter and matched to the nine publications in part B. The analyses and results are presented and discussed in Chapter 4, which is structured along the above-sketched research steps. Within the last chapter of this thesis, Chapter 5, a summary of the major outcomes is provided, pointing to relevant contributions for theory and practice. Moreover, future research paths are illustrated that should stimulate further analysis on the topic and which could not be answered within the scope of this thesis.

Part B comprises a total set of 9 publications, which form the basis for part A. Six of the publications are conference proceedings and three of them are journal publications. Eight of those publications are peer-reviewed, whereas one publication is currently under review.

The sequence of publications corresponds to their contribution to achieving the research objective. This does not necessarily reflect their chronological order. For consistency reasons, the wording and spelling in the publications have been formatted and harmonised. This also includes renumbering the sections, adjusting the layout of figures and tables, and introducing a consistent citation style. Furthermore, minor spelling mistakes have been corrected. These changes, however, have not led to any changes in the publications' content.

Most of my publications have emerged in a research team, which is why I refer to 'we' whenever this is the case. In contrast, if 'I' appears, it corresponds to single author publications and mostly to results of the research synthesis in this thesis.

Table 1.1: List of Publications in Part B

PID	Publication	Outlet
P1	N. Ogonek (2017). "The Tale of e-Government: A Review of the Stories that Have Been Told So Far and What is Yet to Come". In: *Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS-50)*. Waikoloa: IEEE, pp. 2468–2477	*CNF*
P2	N. Ogonek, M. Räckers, and J. Becker (2019c). "How to Master the "E": Tools for Competence Identification, Provision and Preservation in a Digitalized Public Sector". In: *Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2019)*. Melbourne, pp. 56–64	*CNF*
P3	B. Distel, N. Ogonek, and J. Becker (2019). "E-Government Competences revisited – A Literature Review on necessary Competences in a Digitalized Public Sector". In: *Proceedings of the 14th International Conference on Wirtschaftsinformatik*. Siegen, pp. 286–300	*CNF*
P4	N. Ogonek, E. Gorbacheva, M. Räckers, J. Becker, R. Krimmer, B. Broucker, and J. Crompvoets (2016). "Towards Efficient EGovernment: Identifying Important Competencies for EGovernment in European Public Administrations". In: *Electronic Government: Proceedings of the 15th IFIP WG 8.5 International Conference and 8th International Conference on eParticipation (Dual EGOV 2016 and ePart 2016)*. Guimarães, pp. 155–162	*CNF*
P5	N. Ogonek and S. Hofmann (2018). "Governments' Need for Digitization Skills – Understanding and Shaping Vocational Training in the Public Sector". In: *International Journal of Public Administration in the Digital Age* 5.4, pp. 61–75	*JNL*
P6	S. Hofmann and N. Ogonek (2018). "Different but still the same? How public and private sector organisations deal with new digitalisation competences". In: *Electronic Journal of e-Government* 16.2, pp. 127–135	*JNL*
P7	N. Ogonek and J. Becker (2018). "Can we Learn from Down Under How to Rise Up in E-Government? A Comparative Analysis of the Public Sector Competences in the German and Australian Higher Education Systems". In: *Proceedings of the 51st Hawaii International Conference on System Sciences (HICSS-51)*. Waikoloa: IEEE, pp. 2256–2265	*CNF*
P8	N. Ogonek, B. Distel, and J. Becker (2019a). "Let's Play … eGovernment! A Simulation Game for Competence Development among Public Administration Students". In: *Proceedings of the 52nd Hawaii International Conference on System Sciences (HICSS-52)*. Wailea: IEEE, pp. 3087–3096	*CNF*
P9	N. Ogonek, B. Distel, and J. Becker (2019b). "Playing is knowing! Using a simulation game to impart competences to public servants". In: *MIS Quarterly Executive (unpublished)*	*JNL*
	CNF denotes a conference paper; JNL refers to a journal article	

2 Research Background

2.1 Electronic Government

2.1.1 Development of Electronic Government

The wide-ranging use and adoption of ICT in the public sector started in the early 1990s as a vehicle for becoming more efficient and effective in the daily public sector work (Anthopoulos and Reddick, 2015). A prominent example for this is the redesign of the American public sector. In an attempt to reduce costs and improve services for American residents in the last decade of the 1900s, the federal government under President Clinton was supposed to experience a major makeover with the help of IT (National Performance Review, 1997). It was back then that the Internet use started to spread quickly everywhere and everything that could be transformed into "electronic" experienced a hype. This can be also seen as the cradle of the term *electronic government*, first to be coined in the National Performance Review (NPR) that was established to lead this transformation. Besides electronic government, the term electronic commerce (e-commerce) turned up, too (Salem, 2003; Layne and Lee, 2001). At that time electronic commerce and electronic government both were deemed to be primarily used for efficiency gains within the public sector, according to the NPR (National Performance Review, 1997). E-commerce only later became a concept exclusively used by the private sector.

Since its first appearance, e-government has literally travelled the world and has become more important ever since. According to the latest international e-government survey issued by the United Nations (2018), some form of e-government can be found in 193 countries today. The two-yearly survey assesses the degree of ICT implementation on a country level to judge on its ability "to transform and reform

the public sector by enhancing efficiency, effectiveness, transparency, accountability, access to public services and citizen participation" (Aquaro, 2018, p. 4). This statement reflects very well that e-government is not seen as purely technical support anymore, but has evolved into a strategic tool on political level to solve greater societal challenges.

Owing to this long and diverse journey and its evolution since then, the understanding of what e-government comprises and how it delineates from other concepts has changed a lot overtime. Its use today depends very much on the purpose and context, also stemming from the fact that e-government spans across different disciplines like politics, administrative sciences, management and law. Hence, it is not surprising that there is not *the one* definition of e-government, but a plethora of them. Also the term itself is subject to a lot of discussion, ranging from the *virtual state* (Fountain, 2001) to *digital government* (e.g. Gil-Garcia et al., 2017; Jussila et al., 2019) or more recently *smart government*, implying the rich use of data and taking into account newly emerging 'intelligent' technologies (e.g. Schedler et al., 2019; Kankanhalli et al., 2019). Regardless of the term, there is a set of commonalities many of the definitions share. The majority of them exhibit the notion of the increased use of ICTs by governmental institutions. Likewise, there is always an articulated purpose for its use that generally centres in the improvement of the public sector with regard to its various stakeholders internally and/or externally, i.e. the enhancement of inner-governmental processes and structures as well as the service delivery for citizens and businesses (Moon, 2002; Yildiz, 2007). For the purpose of this thesis, I refer to a rather broad definition of e-government by the European Commission as an independent and internationally reputable organisation that does not only include the necessary ICT support and the possible enhancements to be achieved with e-government, but also highlights the need for organisational changes and new skills.

> "eGovernment means the use of information and communication technologies (ICT) in public administrations combined with ***organisational changes*** and ***new skills***. The objective is to improve public services, democratic processes and public policies." European Commission (2006), emphasis added

This definition puts emphasis on the necessity of organisational changes from within and outside governmental institutions as well as changed competence requirements for e-government to be successfully implemented. In doing so, the definition covers all possible relationships governmental institutions can have, between govern-

mental institutions amongst each other (internal perspective), as well as between governmental institutions and citizens or businesses (external perspective).

Although there is a certain degree of e-government implementation to be found almost everywhere in the world, its maturity can vary significantly, not only from country to country, but also from organisation to organisation. Different so-called maturity models have been set up that try to grasp the different e-government development stages. One of the earliest and an often cited maturity model was developed by Layne and Lee (2001). The authors introduce four different stages of e-government development within an organisation, namely *cataloguing*, *transaction*, *vertical integration*, and *horizontal integration*.

Cataloguing represents the simplest form of e-government where governmental institutions provide information on static websites. This involves a purely one-way communication from the governmental body to the citizen or business. The next stage is called *transaction* and as the term suggests, this stage is already more advanced, since full transactional processes between citizens or businesses and governmental institutions can be done. Renewing a passport and paying for it online is one example of such a transaction and thus, involves a two-way communication between the involved parties.

Whereas the first two steps mainly entail the pure digitisation and automation of processes by providing an online presence, the next two steps *vertical* and *horizontal integration* demand governmental institutions to redesign and realign their processes and therefore require organisational changes. *Vertical integration* refers to the communication and consolidation of similar services or similar agencies across different governmental layers. Federal, state and municipal level therefore should have interoperable systems that can exchange information regarding one service/agency to reduce redundancies and inconsistencies. *Horizontal integration* as the most advanced stage of e-government, also called the veritable 'one-stop-shop' for the citizen or business includes the connection of different functional levels on the same governmental layer. Most citizens or businesses will not only need one service but several ones at a time, therefore it is a "system integration across different functions in that a transaction in one agency can lead to automatic checks against data in other functional agencies" (Layne and Lee, 2001, p. 133).

As there is a higher disparity between different functional elements than between different governmental layers, vertical integration will be achieved first (Layne and

Lee, 2001). Each stage does not only add to the technological complexity, because of the use of new systems, but especially to the organisational complexity, due to the increased need for reengineering. Given that the majority of governmental institutions is not in their infancy stage any more, these institutions find themselves in a highly organisationally complex redefinition process that they need to master.

E-government is offered by different governmental institutions across different federal levels, such as, for example, the federal government, state governments and on municipal level by public administrations. In scientific literature, the type of examined institution is not always unambiguously defined.

The majority of empirical data in this thesis was gathered in public administrations at local (municipal) level. Therefore, I intentionally use the term 'public administration' in the conducted studies when referring to the empirically collected data. If a broader context is addressed, i.e. not limited to public administrations, the term 'governmental institutions' is used instead.

2.1.2 Electronic Government Challenges

Despite the high expectations, the gradual worldwide implementation of e-government raised, there are still a number of challenges, that prevent it from tapping its full potential. Those challenges are of very diverse nature, exhibiting both externally-motivated and internally-motivated hurdles, governmental institutions are confronted with. Although this thesis focuses on the internal perspective, all different kinds of existing challenges will be shortly presented here in order to provide a complete picture. They can be very broadly categorised into four different groups: political, social, technological and organisational challenges.

Political challenges concern issues related to the political support that is needed to make e-government a success, also with regard to financial allowances (Gil-García and Pardo, 2005). "Luke warm support from high level decision-makers often leads to 'stop and go' e-Government progress and sustainability problems." (Schwester, 2009, p. 116) The political situation and its history can also be a significant challenge. If the country has suffered corruption and political instability, citizens are less willing to trust their government and also might not want to make use of e-government (Ndou, 2004).

The next dimension addresses *social* challenges, governmental institutions face when implementing e-government. El-Haddadeh et al. (2010) list a variety of factors that could represent a challenge in this dimension, such as training and education or awareness. Training and education have always been important to successfully deal with change scenarios. This is even more important given the fast pace of technological advancements in general and for governmental institutions in particular, having witnessed a long history without considerable technology support. According to Weerakkody and Choudrie (2005, p. 36) "[o]ne of the common [...] strategies for overcoming this obstacle remains education and training of staff on the technology or work practices driving the change". Another aspect of the social challenge dimension is awareness and refers to the limited knowledge about the possibilities e-government offers, which leads to low adoption rates. There is a need for more targeted and intensive promotion. This can constitute a serious challenge because even the greatest technological developments are useless if the target group does not adopt them (Rogers, 2003).

The *technological* challenge subsumes all technology-induced issues. Lacking IT standards and limited system integration are primary issues to be named in this regard, as they hamper collaborative efforts beyond organisational borders. Interoperability, for example, is one of the topics, many researchers in the e-government domain have attempted to address. It refers to the exchange of data between governmental institutions on different levels (Guijarro, 2007; Pardo et al., 2011). Another major problem, that exists since the introduction of e-government is the digital divide. It refers to "the distinction between the information haves and have-nots; the gap between the computer literate and the computer illiterate. [T]wo major divides exist: an access divide and a skills divide" (Bélanger and Carter, 2009, p. 132). This definition indicates that it is *not solely* a technological challenge, but also includes a wider range of socio-economic factors, including age, culture and income (Sipior et al., 2011; Bélanger and Carter, 2009; Hall and Owens, 2011). A structured literature review on barriers of e-government adoption identified the digital divide as most often cited barrier within the analysed dataset of publications in the Information Systems (IS) discipline (Distel and Ogonek, 2016). Another challenge in this category are (perceived) security and privacy issues. If a citizen wishes to interact online with her public administration, she needs to be sure that her sensible data will be transmitted and stored safely in the governmental database and not misused by unauthorised third parties (Featherman and Pavlou, 2003). According to Barth

and Veit (2011), those risks rank among the most pivotal reasons to refrain from using e-government.

The *organisational* challenge dimension describes all issues related to the reengineering process of organisational structures as described in terms of an organisation's e-government maturity in Section 2.1.1, which is a necessary prerequisite for e-government to be implemented. An important obstacle in this category is the organisational culture, because departments might not be inclined to share data with other departments in the organisation or with associate partners outside the organisation. The fear of losing control and ownership of the data is paramount to facilitating the business processes (Ebrahim and Irani, 2005). In a similar vein, Irani et al. (2005) point to the fact that the introduction of IT affects the organisational culture and therefore can signify a potential source of resistance among public servants.

It has to be mentioned that those challenges can take very different shapes and concern different layers, they can rather include external stakeholders (citizens, businesses) or constitute an internal issue like it is the case with the education and training of public servants. Those challenges also greatly vary depending on the geographical location, the cultural background and the political system, e-government is embedded into. In Estonia, for example, the state heavily invested into ICT solutions in a time where the majority of the population has not yet had access to a computer and/or the Internet and provided access in libraries. In doing so, incentives were provided that pushed a quick country-wide adoption of e-government. The mandatory national ID card also functions as digital key to all electronic services in Estonia (e-Estonia Briefing Centre, 2019). Germany, in contrast, pursues a so-called *multi-channel strategy* in e-government, which implies that no governmental institution may be exclusively reached electronically, but must also ensure a paper-based access to the institution at any time (Federal Ministry of the Interior, 2013), which might be one of the many reasons why e-government kicks off slower and less intense there.

2.2 Competences

2.2.1 Competence Definition

Many of the above sketched challenges, especially with regard to the social and organisational challenge dimension can be meaningfully addressed by equipping employees with the necessary competences. In the meantime, it has been widely agreed within the research community that human work is the most important resource and is regarded a strategic asset in terms of economic development in any type of organisation, be it privately owned or a public body (Nordhaug, 1993; Heeks, 2003; Teece, 2004).

In order to determine which competences are indispensable for e-government, it is important to define the term and to gain a general understanding of what it involves. According to Deist and Winterton (2005), who conduct an extensive review of the definitions and usage of the term *competence*, it is a *fuzzy* concept that – depending on the purpose and cultural context – is used and defined very differently. They also stress that the few existing efforts to establish a consistent terminology had limited effects on its clarification so far. Bassellier et al. (2001) also see this issue by pointing to the fact that the generated confusion towards this concept has also impeded the creation of an accrued body of knowledge. Indeed, when reviewing relevant literature, it is striking that a plethora of different terms is used to describe an individual's abilities ranging from *skill*, *capability* or *expertise* to *competence*, just to name some of them.

Although there are conceptual differences between those terms, they are oftentimes used interchangeably and not defined at all like in Gharawi et al. (2014), Atoev and Duncombe (2011), and Janowski et al. (2013). However, there are two common denominations that are used recurrently. The typology of *knowledge, skills and attitudes*, for example, is used to describe the 'ingredients' of competence. The earliest and most widely known use of this typology is Bloom's Taxonomy (see Section 2.2.3) where the authors describe three different domains, educational activities can touch upon. Those are the cognitive domain, which refers to mental skills *(knowledge)*, the affective domain that includes feelings and values *(attitudes)* and the psychomotor domain that targets manual or physical skills *(skills)* (Bloom et al., 1956; Krathwohl et al., 1964). This typology has become especially popular in any kind of training

setting (Deist and Winterton, 2005). Another common typology uses the triad of *knowledge, skills and competences*. To give an example, this typology is employed by the European Commission in the context of the European Qualifications Framework for Lifelong Learning (EQF). All learning outcomes in this framework are defined in terms of knowledge, skills and competences. *Knowledge* refers to "facts, principles and theories", *skills* refer to cognitive or practical skills and *competence* is the ability to use knowledge and skills, including responsibility and autonomy (European Commission, 2008).

In this thesis, the term *competence* as coined by Nordhaug (1993), who describes it as a *combination of work-related knowledge, skills and abilities held by an individual* is used. This choice was made, since the definition addresses work-related competences as opposed to generic, not work-related competences. Moreover, it is geared towards the individual and not understood as the competence of an organisation as a whole. The definition shows that competences encompass more than (practical) skills. It is a conglomerate that includes a diversified mix of different knowledge dimensions. In this sense, competence can serve as the generic term for a set of different kinds of more specific competences. Thus, the term *competence* offers an integral view and therefore matches the underlying understanding as used in this thesis.

2.2.2 Manifestation of Competences in Organisations

Traditional structures in organisations advocated the design of jobs in terms of tasks, employees have to fulfil. Those tasks included narrowly defined bits of work assigned to one dedicated person. Today, organisations have moved on to designing *roles* instead of tasks. Thus, competences, employees need to have for the fulfilment of their tasks are summarised in a *role*. On the one hand, this implies a lesser degree of knowledge and control concentration at the top level, i.e. management of the organisation, and on the other hand more competence and responsibilities for the individual at role level, allowing more freedom to decide how to achieve a goal (Daft et al., 2014). A *role* is "[a]n organized set of behaviors expected of an individual in a specific position" (Gibson et al., 2012, p. 254).

Roles are integrated into a very dynamic social environment and hence demand regular redefinition (Daft et al., 2014). Managers carry out roles that can be successfully accomplished "if they skilfully apply the best available knowledge to the situation

at hand" (Gibson et al., 2012, p. 8). In today's working environment, it is common that an employee embodies a number of different roles simultaneously, especially in small organisations. Therefore, it is important to gain an overview of the roles that shape the digital transformation process in the public sector in order to allocate the competences to the respective roles.

While the e-government demand side in terms of its users (businesses and/or citizens) is well-researched, the supply side, i.e. governmental institutions at all levels, has not yet been a major focus of research contributions. Classifications of users include their general attitude towards the Internet, their usage preferences, knowledge or their access to the necessary infrastructure, just to name some of them (e.g. Carter et al., 2016; Müller and Skau, 2015). The supply side, in contrast, is considered as a homogeneous entity, as found by Greger et al. (2014), who conduct a study on e-government stakeholders and analyse public administrations in this regard. The differentiation of roles as well as their meticulous description appears to be gaining in importance, though, judging on recent contributions that examine central roles, such as the CIO including a description of necessary competences (Estevez and Janowski, 2013; Marcovecchio et al., 2013; Iwasaki, 2014).

2.2.3 Competence Development

For the acquisition of competences it is important to gain an understanding of how the human process of learning is organised. Bloom et al. (1956) developed *the taxonomy of educational objectives*, a framework that was created to facilitate the measurement of learning objectives. Initially geared at universities, it describes desired learning outcomes from some kind of instruction that ease the comparison across different educational institutions. In doing so, it provides a common language that can be used regardless of the content and domain. The original taxonomy included a total set of six learning objective categories: *knowledge*, *comprehension*, *application*, *analysis*, *synthesis*, and *evaluation*. This original taxonomy became especially popular for the analysis of curricular objectives and the measurement of their distribution along its different categories to evaluate their balance within the instruction mix. The taxonomy is structured from simple to complex and from tangible to abstract and thereby follows a hierarchical order that expects the learner's mastery of a simple category before advancing to the next category. Krathwohl (2002) revised the original taxonomy to refine it in terms of consistency in terminology and to align

it with today's established nomenclature in educational settings. In addition, he splits the taxonomy into a *Knowledge dimension* and a *Cognitive Process dimension* to allow for a better distinction with an emphasis on the knowledge dimension. This dimension, however, is not a subject of this thesis. The focus is purely on the cognitive process dimension, which is the actual continuation of the original taxonomy by Bloom et al. (1956). The revised version also contains six categories, which are termed *remember*, *understand*, *apply*, *analyse*, *evaluate* and *create*, and is structured hierarchically (see Figure 2.1).

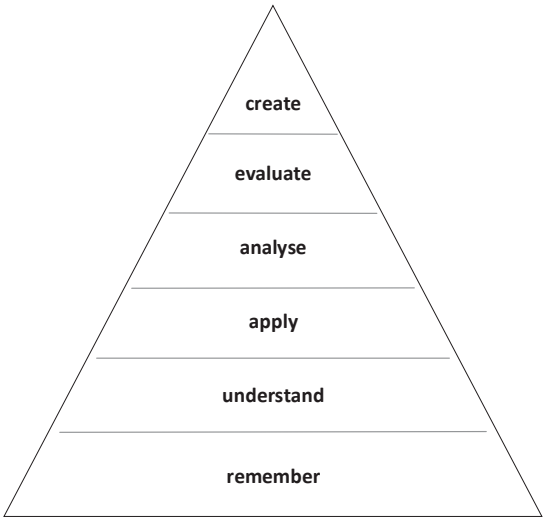


Figure 2.1: Revised Version of Bloom's Taxonomy (adapted from Krathwohl (2002))

Even though Krathwohl (2002, p. 215) sees his revision not as strict as the original taxonomy in terms of ranging from simple to complex, he acknowledges "[i]f, however, one were to locate the 'center point' of each of the six major categories on a scale of judged complexity, they would likely form a scale from simple to complex." Learners begin at the bottom of the pyramid and work their way up to the top by accumulating higher levels of knowledge.

In this revised taxonomy *remember* is the most basic dimension that refers to recognising and recalling knowledge, once instructed. *Understand* relates to the decoding of any kind of information. It involves summarising, classifying and explaining knowledge, amongst others. The *application* dimension goes one step further by executing or implementing a given procedure. When *analysing*, the different facets of a phenomenon are broken down into smaller units and delineated from each other, organised or attributed. In the *evaluation* dimension, standards or pre-defined

criteria are used to take a well-informed decision. The most advanced dimension is called *create* and involves the active use of the previously gained knowledge to develop and implement new ideas. Thus, in a nutshell, the six different dimensions describe six different levels of competences, starting from basic knowledge to applying this knowledge and ultimately creating new knowledge. Knowledge forms the obligatory precondition for more nuanced competence levels. It can be present without having any other competences on a specific matter (Nordhaug, 1993). All of the above-sketched dimensions are subject of educational efforts, since competences contain *teachable* aspects that can be imparted or 'learned' via training efforts (Hunnius et al., 2015).

2.2.4 Competence Frameworks

An established way of listing and describing competences is in the form of competence frameworks. This listing and description is important in many ways. First of all, if employees are looked for in an organisation, a job description needs to be generated that identifies the candidate's ideal profile in terms of her competences. Likewise, such a description helps to grasp the plethora of competences that are available or, maybe even more important, that an organisation lacks to achieve its strategic goals. Finally, an employee can also be characterised and evaluated with the help of the competences that her job requires.

As outlined before, many organisations, irrespective of the sector, currently find themselves on a journey entering the digital world to leverage the manifold benefits that are associated with the use of IT. In order to assist those organisations in a smooth transition process from *offline* to *online*, several frameworks have been established that list necessary work-related competences. In the following, I will list three widely known frameworks. This list by no means claims to be exhaustive, but offers a general overview of practice-related competence frameworks.

The European Electronic Competence Framework (e-CF) is a framework that describes the competences, skills and knowledge needed by ICT professionals. It was designed to assist in identifying the competences, a digital workplace requires and provides support in the recruitment, qualification, training and assessment of the needed professionals. Rather than focusing on different job profiles, the framework

purely zeroes in on competences. This framework consists of 40 pre-defined competence categories, split into five main ICT areas and four different proficiency levels. Each competence offers a generic description and examples to provide context for the presented competences. It relates to the EQF that should serve as bridge between qualifications achieved in different European countries and aims at making them understandable on a European-wide level. Initially developed in the year 2005, the e-CF became a European standard in the year 2016 (European Committee for Standardization, 2019).

The Skill Framework for the Information Age (SFIA) is another well-known framework that aims at providing a common language to define professional skills in a digital world. As opposed to the e-CF, the SFIA is not limited to pure ICT competences, but also lists a number of more general business competences. Established in the year 2000, the current version (SFIA 7) contains 102 listed skills and seven different levels of responsibility. This framework offers a reference model for any individual or job profile in the area of ICTs, digital transformation and software engineering. Each skill comes with a generic definition and a definition for the application on the respective level of responsibility.

Whereas the e-CF and the SFIA focus on individual competences, there is another framework that is internationally recognised, the Occupational Information Network (O*NET), which in contrast, does not provide competences, but is an online database that includes standardised descriptions of about 1.000 occupations across the United States (U.S.) economy. It was developed in the 1990s by the United States Department of Labor, Employment and Training Administration (2019). The database lists tasks, technology skills and tools as well as work-related characteristics (e.g. work values and styles) (United States Department of Labor, Employment and Training Administration, 2019).

2.2.5 Competence Frameworks for E-Government

Whereas especially the first two mentioned competence frameworks (e-CF and SFIA) assist practitioners in determining needed competences and training needs in a digitally-shaped working environment, an equivalent for the e-government domain is absent. The previously presented frameworks are very generic in nature and do

not consider the peculiarities of the public sector, which makes them less suitable for an application in the e-government context.

The importance of competences for the successful mastery of e-government has been repeatedly highlighted both in practice and in scientific contributions. For instance, as early as 1986, a special issue of the journal Public Administration Review (PAR) addressed the need for "computer-related education for public sector students" (Kim and Layne, 2001, p. 233). In a similar vein, Kaiser (2004) sees an increased necessity for primarily technical competence in order to be able to handle the 'new' systems. However, these early publications purely focused on IT competences as single most important characteristic that is needed for the IT-induced change in governmental institutions.

The impact on the other subject areas, a public servant is confronted with, did not find consideration back then. It is only slowly that more holistic considerations of needed e-government competences have arisen. Gascó (2003, p. 13), for example, acknowledges the implications of e-government on institutional change processes and points to the multifaceted nature of those implications, which includes "technological, managerial, and political variables [that are] affected by ICTs implementation". Leitner (2006), moreover, identifies the need for proper electronic government competence frameworks and empirically confirms the importance of management, ICT and further competences, such as networking and interpersonal skills. Estevez and Janowski (2013) provide an overview of the competences, one role within e-government, the government CIO, should embody, consisting of leadership, communication, interpersonal skills, negotiation and analytical skills. Janowski et al. (2012), too, see the gap in e-government education concerning competence needs of different e-government-relevant roles and develop a theoretical framework for the classification of e-government education. This framework contains six dimensions: who – learners, why – roles, what – competences, how – programmes, where – schools, and when – prerequisites that enables the analysis of all e-government stakeholders and their respective needs as well as interrelationships.

While the above-mentioned authors already offer a more complete picture of the needed competences, the scientific consideration of e-government competences remains fragmented. Although not exhaustive either, Hunnius et al. (2015) identify a set of different competences needed for e-government by means of a literature review that can be seen as the most holistic collection of e-government competences

published so far. They distinguish between five different competence categories, i.e. *technical*, *socio-technical*, *organisational*, *managerial* and *political-administrative* competences. *Technical* competences are IT-related skills that generally deal with the introduction, strategic use and development of IS. *Socio-technical* competences are located at the interface of a technical system and human beings and involve the consideration and balance of both dimensions for a fruitful co-existence. The *organisational* competence category consists of knowledge and skills of organisational structures, process management etc. *Managerial* competences constitute 'traditional' business and management skills, such as project, change and financial management. Finally, *political-administrative* competences address knowledge and skills concerning the environment, public administrations find themselves in, like knowledge about legal conditions and policies that shape the public sector's design.

Despite the fact that there have been some attempts listing different competences, the majority of those contributions does not provide more detailed insights into the composition of the needed competences, but stays on a meta level and thus, fails in providing targeted guidance and recommendations on this topic. The same is to be found in practice. Already when setting up the report of the NPR for the transformation of the American government by means of IT in the year 1993, 13 recommendations were issued along with this report, whereof one exclusively deals with the importance of and need for *training* of public servants ('Provide Training and Technical Assistance in Information Technology to Federal Employees'). This recommendation comprises five action points, emphasising the lack of IT training in the public workforce: "many members of the federal workforce lack sufficient training and background to use new technologies effectively, and many managers fail to realize the importance of IT training" (National Performance Review, 1993). Furthermore, governments having the will to use e-government need to ensure "that existing public servants have the skills and capabilities to support innovative practices in government" (OECD, 2017, p. 5).

This repeatedly voiced importance of competences and training by policy makers as a prerequisite for a fully functioning e-government is in direct contradiction to the scant and fragmented theoretical contributions on the topic within the e-government domain. Therefore, it has to be ensured that e-government competences are consistently and holistically delivered via targeted teaching approaches.

2.2.6 Competence Delivery

In order to acquire competences, educational efforts in terms of training are required. This training can involve practical education, several years of study or short term training formats, such as workshops. Besides this general distinction of training formats, different teaching methods can be chosen to help imparting competences. Depending on the respective competence, one method can be more appropriate than another. In general, many different ways exist to classify the competence delivery. For the purpose of this thesis, I will use a very broad classification, dividing competence delivery into three broad categories: *classroom or face-to-face teaching*, *e- or online learning* and *blended learning*.

Traditional classroom teaching includes lectures, seminars, workshops, mentoring, and game-based approaches. Whereas this type of teaching has dominated the competence delivery for a long time, especially the online formats have considerably made up ground in recent years. With the rising importance and penetration of ICT in every aspect of life, the competence delivery equally has significantly shifted into the online direction.

> "Academics who have commonly taught in a face-to-face environment are under pressure to embed ICTs into their face-to-face teaching and to work in blended and online modes." Redmond (2011, p. 1051)

The increased pace of technological advancements necessitates a continuous update of competences and reinforces the call for lifelong learning. To support this call, digitally and online-aided means can enrich traditional competence delivery modes and can also present a means to diminish the education divide by providing easier and free of charge access to education to every learner (Evans et al., 2013). From the learner's point of view, e- or online learning offers more flexibility and customising (de Freitas et al., 2015). From the training provider's/educational institution's point of view, it has a high scalability, because lectures can be videotaped and presented to an indefinite number of learners. In this context, so-called massive open online courses (MOOCs) have quickly gained in popularity. As of 2018, more than 900 universities worldwide offered one or more MOOC(s), reaching more than 100 million learners (Class Central, 2018).

A very general definition of *online learning* quantifies different learning approaches in terms of the degree of online provided contents. Whereas in online or e-learning,

at least 80% of the course content is delivered online, a *blended learning* approach has an online share of 30 to 79% and traditional face-to-face teaching has no online transmitted course contents (Allen and Seaman, 2003). "Blended learning can be defined as the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies." (Kaur, 2013, p. 612) In general, it is possible to transfer basically every type of traditional classroom teaching to its digital counterpart. While classroom teaching and e-learning present the opposite ends of a continuum from offline to online, blended learning as approach combining elements of both, is situated somewhere in the middle of this continuum, depending on the degree of use of technical and online aids.

An example of such a blended learning approach that can be located at any point of this continuum, since it can be done completely offline, supported by digital means or completely online and that has also gained popularity amongst learners and instructors/teachers, is game-based learning. On the one hand, this can be explained by the general decrease in motivation on the learner side, where "[t]he challenge of teaching has increased when faced with increasingly apathetic students" (Wood and Reiners, 2012, p. 101). On the other hand, it offers the possibility to put the learners ('the players') into a situation that they otherwise would have had difficulties getting themselves into in real-life. They can put themselves in the shoes of important decision makers, for example, and practice how their political decisions affect other stakeholders.

The major advantage is that there is no risk involved for the players when taking certain, also possibly mistaken actions (Garris et al., 2002; Salas et al., 2009; Hofstede and Pedersen, 1999). Therefore, it enables a free and easy learning process that happens almost 'accidentally' while having fun. This game-based approach has spread to a variety of different contexts, such as advertising, politics, and defense (Djaouti et al., 2011) and has also found its way into education, since it has proven its aptitude for increasing the learner's motivation, engagement and performance in the learning process (Wood and Reiners, 2012; Nunohiro et al., 2012; Fletcher and Tobias, 2006; Tobias et al., 2015). Dewey (1916, p. 38) already constituted that "education is not an affair of 'telling' and being told, but an active constructive process". Today also known under the term *gamification*, it refers to "the use of game design elements in non-game contexts" (Deterding et al., 2011, p. 9). According to the *Hype Cycle 2016* by Gartner (2016), gamification will become a mainstream instrument in educational settings within the next two to five years.

In general, educational institutions have recognised the benefit of gamified approaches, especially in terms of motivating their learners by actively engaging them in exciting game scenarios. Moreover, gamification can help to increase the understanding of new phenomena and situations (Fletcher and Tobias, 2006). Yet, the idea of using games and simulations for educational purposes is not new. War games have already been used in the 1600s and since the 1800s, they have been used for military planning purposes (Gredler, 2004).

Especially simulation games are suitable to "address the changing competences needed in the information age: self-regulation, information skills, networked cooperation, problem solving strategies and critical thinking" (Westera et al., 2008, p. 420). Thus, they lend themselves for use in newly technology-induced environments. That is why educational institutions increasingly turn to simulation games as a means to impart competences. They are especially popular in management education as well as for training purposes in business settings (Douglas-Lenders et al., 2017; Salas et al., 2009; Gunther et al., 2010; Goi, 2018).

However, when looking at current competence delivery modes, i.e. teaching formats in e-government, the use of simulation games is very scarce. One of the few examples is the contribution of Klievink and Janssen (2010) who develop a simulation game to understand service delivery issues and to identify possible solutions. This restraint might be caused by the mixed effects reported when simulation games have been employed (Tobias and Fletcher, 2007; Vlachopoulos and Makri, 2017).

2.2.7 Experiential Learning

Gamified approaches in general and simulation games in particular exhibit the notion of experimenting and actively becoming part of the action. This philosophy of learning from own/life experience (and mistakes) is described in experiential learning theory (ELT) (Kolb, 1984). According to ELT, learning is "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 41). The experiential learning cycle, as depicted in Figure 2.2, shows the elements that are involved in the process of learning: *experience, reflection, thinking and action*. Experience forms the basis for observations and reflections, which are transformed by the individual ('learner') into more abstract ideas, from which new inferences can be drawn that again can be put to a test and so on (Kolb and Kolb, 2009a). Since its

first appearance in 1971, ELT has been made use of in academic and professional training in a variety of fields (Kolb and Kolb, 2009a). Many authors report about the successful use of simulation games, harnessing the benefits of experience-based learning (Garris et al., 2002; Kriz, 2003; Ranchhod et al., 2014; Mohsen et al., 2018).

As flexibility becomes increasingly important in today's changing environment, where previously gained experience and knowledge has to be applied in new contexts, experiential learning offers the possibility of "learning by doing" (Lewis and Williams, 1994). Amalgamating experiential learning with Bloom's taxonomy, experiential learning addresses all of Bloom's dimensions within its iterative learning cycle with a special attention given to activation of the individual, her reflection and experience for learning to happen.

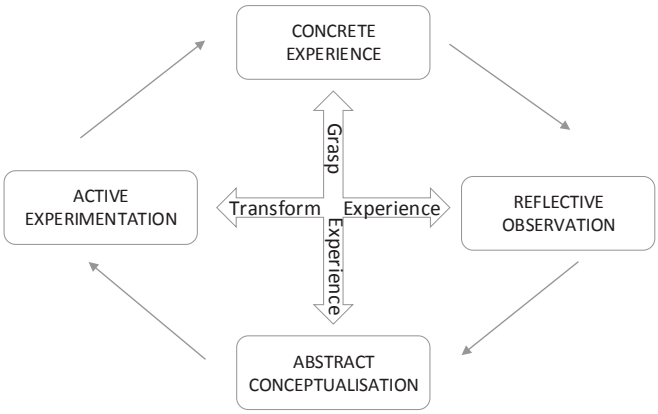


Figure 2.2: Experiential Learning Cycle (adapted from Kolb and Kolb (2009a))

Concluding this chapter, the most important takeaways are the limited number of frameworks, especially with regard to e-government that appears to contradict the increased demand on the side of practitioners and the call for strengthening competences on the side of policy-makers worldwide. A variety of delivery modes exist to impart competences, ranging from traditional offline face-to-face teaching to online and gamified formats. Simulation games as one of those gamified approaches that draw on the player's experience as major source of learning, have gained considerably in popularity and importance, also because they are particularly suitable for addressing changing competence needs in times of digitalisation. However, taking a look at gamified approaches in general and simulation games in particular in the e-government domain, there are, to the best of my knowledge, only limited efforts to be reported that attempt to advance the body of knowledge and make use of those tools to better address the public sector competence needs.

3 Research Approach

3.1 Design Science Research

Stemming from the Latin word *scientia*, the term *science* denotes knowledge, "which is derived from the facts of experience" (Chalmers, 2013, p. 1). Thus, science can be described as the systematic and organised pursuit and derivation of knowledge with the help of scientific methods (Recker, 2013).

There are two very basic, yet completely distinct classes of science that have historically arisen, the *natural sciences* and the *social sciences* (Hevner et al., 2004; Recker, 2013). Whereas the natural sciences are concerned with phenomena that are to be found in nature and can be very well described with a high degree of accuracy and precision (also referred to as "exact sciences" (Recker, 2013, p. 12)), the latter ones put an emphasis on the human being and its diverse relationships, as in the case of IS where the object of interest resides in the relation between the individual/the organisation and technology. Social sciences are deemed to be much less precise and less accurate, since they examine behaviours and states of mind, amongst others (Bhattacherjee, 2012; Recker, 2013).

With this distinction and the classification of IS as part of social sciences in mind, the general call for objectivity in scientific research "to reduce biased interpretations of results and to reduce dependency and partiality of the research team or any interpreter of the findings" (Recker, 2013, p. 15) becomes even more important.

IS as interdisciplinary discipline combines insights from business, computer science, wider social science contexts as well as own contributions. Therefore, a variety of research methods is needed to shed light on the different involved dimensions of IS research problems, which are typically complex in nature (Mingers, 2001). This thesis' objective of *designing a tool for imparting e-government competences* can be seen

as such a new and complex problem. Competences in the area of government are changing induced by the introduction of fast advancing information systems. Public servants need to be trained on this new competence mix that comes along with those new technologies. They need to adapt to the current requirements, a digitalised public sector poses. Yet, there is a lack on scientific literature exemplifying those competences as well as a lack on how these competences can be meaningfully imparted to future public servants as well as to the workforce already working in this environment, given the need to update their competences.

In general, the use of a given research method highly depends on the research problem at hand, noting that no research method can be considered superior to any other. While IS has been ruled for a long time by the use of quantitative methods, qualitative research methods have significantly made up ground in the last years (Chen and Hirschheim, 2004). In a similar vein, many disciplines within the social sciences have started to acknowledge the importance of both qualitative and quantitative methodologies in order to produce meaningful research outputs (Recker, 2013; Kumar, 2019). The combination of both methodologies is also referred to as *mixed methods approach* (Creswell, 2013; Kumar, 2019). According to Venkatesh et al. (2013, p. 23) "Mixed methods research, in contrast, uses quantitative and qualitative research methods, either concurrently (i.e. independent of each other) or sequentially (e.g. findings from one approach inform the other), to understand a phenomenon of interest." Having said this, a comprehensive analysis of the complex topic of e-government competences requires such a mixed methods approach along the different stages of this research endeavour.

Whereas quantitative methods rely on the 'truth' of numbers by isolating single facts of a given phenomenon and applying dedicated measures on 'quantitative', i.e. predominantly numerical data, qualitative research is more concerned with sense-making of phenomena happening 'in context' (Recker, 2013). Both approaches exhibit strengths as well as weaknesses: when using a qualitative approach, the phenomenon is analysed in depth, using an open, flexible and less-structured approach to examine human acting and the rationales for why they act in certain contexts like they do. This approach mostly comprises a small data sample, i.e. few individuals, which makes generalisations hardly possible. Examples for qualitative research methods are observations, focus groups or interviews (Creswell, 2013; Brinkmann, 2013). The qualitative interview constitutes the most widely used method among them (Myers and Newman, 2007).

In contrast, with a quantitative approach, a rigid and structured procedure is followed. The data sample is large and thus, allows for generalisations, but at the same time offers limited in-depth examination (Kumar, 2019). Surveys represent the most common quantitative research design in IS research (Chen and Hirschheim, 2004). Thus, although both approaches have their justification, the appropriateness depends on the respective purpose of the study.

Information Systems (IS) is considered to be an applied research discipline whose primary interest lies in producing solutions that arise when IT is being implemented by employees in an organisational context (Hevner et al., 2004; Peffers et al., 2007). In a first step, it is therefore important to describe the problem(s) in detail to be able to explain their possible causes and find solutions for them. Although a large part of IS research is considered to be explanatory in nature (Peffers et al., 2007), the design of innovative *artifacts* that contribute to a solution has become an important element, too (Hevner et al., 2004; March and Storey, 2008; Peffers et al., 2007). Thereby the artifact bridges "the technological research [...] the 'concept' stage, and the social research [...] the 'impact' stage" (Nunamaker et al., 1990, p. 93). An artifact as defined in the IS literature can consist of a model, a method, a construct, an instantiation, but also a new theory or a new method or process (e.g. March and Smith, 1995; Hevner et al., 2004; Ellis and Levy, 2010).

Initially coming from the engineering discipline, in design science it is imperative to build a solution exemplifying "how things ought to be, how they *ought* to be in order to attain goals, and to *function*" (Simon, 1996, p. 4). As valid for any other research methodology, which should ensure a rigorous approach, there are guidelines on how to thoroughly apply design science. March and Smith (1995), for example, propose the following four sequential activities to design an artifact: build, evaluate, theorise, justify. In a similar vein, Hevner et al. (2004) use the stages 'Develop/Build' and 'Justify/Evaluate'. They are the first ones to introduce it as a cyclic process, thus placing more importance on the iterative nature of the design process. In a later contribution of Hevner (2007), the focus is on the interconnectedness of the different parts of the design science research framework by adding a relevance and a rigour cycle to the actual design cycle, integrating the research environment and the existing knowledge base. Design science has become an acknowledged methodology in the German IS discipline, too (Österle et al., 2011).

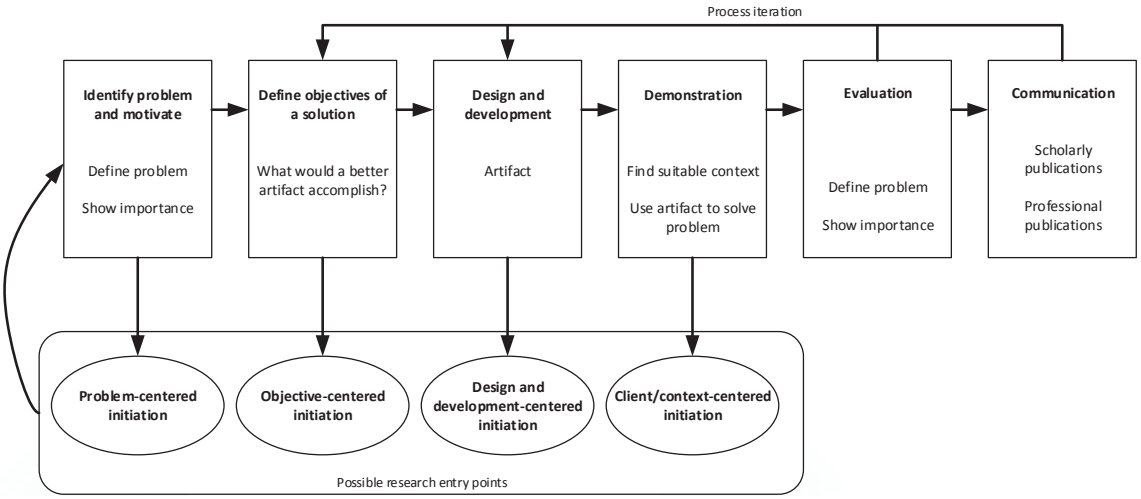


Figure 3.1: DSRM Process Model (adapted from Peffers et al. (2007))

Peffers et al. (2007) introduce another guiding process for relevant and rigorous DSR, the Design Science Research Methodology (DSRM). They split up their process in six consecutive steps, starting with the identification and motivation of the problem (1), followed by the definition of objectives of a possible design science solution (2). Subsequently, the design and development of the artifact sets in (3), after which the artifact's suitability for solving the identified problem in a given context is put to a test (4). Then, the artifact has to be evaluated in terms of its effectiveness and efficiency for addressing the problem (5) and finally the last step comprises the communication of the identified problem, the created solution (artifact) as well as its unique character and importance to the field by means of scientific publications (6). From the second step onwards, process iterations can be done, if the adequacy of the identified solution is not feasible and/or satisfactory. The complete process model is depicted in Figure 3.1.

In this thesis, I will follow the just sketched DSRM by Peffers et al. (2007), since it constitutes a comprehensive and detailed approach. This approach can involve qualitative and quantitative research methods. In the following, all applied research methods for this research endeavour will be shortly introduced and explained.

3.2 Literature Review

"Reviewing the literature is the foremost step in conducting scientific research." (Yang et al., 2017, p. 3290) This statement highlights the importance, literature reviews have as a mandatory prerequisite in any research field. Before starting to investigate a topic of interest, it is important to first gain an overview of what has already been done in terms of relevant contributions to this field (Webster and Watson, 2002). Owing to their importance for the research field, literature reviews should excel in *relevance* and *rigour*. Whereas relevance in this context can be enhanced by "avoiding the reinvestigation of what is already known" (Baker, 2000, p. 219), rigour can be achieved by a thorough use of the methodological approach, transparency and reproducibility (vom Brocke et al., 2009; Recker, 2013; Okoli, 2015). Only then literature reviews help to build on and acknowledge already existing work, gain new ideas as well as possibly question existing ones and facilitate the identification of research gaps. Hence, they also stimulate the creation of new knowledge and are also particularly apt to shape a general understanding of the research domain (vom Brocke et al., 2015). Literature reviews can be qualitative and quantitative in nature. Both forms are used in this thesis and will be outlined in the following.

IS as a young and interdisciplinary discipline has often been criticised for largely borrowing theories from other 'neighbouring' disciplines and for a shortage of own theoretical contributions. It can therefore especially benefit from generating reviews that assemble the entire body of knowledge to strengthen its right to exist as independent discipline (Webster and Watson, 2002; Okoli, 2015). However, this unique interdisciplinary feature also renders literature reviews more challenging, due to the dispersion of insights across several disciplines (i.e. business, computer science etc.), publication outlets (conference proceedings, journals etc.) and consequently different databases (Levy and Ellis, 2006; Boell and Cecez-Kecmanovic, 2014; vom Brocke et al., 2015; Okoli, 2015). Another issue that comes into play is that despite their importance for advancing the IS body of knowledge, they are also being reproached for suffering from low quality and biases (Boell and Cezec-Kecmanovic, 2011; Okoli, 2015).

Qualitative Literature Review

As a remedy to those above-sketched weaknesses, *qualitative systematic literature reviews* have gained in importance and constitute the majority of stand-alone reviews in the IS discipline today. On the most abstract level, a literature review can be classified into two broad categories: a stand-alone (systematic) review is a research contribution by itself, which follows a rigorous 'systematic' approach, uses a predefined search strategy and is published as a research paper. In general, the expression literature review can also refer to a part of the research within a project or paper that summarises the state of the art or compiles background information, not necessarily offering a systematic approach (Kitchenham and Charters, 2007; Boell and Cecez-Kecmanovic, 2014; Okoli, 2015).

In the last years several step-by-step instructions and guidelines have been published to encourage IS researchers in dedicating themselves to more rigorous systematic literature reviews (Webster and Watson, 2002; Levy and Ellis, 2006; vom Brocke et al., 2015; Okoli, 2015). According to Kitchenham and Charters (2007), there are certain characteristics, systematic reviews share, i.e.

- specifying the research question and the method(s) used for the review
- having a predefined search strategy in place that is well-documented to ensure the repeatability of the search process
- having clear inclusion and exclusion criteria for the choice of articles, including the information to be gathered from each article

According to Google Scholar citations, the guidelines by Webster and Watson (2002) on how to write a literature review are probably the most widely used ones. The authors are among the first ones to introduce detailed instructions to guide researchers through the process of writing a literature review in the IS discipline. They start with where to look for relevant literature: "[t]he major contributions are likely to be in the leading journals" (Webster and Watson, 2002, p. xvi). The predefined search strategy includes the decision on the (online) repositories and outlets that are searched. Furthermore, the timespan, in which publications are considered as well as the time in which the search takes place are defined (Kitchenham and Charters, 2007; Kitchenham et al., 2010). Moreover, it is crucial to establish a search string, i.e. a sequence of relevant keywords connected with the operators *AND*/*OR* for the search. Then, the initial search is reinforced by a so-called *forward and backward search*. A forward search refers to an additional search of a scientific database such as

the *Web of Knowledge* to identify further possibly suitable research articles that have cited the identified set of articles. A backward search, in contrast, implies looking into the citations of the previously identified set of articles to check for potential further literature fits. Subsequently, Webster and Watson (2002) propose creating a concept matrix with the final set of suitable research papers, grouped according to comprised concepts to identify similar, opposing or new ideas. This approach helps to synthesise the current status of the scientific body of knowledge and also enables the creation of a research agenda, identifying research gaps and discussing future research streams in a structured way (vom Brocke et al., 2009). Levy and Ellis (2006, p. 182) introduce another approach for implementing a systematic literature review taking a process perspective, including an input, processing and output process step, i.e. following "sequential steps to collect, know, comprehend, apply, analyze, synthesize, and evaluate quality literature". vom Brocke et al. (2009) advocate for a more comprehensive and transparent documentation of the search process when implementing literature reviews in order for other researchers to understand their approach and judge upon the credibility and exhaustiveness for the use in their own research endeavours (vom Brocke et al., 2009).

Quantitative Literature Review

In view of the vast and ever-increasing amount of available data and online repositories that enable the retrieval of any kind of document dating back several decades, manually implemented qualitative systematic literature reviews can become very cumbersome. Quantitative automated techniques with the help of algorithms operating on underlying statistical methods therefore have recently become more popular as research approach of choice. They are used for a variety of purposes and also have demonstrated to provide a useful means to implement a high quality literature review while at the same time managing the massive amounts of information. *Text mining* is such an automated technique that can help to transcend human limits when needing to process large data sets and at the same time to de facto exclude humanly caused biases (Urquhart, 2001). *Topic modelling* as one form of text mining supports "inductively discovering topics running through a large collection of texts" (Debortoli et al., 2016, p. 111), coming from the idea that documents comprise multiple topics. Latent Semantic Analysis (LSA) as underlying algorithm and first widely applied method, which came up in the late 1980s, or Latent Dirichlet Alloca-

tion (LDA) as further development with fewer interpretational weaknesses, are two possible forms of such automated techniques of information sorting and retrieval that have gained continuously in interest and today span a variety of disciplines (Evangelopoulos et al., 2012). Especially the latter one (LDA) has found its way into the IS discipline (Vakulenko et al., 2014; Gorbacheva et al., 2016; Debortoli et al., 2016). The basic idea of these automated machine-learning techniques is that "words that occur in similar contexts tend to have similar meanings" (Turney and Pantel, 2010, p. 142) and thus can be grouped accordingly. Thereby, LSA and LDA look for similarities across different documents and topics as well as topics and words. Those topics can then be filtered and analysed more easily (Blei, 2012; Debortoli et al., 2016). Kitchenham et al. (2010) compare the results of a manual literature search and an automated search and come to the conclusion that results are almost as accurate as with the manual search, although they advise that "for completeness, automated searches need to be backed up with manual searches of the most recent relevant conference proceedings" (Kitchenham et al., 2010, p. 804).

Although not being exclusively developed for this purpose nor being limited to it, quantitative techniques for conducting a literature review or a content analysis support researchers in a variety of scientific disciplines in coping with the excessive amount of data. In this thesis, I exclusively refer to text mining as tool for conducting a quantitative literature review on the abstracts of eight leading e-government journals from the year 2000 to 2016, which is the reason why this method is listed in this section.

This thesis contains three literature reviews, whereof two are qualitative literature reviews and one is a quantitative review. As a first step to identify what research topics have guided the scholarly discussion in e-government in eight leading e-government journals throughout the past 16 years, starting with the year 2000, I performed a quantitative text mining approach with topic modelling. This was done to extract the research areas dominating the scientific discourse in this domain (P1: Ogonek (2017)). The aim was to analyse the state of the art and to identify research gaps.

Moreover, we used a qualitative systematic literature review to identify research contributions in the area of public administration roles and necessary corresponding competences to unveil starting points for the description of necessary roles and competences in public administrations in the digital age (P2: Ogonek et al. (2019c)).

Furthermore, we performed a second qualitative systematic literature review to find out, if after a period of five years, the identified gap on e-government competences in scientific literature had been closed or become smaller and used this review to enrich previous findings (P3: Distel et al. (2019)). What is more, each research paper (P1–P9) *per sé* contains a literature review as part of the related work section.

3.3 Delphi Method

"Project DELPHI" was the original study's name at The RAND Corporation that employed the Delphi method in an experiment to "obtain the most reliable consensus of opinion of a group of experts" (Dalkey and Helmer, 1963, p. 458). The Delphi method constitutes one of the qualitative research methods, where the participants ('experts') receive questionnaires that they need to fill in individually. Alternatively, interviews can be used for the opinion gathering. The idea is to avoid the direct exposure of the experts to one another. All experts stay anonymous to circumvent biases or other interferences in terms of persuasion, narrow-mindedness or the perceived need to defend one's ideas, to just name some of them. As the method implies an iterative approach, i.e. after filling in the first questionnaire, a new questionnaire is designed, based upon the previous round's answers, this iteration will last until the majority of participants reached a consensus. The overall aim of the Delphi method is geared towards "structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem" (Okoli and Pawlowski, 2004, p. 3). Since its appearance, the Delphi method has been repeatedly applied in the IS discipline, supporting the organisational decision-making process (e.g. Holsapple and Joshi, 2002; Nevo and Chan, 2007; Becker et al., 2015).

This thesis contains one Delphi method, which serves as refinement method for the results obtained by the automated text mining analysis (P1). According to Debortoli et al. (2016, p. 118), it is recommended – if human interpretation of the results is intended and not a subsequent processing by means of another machine-learning method – that a minimum of two researchers "inspect the actual word probabilities [...] and the documents strongly associated with each topic". In this Delphi study, six researchers, all from the IS discipline, but with distinct focus areas, served as experts. In contrast to the traditional Delphi method, no questionnaires were designed.

Instead, the results of the text mining analysis, including most relevant words, the graphical representation of the most relevant words and the best fitting abstracts were step by step handed to the experts as their unit of analysis and interpretation. The experts first individually identified the appropriate number of topics by trying to assign labels to the different topic options, ranging from two to sixteen topics. After a consensus on ten topics as optimal number was reached, all of them again individually identified suitable labels for those ten topics, based on the most relevant words for each topic and the graphical representation of the topic. Then, the experts additionally received the 5 to 7 best fitting abstracts for each topic. During the next iteration, the experts were given the chance to refine or change their afore-chosen headings. In the end, the results of the other experts were disclosed to each participant and the top 50 matching abstracts were additionally distributed to sharpen the final decision.

3.4 Focus Group

Focus groups are an established qualitative research method in the social sciences that first was particularly made use of in the health discipline, but today spans a variety of disciplines (Kitzinger, 1995; Wilkinson, 2016). Despite its broad use, a multitude of terms such as 'focus group interview', 'focus group discussion' or 'group interview' are used to describe the same phenomenon, which constitutes a source of confusion (Barbour, 2007). Although variations exist, in general, a focus group is about "engaging a small number of people in an informal group discussion, 'focused' around a particular topic or set of issues" (Wilkinson, 2016, p. 84). The most important characteristic is the flow of discussion between the participants that can be guided by the researcher's stimulating questions, who acts as moderator. The moderator, however, only facilitates the discussion when needed (Barbour, 2007; Wilkinson, 2016). The discussion is audiotaped and/or notes are taken, which are transcribed afterwards by the researcher for the data analysis (Kitzinger, 1995; Wilkinson, 1998). Onwuegbuzie and Dickinson (2009) summarise a number of benefits, focus groups can have. Amongst them are a more efficient and fast data collection process due to the fact that many participants are present and can be interviewed at once, possibly deeper insights, given the informal setting that encourages a more personal and open atmosphere. This can provoke more spontaneous

answers through the interactions between participants and thus, can increase the general number of participants. Yet, a downside to using focus groups is the limited existence of guidelines on how to best analyse and interpret the data obtained from them (Onwuegbuzie and Dickinson, 2009; Wilkinson, 2016).

This thesis contains one focus group workshop. In order to discuss/select the roles and respective competences needed for public administrations in a digital age, three focus group workshops with a varying number of experts from German public administrations on municipal and state level, academia (from universities and universities of applied sciences), unions and educational training providers were conducted between October 2015 and February 2016 (P2). This was done to develop and refine the final composition and look of the instruments that should enable and support the roles' documentation and preservation (i.e. *role fact sheet* and *competence matrix*). According to Wilkinson (1998), there are three main purposes of focus groups: (1) as complementary research method within a multi-methods approach, i.e. combining different qualitative research methods, (2) as sole research method to capture participants' attitudes, feelings and/or experiences or (3) as means to promote change by giving voice to individuals or groups that normally stay unheard. The applied method in this thesis corresponds to the first of the three main purposes, focus groups are used for.

3.5 Interview

There is a widely known saying, stating 'talking helps'. Psychological case studies even go a step further by stating that talking can become a cure, since it creates new connections in the human brain (Holmes, 2008). Thus, not surprising, interviews are considered a very important means in scientific research to gain new knowledge about personal and social beliefs and traditions (Brinkmann, 2013). They have become *the* method of choice in social science research (Rapley, 2001; Brinkmann, 2013). Especially when a phenomenon is in its early stages and has not yet been extensively researched or understood, the researcher herself has to become the primary investigator by actively observing and interviewing individuals to collect necessary data and learn about opinions and views (Recker, 2013; Creswell, 2013). An interview involves a verbal interaction between two or more individuals, who are generally referred to as the interviewer (asking the questions) and the interviewee (responding).

An interview can either take place face-to-face, via the phone or in any type of virtual setting (Brinkmann, 2013; Kumar, 2019; Creswell, 2013). A *qualitative interview* can take on several forms and serve a variety of purposes. In general, interviews can be classified as quantitative or qualitative research method.

Despite the potentials, qualitative interviewing may offer with regard to knowledge creation, there are also challenges, the implementation of this approach brings along. According to Myers and Newman (2007), interviews can bear several issues. For example, the artificially constructed interview situation with interviewer and interviewee not knowing each other might lead to a lack of trust on the part of the interviewee, who therefore might not be inclined to disclose sensitive information. Since an interview is a direct encounter, the interviewer is part of the interview setting and might unintentionally intrude established structures and in doing so, change the interviewee's behaviour due to the fact of being observed (also labelled as the *Hawthorne effect*). Communication in terms of the use of words – spoken as well as written – is another common problem, since there might be ambiguous statements that lead to misinterpretations on both sides.

According to Recker (2013), there are three types of interviews. *Descriptive* interviews assemble subjective perspectives to provide a phenomenon's joint description as understood by the interviewees. *Exploratory* interviews are directed towards defining questions or proposing new theories or constructs. Propositions and hypotheses typically form outcomes of the observed data. Lastly, *explanatory* interviews are geared towards checking the previously observed relationships on actual occurrence in real-life scenarios.

Several authors distinguish between *structured*, *unstructured* and *semi-structured* interviews (e.g. Myers and Newman, 2007; Brinkmann, 2013). A structured interview employs a standardised way of asking questions, as used in quantitative surveys (see Section 3.6). All questions have been previously defined in the interview script and are always asked with the same wording and order. Thus, a structured interview does not allow for spontaneous changes. An unstructured interview constitutes the opposite of an structured interview. There is none or only little pre-defined script, because it is mainly about the interviewee telling her story (Brinkmann, 2013). This kind of interview is especially meaningful for "exploring intensively and extensively and digging deeper into a situation, phenomenon, issue or problem" (Kumar, 2019,

p. 220). Thus, the interviewer has the maximal freedom and flexibility of asking any questions she deems appropriate in the course of the interview.

However, it also demands a lot of experience and skills by the interviewer in the implementation and analysis phase (Kumar, 2019). Furthermore, the lacking structure renders the interview results more difficult to code and analyse (Myers and Newman, 2007; Turner, 2010). A semi-structured interview is located in the middle of the two previously described rather 'extreme' forms. It represents the most common form of qualitative interviewing (Brinkmann, 2013) and also the most widely employed qualitative method in IS (Myers and Newman, 2007). A semi-structured interview is characterised by being guided by a previously elaborated interview guideline. On the one hand, it offers more freedom than a structured interview by giving the interviewee the possibility to freely add to the conversation whatever she feels is important. On the other hand, the interviewer can also improvise, i.e. deviating from the interview guideline to set the focus of the conversation on topics that have emerged during the interview (Myers and Newman, 2007; Brinkmann, 2013). At this point, it is important to mention that both Brinkmann (2013) and Recker (2013) highlight the fact that there is a certain degree of relativity ranging from 'unstructured' to 'structured' interviews, because neither the first nor the latter one exists in those extremes, but interviews have to be considered 'rather' structured or unstructured.

In the following, I will briefly outline how a semi-structured interview is prepared for and analysed. First of all, after having identified a research gap, a research question that effectively addresses the problem needs to be formulated (Turner, 2010). This forms the basis for the interview guideline, where the different topics covered by this interview are listed. Few guiding questions are added, detailing the topics. In this step, it is imperative to consult scientific literature (again) to make sure, the interview guideline considers theoretical contributions. After a *pre-test* of the guideline, the sample is selected. Unlike quantitative approaches, where *random* sampling is encouraged to display as much of the target population as possible, in qualitative approaches, the researcher often looks for a sample with certain characteristics, as for example being employed in a public administration in Germany, and therefore performs *purposive* (Recker, 2013) or *criterion based* (Turner, 2010) sampling. All interviews are audiotaped and/or noted down and transcribed afterwards. As qualitative data consists of text, not numbers, no statistical method can be applied for the analysis. An interview transcription facilitates the content analysis (see Sec-

tion 3.7) afterwards by enabling a thorough examination and by allowing the data to be used again for other purposes (Bryman and Bell, 2003). Naturally, qualitative research involves more interpretational efforts and "[i]nterpretations are inherently subjective, historically and contextually bound to the researcher developing and expressing the interpretation" (Recker, 2013, p. 89). This needs to be internalised by the researcher to be aware of potential biases (Creswell, 2013).

3.6 Survey Research

In general, surveys can be referred to as "gathering information about the characteristics, actions, or opinions of a large group of people, referred to as population" (Pinsonneault and Kraemer, 1993, p. 77). Survey research refers to surveys conducted with the ultimate aim of broadening the scientific knowledge base, as opposed to surveys that are conducted for marketing purposes, for example. Survey research is a *quantitative* method that enables the collection of standardised information about a population, whose subjects can range from individuals to whole organisations. This information is gathered by asking a large number of individuals predefined questions in a structured manner in order to derive generalisable findings (Pinsonneault and Kraemer, 1993). As for qualitative interviews (see Section 3.5), Recker (2013) outlines three main purposes of survey research, which are *exploratory*, *descriptive* and *explanatory*. *Exploratory* survey research refers to gaining better insights into a phenomenon and learning how to best measure it. *Descriptive* surveys enable learning about patterns in a given population, i.e. their attitudes, processes, behaviours etc. that facilitate a more detailed description. They are not appropriate for hypothesis/theory testing, which is the major purpose of *explanatory* surveys (Recker, 2013).

Unlike qualitative research that involves a time-consuming data gathering process and a high degree of interpretation, surveys – due to their standardised approach – are easier to manage and evaluate in the end. Yet, survey research is not suitable for any kind of research: if the topic of interest has not yet been analysed thoroughly from a scientific perspective or if the aim is to gain in-depth knowledge about a phenomenon, survey research is not the appropriate approach (Pinsonneault and Kraemer, 1993). There are also downsides to survey research, which includes its

proneness to limited response rates that might have an influence on the generalisability of the results. Surveys can also produce different results when being implemented across cultures and in different contexts, which again might impede generalisability. Finally, they just capture a momentary state that might be prone to change (Recker, 2013).

In the following, I will briefly go through the mandatory steps of conducting survey research: The construction of one or more appropriate research questions forms the start. Suitable research questions evolve around the 'what', 'why' and 'how' of a given phenomenon (Pinsonneault and Kraemer, 1993). Then, the phenomenon is operationalised, unveiling its facets (i.e. the set of variables), on the basis of which the survey questions are constructed. Then, suitable measurements for the survey items like *Likert scales* are added to it. A Likert scale is usually set up employing a so-called five or seven-point scale, which comprises a choice of five to seven answer categories, ranging from 'fully agree' to 'completely disagree', for example. Like with qualitative interviews, a *pre-test* of the survey should ensure unambiguity and clarity of the questions asked. Finally, after the survey has been sent out, either paper-based or online and responses have been collected, the data analysis can be done. For this, either straightforward descriptive statistics or more complex statistical analyses are applied, depending on the purpose. A distinction can be made between univariate and bivariate analyses, commonly denoted as *first generation data analysis*. This type of analysis is limited to the simultaneous analysis of one level of connection between independent and dependent variable. Multivariate analysis as so-called *second generation data analysis*, in contrast, include methods that are much more powerful and widely used for high quality analyses. Structural Equation Modelling (SEM) or Partial Least Squares (PLS) are two of those methods that enable the simultaneous analysis of multiple measurements of the subject of interest (Recker, 2013).

This thesis contains one survey research. In order to shape an understanding of the nature of needed competences in public administrations in Europe and in how far graduates exhibit these competences, we conducted an online survey amongst representatives of public administrations and affiliated organisations (P4: Ogonek et al. (2016)).

3.7 Content Analysis

As pointed out before, the output of qualitative research in general is some form of textual document, which cannot be analysed with statistical methods. "[C]ontent analysis is an *empirically grounded method*, exploratory in process, and predictive or inferential in intent" (Krippendorff (2004, p. xvii), emphasis as in source document). Content analysis constitutes one of the main methods of analysing qualitative data (Kumar, 2019) to infer inherent concepts. Although the term *content analysis* dates back to the 1940s, this type of analysis was already in use before, for example for the analysis of newspaper articles over a certain period of time in the late 19th century or for the analysis of mass communication to identify propaganda during World War II. Since its first appearance in journalism contexts, content analysis has spread to many different disciplines (Krippendorff, 2004). Content analysis deals with any kind of communication available in text form, such as interview transcripts or meeting minutes (Mayring, 2000). Within this analysis, the focus can either be on the frequency of appearance of the concepts, referred to as conceptual analysis, or on the co-occurrence of concepts, i.e. their relationships, referred to as relational analysis (Recker, 2013).

According to Weber (1990), there are six basic (recording) units that can be considered: word, word sense, sentence, theme, paragraph or whole text, which need to be defined before starting the actual analysis. While Recker (2013) makes an distinction between content analysis and the coding process as proper qualitative analysis technique, for many other authors the coding represents an inseparable part of content analysis (Weber, 1990; Mayring, 2000; Krippendorff, 2004). Then, the coding categories can either be *inductively* or *deductively* defined. The *inductive* category approach implies the creation, revision or reduction of coding *during* the analysis of the material, i.e. deriving the coding categories from the observed facts, whereas the *deductive* approach implies that coding categories have already been pre-defined, informed by theory, the material is analysed and interpreted on (Mayring, 2000; Recker, 2013). Once this decision has been made, the complete material is coded based on this category and coding scheme. In order to guarantee reliability, i.e. that findings are replicable, it is recommended to perform this analysis with more than one researcher (Creswell, 2013). So-called *intercoder agreements* are an established way to test the reliability. Two ore more researchers individually code a text passage, using the same codebook and afterwards compare their codings to check the

extent to which their codings match (Guest et al., 2012; Creswell, 2013). This analysis can also be supported by data analysis software, such as NVivo or QCA map, especially if there is a large number of text (Krippendorff, 2004). Finally, the results need to be analysed and evaluated. As qualitative research method, a subjective bias due to the interpretive nature of the analysis can occur, which constitutes a major disadvantage.

Three content analyses are part of this thesis. We implemented a content analysis on the online available module handbooks of Bachelor and Master programmes for the public sector in Australia, which ranks world's second in terms of e-government implementation to gain insights into whether the higher education in this domain differs significantly from the higher education in Germany (P7: Ogonek and Becker (2018)). The other two content analyses were used for the evaluation of qualitative interviews. Since both studies had interviews as primary research method, they are described in Section 3.5 (P5, P6).

3.8 Conceptual Research

Conceptual research is understood as "contributions that focus primarily on theoretical advances without relying on data" (Yadav, 2010, p. 1) and thus refers to articles that do without any empirical methods for their verification or falsification. It constitutes an important research method across different disciplines (Meredith, 1993; Yadav, 2010). Despite the focus on applied sciences in IS (Hevner et al., 2004; Peffers et al., 2007), conceptual research also plays an important role in the advancement of this discipline and ranges among the most frequently used research methods (Mora et al., 2008). Yadav (2010) advocates for conceptual research as primary method for theory development: "the conception of new ideas (e.g. new constructs) [...] or for the creative synthesis of existing ideas (e.g. new relationships between well-accepted constructs)" (Yadav, 2010, p. 2). In a similar vein, Meredith (1993) argues that only if a phenomenon is fully understood by creating explanatory conceptual models, they will also find their way into real-life scenarios, because only then managers will be inclined to use them.

Mora et al. (2008, p. 7) also refer to conceptual design research for "explorative and conceptual artifacts design research purposes" as element of conceptual research in

IS, which can be "a construct, a framework/model, a method/process or a system/-component" (Mora et al., 2008, p. 4). This is in line with the notion of DSR in this thesis. While being particularly useful in novel domains that do not (yet) have data at their disposal, a major criticism of conceptual research is the lack of empirical test, evaluation and subsequent iteration process that normally jointly emerge with the development of valid theories (Meredith, 1993; Yadav, 2010).

This thesis comprises two conceptual researches in the form of the development of a simulation game. Primarily designed and implemented for higher education in the e-government domain, we used all insights from previously implemented studies on the topic of needed competences and possible delivery modes to design this game. The simulation game is targeted towards a more context oriented competence delivery for higher education students in e-government (P8: Ogonek et al. (2019a)). Since this very 'hands-on' approach also represents an ideal competence delivery format for (vocational) training in the public sector, also given its flexible structure and high degree of adaptability, an instruction for its transfer to governmental institutions as a further development is presented, too (P9: Ogonek et al. (2019b)).

4 Research Results

4.1 Application of the Design Science Research Methodology

In this chapter, the confluent research steps that, in the end, resulted in the design of a simulation game, are presented. To do this in a comprehensive manner, the chapter is structured along the design science process steps according to Peffers et al. (2007) that guided the research endeavour, as presented in Section 3.1 and depicted in Figure 4.1. In each section, one or more of the publications will be touched upon, depending on the outcome of the respective study. Each section will be concluded with a short synthesis of the presented findings and a subsequent discussion.

As e-government competences form the basis for the whole research endeavour, they are the focus in Section 4.2 (*Problem Identification and Motivation: Competences as Basis*). The gap in scientific literature is unveiled as well as own research findings on this topic are presented in this section. Subsequently, in order to cluster the identified competences, a set of reference roles in public administrations is conceptualised that embodies the competences (see Section 4.3, *Definition of Objectives: Identification of (Training) Requirements*) .

For the effective use in public administrations, a *role fact sheet* and a *competence matrix* are developed that facilitate the classification of those competences. In addition, Hunnius et al. (2015) identified the competence delivery in German e-government study programmes as not meeting the requirements neither in terms of delivering all the necessary competences nor in the way those competences are delivered. For this reason, a comparative study with Australian e-government study programmes was conducted to derive implications for a more targeted competence delivery.

Since those elements constitute the necessary prerequisites for the design of a simulation game that addresses the identified needs, they are presented in detail in this section. The design of the simulation game as central artifact as well as its use in a suitable context (demonstration) and evaluation are presented in Section 4.4 (*Artifact Design, Demonstration and Evaluation: Let's Play E-Government*). The artifact has two instantiations: one as part of a Master's study programme course with a subsequent evaluation; the other one designed for use in governmental institutions. A demonstration and evaluation for the second instantiation are still to be implemented.

The DSRM also involves communication activities as important elements (Hevner et al., 2004; Peffers et al., 2007), which refer to 'scholarly research publications' and 'professional publications' that help to disseminate the newly gained knowledge. Given that this communication is as iterative as the design science process itself, the findings were presented at conferences and by means of journal publications. Hence, the communication activities will not be presented in a separate section, but each section will refer to the publications that were used to communicate the problem and its importance to scientific and practice stakeholders.

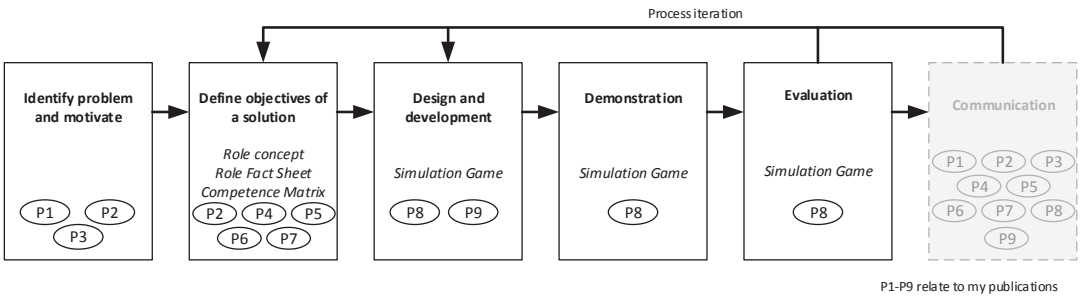


Figure 4.1: Simplified DSRM Including Research Steps

4.2 Problem Identification and Motivation: Competence Identification as Basis

As a first step to create a broad overview of the e-government research domain and to identify gaps in literature that are of major importance, but suffer limited attention in research, I conducted a quantitative literature review by means of an automated text mining analysis in P1. The main aim was to gain insights into whether the area

of e-government education and necessary competences constituted a research focus within e-government related journals and what trends were to be identified in the considered timespan from 2000 to 2016.

E-Government – A Multifaceted Research Topic

E-government spans across a variety of disciplines, which is the reason why its research contributions are very rich and can be of very diverse nature. In order to gain a comprehensive overview of the research field, a literature review constitutes a valid approach (see Section 3.2). Although many literature reviews exist in e-government, when looking at specific contributions, they mostly deal with *one* dedicated topic such as trust issues (e.g. Scherer and Wimmer, 2014) or organisational success factors (e.g. Yang and Maxwell, 2011). There are also literature reviews that attempt to provide a picture of the e-government domain as a whole, like e.g. Grönlund (2005), Madsen et al. (2014) or Rana et al. (2011). Yet, different authors define different constraints for their analysis. Whereas Grönlund (2005) investigates different scientific e-government conferences of the year 2003, Madsen et al. (2014) use the impact factor as primary criterion and analyse the 50 most cited e-government papers published between the years 2001 and 2010. Rana et al. (2011), in contrast, consider a set of five e-government journals as basis to analyse all articles published between the year 2007 and 2010.

While all of those papers offer valuable insights, their subjective choice of considered publication outlets and periods limits their validity and renders a comparison close to impossible. In addition, regardless of those reviews, continuous updates are necessary to capture the most recent research developments. What is more, with recent advancements in digital technologies, new ways of data analysis become available that facilitate the analysis of large datasets, which has not been possible before (cf. Section 3.2, *Quantitative Literature Review*). To the best of my knowledge, such an extensive literature review in terms of the considered data and timespan did not exist when I conducted this study.

In order to identify the topics that were of special interest in e-government, I analysed 2.269 titles and abstracts of the major e-government journals, as identified by the EGOV Community[1] (see Table 4.1) with an automated text mining analysis, us-

[1] www.egovconference.org/journals-1

ing the freely available online tool MineMyText[2]. The choice of focusing on journals was made because of the recommendations by Webster and Watson (2002) who advocate for using journals as prime source for relevant research contributions. This choice naturally also presented a limitation, since relevant contributions published in conferences were not considered. Yet, those were integrated in the other two qualitative literature reviews P2 and P3.

This automated search yielded topic clusters, based on the co-occurrence of words within those titles and abstracts (see Figure 4.2). The considered journal abstracts span from the year 2000 to the year 2016, depending on the journal's availability at that point of time.

Table 4.1: Considered Dataset

Journal Name	**1st Issue**	**# Abstracts**
Electronic Government, an International Journal (EG)	2004	266
Government Information Quarterly (GIQ)	2000 (1984*)	680
Information Polity	2002 (Vol.7)**	261
International Journal of Electronic Governance (IJEG)	2007	140
International Journal of Electronic Government Research (IJEGR)	2005	207
Journal of E-Government	2004-2007***	51
Journal of Information Technology and Politics	2007	215
The Electronic Journal of e-Government (EJEG)	2003	221
Transforming Government People, Process and Policy (TGPPP)	2007	228

* first issue | ** first considered volume | *** continued as Journal of Information Technology and Politics

(Source P1)

This automated analysis was run several times to identify the optimal number of topics that both yielded unambiguous word clusters and disclosed all included topics within the dataset. Following the suggestion of Debortoli et al. (2016) to limit the number of topics to 50, if human interpretation was to follow this analysis, the results of this automated analysis with a maximum of 16 topics were then presented to six IS experts in a Delphi study (see Section 3.3). This approach was chosen, since it has repeatedly shown to be a meaningful tool in IS for the identification and prioritisation of management-relevant decision-making (Okoli and Pawlowski, 2004). The experts were first asked to decide on the adequate number of topics and second, to define appropriate labels for each topic. As support for their decision,

[2]www.minemytext.com

they received so-called word clouds (see Figure 4.2) for different numbers of topic distributions.

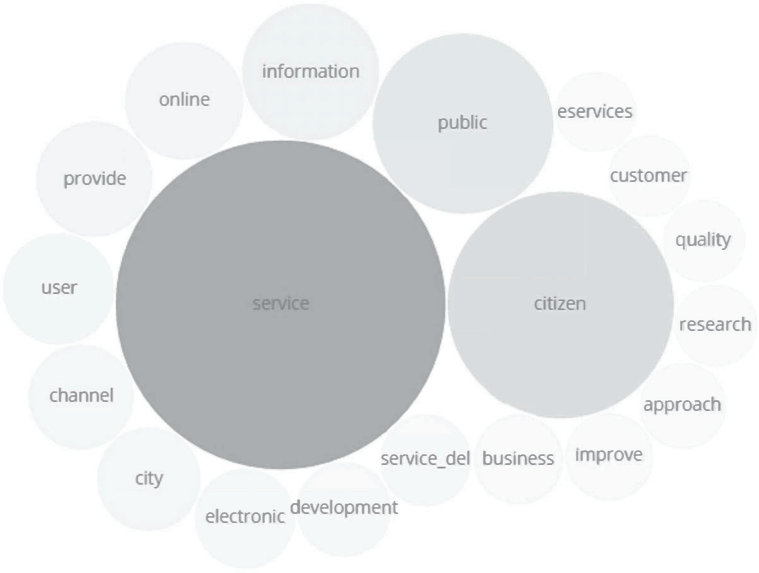


Figure 4.2: Most Relevant Words for Topic 10

(Source P1)

With this information at their disposal, they were asked to decide independently, without discussing or disclosing their results to the other experts, whether or not they could assign an appropriate label for each topic.

After two rounds, this resulted in the identification of ten topics as optimal topic number. Then, the experts assigned headings for each of those topics, again individually. As support here, they additionally received the best explaining abstracts of publications matching every topic. Those abstracts were automatically assigned to the topic by the tool, depending on the word's frequency of occurrence in a given topic. The higher this occurrence, the higher score (in %) a publication received for explaining the topic. A shortened example is displayed in Table 4.2.

In a last round, after all experts had made their choice, the ten identified topics were the following: *(T1) e-participation*, *(T2) e-government adoption factors*, *(T3) governmental information management*, *(T4) e-government research*, *(T5) socio-economic factors and digital divide*, *(T6) IT and Systems Support for e-government*, *(T7) implementation and management of e-government (projects)*, *(T8) public governance and open government*, *(T9) e-government websites and (T10) e-government services*. Those results were also com-

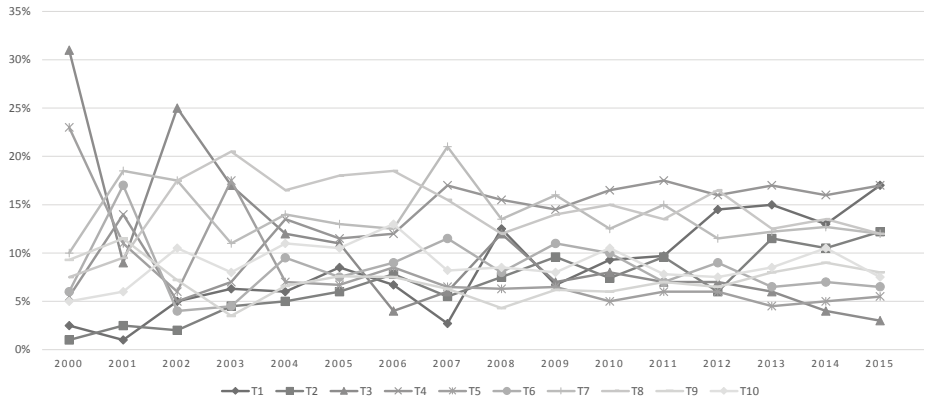
Table 4.2: Example of a Best Explaining Abstract of Topic 10 (Excerpt)

%	Abstract
96.67% Pieterson (2010)	**Citizens and Service Channels: Channel Choice and Channel Management Implications** The arrival of electronic channels in the 1990s has had a huge impact on governmental service delivery. The new channels have led to many new opportunities to improve public service delivery, not only in terms of citizen satisfaction, but also in cost reduction for governmental agencies [. . .] The authors will explore the channel choices of citizens and further converse on how these findings may help in improving channel strategies and marketing and thus help in improving citizen satisfaction and reduce cost of governmental service delivery.

(Source P1)

pared with another qualitative literature review in this domain by Scholl (2014) to check their validity, which could be confirmed and extended.

In contrast to many 'traditional' qualitative literature reviews, this quantitative review did not only provide valuable insights, but also enabled an analysis of the development of these ten topics over the considered timespan (see Figure 4.3).



(Source P1)

Figure 4.3: Development of the Ten Topics over Time

This represents a feature that is difficult to achieve with manually performed qualitative analyses. Like this, it was possible to identify times, in which the topics were of 'higher' importance (peaks) and to receive a general picture of whether they gained or lost in relevance over the considered timespan, measured by the frequency of their appearance (in %) within the considered dataset. With the help of this feature, trends in e-government research can be identified more easily. This study provides

a very good overview of the e-government landscape as such and its development over time concerning the ten identified topics. Even though text mining does not replace human analysis, because it cannot assign any meaning to the data and does not deliver any in-depth results (Debortoli et al., 2016), this study offers a first indicator for the fact that e-government competences as research topic seems to be of minor importance, since it did not appear within the final dataset.

E-Government Roles and Corresponding Competences

In the course of this research endeavour, we conducted two further qualitative literature reviews that confirmed this first impression of the topic's limited importance in research and helped to structure the findings. Although many scientific contributions touch upon it and highlight its importance, they do not provide further insights. At the same time, international policy makers such as the Organisation for Economic Co-Operation and Development (OECD) or the European Commission (EC) have recognised the need for the development and education of administration-specific competences (OECD, 2017; European Commission, 2018b). Those reviews were necessary because the first quantitative literature review (P1) did not deliver any results with regard to the topic in question. Moreover, more in-depth insights could be gained like this.

In the first qualitative study, we were interested in identifying the relevant roles in public administrations that embody the necessary competences as well as the actual competences to design tools for competence documentation and preservation (P2). As preparation and basis for the instrument development, we performed a structured qualitative literature review including a set of keywords for the identification of suitable articles, as proposed by Webster and Watson (2002). For this reason, we searched the databases EBSCOhost and GoogleScholar with the keywords *personnel/staff, role, stakeholder, e-government, public administration* as well as alternative spellings and singular/plural forms in a search period covering the months September and October 2015. We also extended this search to further scientific journals and more practice-oriented studies in the fields of e-government and public administration. This search confirmed that there was hardly any scientific analysis of e-government competences. In case there were studies that discussed the topic at all, those studies solely scratched the surface by purely mentioning *competences*

and highlighting their importance. However, they did not deliver any in-depth considerations on their composition.

While practical studies at least partly listed roles and professional areas, scientific literature on this topic, in contrast, was very scarce. Only one study stood out that considered competences necessary for e-government in a more holistic way. By means of a literature review, Hunnius et al. (2015) collected insights from scientific studies in the area of e-government that deal with competences. They summarise their findings by categorising them into five overarching professional competence categories, namely *technical*, *socio-technical*, *managerial*, *organisational* and *political-administrative*.

In their study, they confirm the lack of scientific literature on necessary e-government competences and point to the neglect of a holistic classification: "Even fewer attempts have been made to comprehensively systematize e-government competencies." (Hunnius et al., 2015, p. 2117) Their study as one of the few sources hence served as basis for the further in-depth analysis of this topic. However, they purely focus on professional competences in the collection of competences and thus do not display the complete competence set (Hunnius et al., 2015). Due to the fast pace in technological developments, the changing nature of competences as a consequence hereof, and the lack of further comprehensive literature reviews, an update and completion of their study findings, that was published in early 2015, appeared sensible.

E-Government Competences – An Interdisciplinary Mix

As the nature of design science by definition requires multiple iterations for the design of artifacts that are both innovative and workable to achieve organisational goals (Hevner et al., 2004; Hevner, 2007; Peffers et al., 2007), we performed another structured literature review in P3 in line with the guidelines proposed by Webster and Watson (2002). The aim was to examine, if there had been additions to the knowledge base in the area of e-government competences that provided a more holistic perspective and better guidance for practitioners.

In order to cover as many scientific contributions as possible, we organised the search in a two-step process. First, we used a very broad set of search terms that included variations of the terms *competence*, *public administration* and *e-government*.

Given that many scientific articles are now published that focus on the disruptive nature of IT, we were interested in the coverage of those papers, too. Hence, we focused on this branch in the second search by adding the search terms *digitalisation*, *innovation* and *technologies* to the previous search string. In total, this literature search yielded 1.235 hits, as depicted in Table 4.3.

Table 4.3: Structure and Results of the Literature Review

#	Search String	Hits
1	Competenc* OR skill* OR qualifi* AND eGovernment OR e-Government OR electronic Government OR electronic services OR online administration OR public administration OR online government	835
2	Competenc* OR skill* OR qualifi* AND digital* OR technolog* OR innovati* AND eGovernment OR e-Government OR electronic Government OR electronic services OR online administration OR public administration OR online government	400
		1.235

For this search we used the database *SCOPUS*, as it includes a wide range of scientific outlets. We limited the results to hits from the year 2000 onwards for two reasons. First, because e-government as a research domain by then started to gain in importance and second, due to the rapid changes technologies have undergone since then, which might have an impact on the competence composition as well. The identified competences and personality traits are depicted in Table 4.4. The analysis of this final dataset demonstrated the unchanged scarcity of scientific contributions on competence development in the public sector. It became obvious that this topic still seems to be of limited interest within the e-government research community.

The total number of identified contributions devoted to competences in the public sector as well as the fact that many of the authors in their works did not take up work that had been done by others, confirmed this impression of a scattered analysis of this topic. Instead, the authors focused on a subset of competences, depending on the overall research approach, for example targeting leadership competences (e.g. Mancebo Fernandez et al., 2008) or they investigated competences for selected roles, such as, for example, the competence needs of a CIO in a governmental institution (e.g. Marcovecchio et al., 2013; Iwasaki, 2014).

Table 4.4: Identified Competences and Personality Traits in Identified Articles

Type	Area	Exemplary Competences/Personality Traits
competence	business	strategic planning (Leitner, 2006; McQuiston and Manoharan, 2017); project management (Banerjee et al., 2015; Williams, 2002); programme management (Ylinen and Pekkola, 2018; Iwasaki, 2014); contact management (Schulz and Schuppan, 2011; Ylinen and Pekkola, 2018); finance (Michelucci et al., 2016); economics (Stare and Klun, 2018); accounting (Michelucci et al., 2016; Hoefer, 2003)
	IS/IT	management (information) systems (Hoefer, 2003), IT skills (Hunnius et al., 2015); information systems (Getha-Taylor and Lee, 2008; Stare and Klun, 2018); cyber security (Gharawi et al., 2014); enterprise architecture (Marzullo and Souza, 2011); technology management & assessment (Iwasaki, 2014)
	organisation	organisational design (Janowski et al., 2012; Hunnius et al., 2015); administrative processes & workflows (Hunnius and Schuppan, 2013; Noordegraaf, 2000); coordination/implementation (Schulz and Schuppan, 2012; Haq, 2011); identification with agency (Hoefer, 2003), organisational theory (McQuiston and Manoharan, 2017)
	(public) policy	public policy (Gupta et al., 2017; Awortwi, 2010); knowledge of agency's policy area (Hoefer, 2003); social policy (Hoefer, 2003); policy planning (Auluck and Levin, 2009); politics & political processes (Williams, 2002); policy processes (Schulz and Schuppan, 2011)
	law	administrative law (Hunnius and Schuppan, 2013); legal aspects for data management (Michelucci et al., 2016); legal tools (Michelucci et al., 2016); legal aspects (Marzullo and Souza, 2011); legal framework (Marcovecchio et al., 2013); regulatory theory (Mincu, 2017)
	other	professional experience (Michelucci et al., 2016; Hoefer, 2003; Brans and Hondeghem, 2005); evaluation & research (Hoefer, 2003; Reichard and van der Krogt, 2014); socio-technical skills (Hunnius et al., 2015; Dawes, 2004; Marcovecchio et al., 2013)
	soft skills	leadership (Yuryeva et al., 2015); conflict management/negotiation (Thudugala and Weerawarana, 2013); (cross-cultural/unit, oral & written) communication (O'Leary et al., 2012); mediation (O'Leary et al., 2012); assertiveness (Mancebo Fernandez et al., 2008); influencing (Mincu, 2016); relationship (Getha-Taylor, 2008)

Continued on next page

Type	Area	Exemplary Competences/Personality Traits
personality	character traits	tolerance (Banerjee et al., 2015); continuous learning (Gharawi et al., 2014); creativity (Bhatta, 2001); commitment (Auluck and Levin, 2009; Virtanen, 2000); tenacity & perseverance (Mancebo Fernandez et al., 2008); flexibility (Brans and Hondeghem, 2005)
	analytical	critical thinking (Gunn et al., 2014); analytical thinking (Thudugala and Weerawarana, 2013); strategic & innovative thinking (Getha-Taylor and Morse, 2013); decision-making (Bhatta, 2001); problem-solving (Haq, 2011); abstraction (Ylinen and Pekkola, 2018)
	self management	self-organisation (Schuppan, 2014); self-control (Gupta et al., 2017); self-awareness (O'Leary et al., 2012); self-confidence (Getha-Taylor, 2008); self-reflection (Schuppan, 2014)
	other	psycho-social stability (Auluck and Levin, 2009)

(Source P3)

Synthesis

Overall, the conducted studies show independently of each other that research on e-government competences is still in its infancy. Despite the repeated call for a focus on the training and education of administration-specific competences in a digital public sector, this area has received little scientific interest. It does not appear within the ten most discussed topics that shaped the scientific discourse in that area throughout a timespan of 16 years (P1). Its limited appearance is underlined by the findings in P2, where the few identified studies limit themselves to mentioning the topic or the term itself, but fail in providing a more in-depth analysis of it. In P3, at first glance, it seemed that in the meantime a lot of scientific discussion evolved around the topic, judging on the high number of initially 1.235 identified studies. However, when taking a closer look, it becomes evident that most of these contributions are still limited to a superficial examination of the topic, only mentioning the term on a side note without going into further details. In the end, only 43 studies were left that treat the topic in a more differentiated way, offering a rather holistic perspective. Moreover, instead of building on each other, existing publications mostly provide isolated perspectives and a focus on single roles. Yet, with our findings from P3, we could validate the results obtained by Hunnius et al. (2015). We intentionally opted for not using their category names to classify our results, but basically came up with nearly the same categorisation in the end. Despite the fact that our categories exhibit

slightly different terms, they can be seen as synonyms. The biggest difference is the splitting up of their *political-administrative* competence category into two separate categories, which we labelled *(public) policy* and *law*. What is more, we extended their competence framework to *soft skills* and *personality traits*.

This limited and ragged analysis naturally also translates into the education and training of the needed competences, that, depending on the strategic orientation of the educational institution, teach some fraction of those competences instead of providing the complete competence mix, as identified by Hunnius et al. (2015). For this reason, there is a need to derive a comprehensive set of e-government competences that meets the diverse demands of the interdisciplinary work environment of public servants.

Discussion

The majority of the few studies that examine necessary e-government competences in a more detailed manner, consider the governmental institution as one entity. These studies mostly do not differentiate between the variety of different roles a governmental institution accommodates, as also discovered by Greger et al. (2014). There are some studies that focus on employees in general (e.g. Mancebo Fernandez et al., 2008), on leaders (e.g. Getha-Taylor and Morse, 2013; O'Leary et al., 2012) or they make a distinction between IT-related and non-IT-related jobs (e.g. Marzullo and Souza, 2011; Gunn et al., 2014). Yet, those studies exclusively target one role or job type. This very basic differentiation, however, neither covers all governmental roles nor does it unveil whether or not those competences are needed in the governmental institution per sé or if they are task, i.e. role-specific.

This leads to a dispersed view on e-government competences. Considering the entirety of identified articles, it becomes clear that there is a lack of conceptual and/or theoretical approaches to the topic. The great majority of articles bases the findings on empirical approaches. One the one hand, this is comprehensible, because employee competences in general are a topic that needs to advance close to practice in order to remain applicable. On the other hand, especially regarding the field of e-government competences, practice and theory need to go hand-in-hand, since "[a]s a pracademic field, public administration is based on the integration of academic

concepts with its practical applications, as its boundary and scope are increasingly expanded in an ever-complex world" (McQuiston and Manoharan, 2017, p. 174).

This mainly empirical focus exhibits another weakness. Despite providing practically relevant contributions, our in-depth analysis of identified articles (P3) shows that those empirical studies rather start their investigation from the very beginning than building on previous research contributions that target a similar topic. Thus, a better linkage of existing research could help in providing a more complete picture on needed e-government competences. Besides, given that different roles might have the same competence needs, but not to the same extent, a differentiation of the competences in two dimensions, *horizontally* and *vertically* might be useful. The *horizontal* dimension distinguishes the competences concerning the tasks within a governmental institution. For example, a CIO of a governmental institution might need more business skills than does a case worker, who, in contrast, might need more soft skills. The *vertical* dimension then distinguishes competences in relation to the degree to which they have to be appropriated from basic knowledge to in-depth competences that enable a *role* to actively evaluate and design new systems.

4.3 Definition of Objectives: Identification of (Training) Requirements

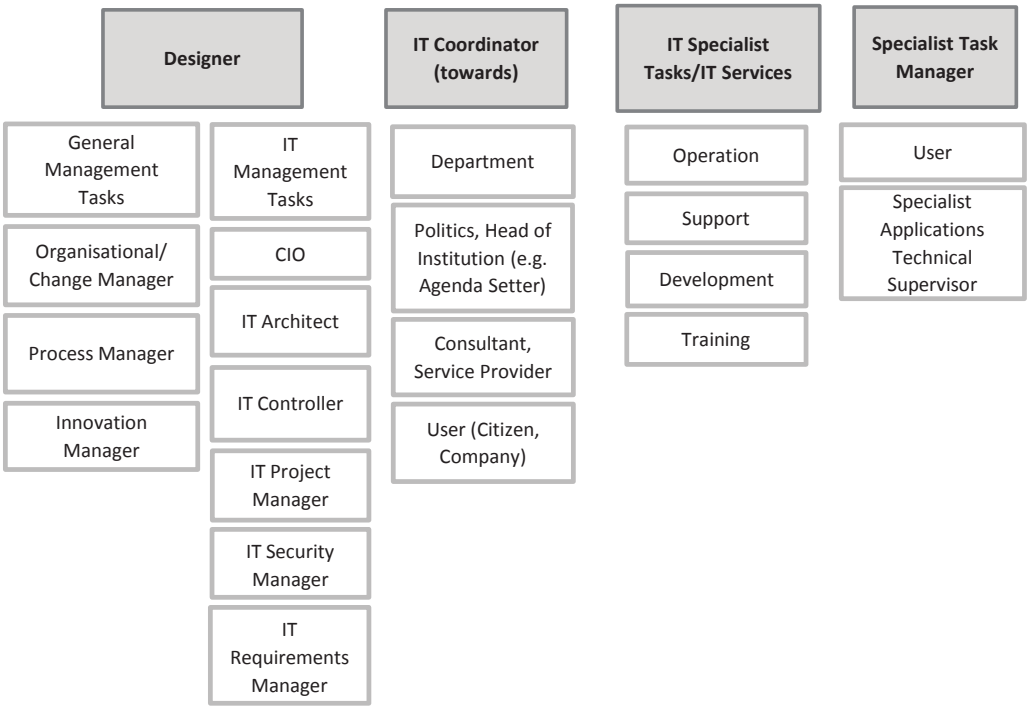
The previous section laid the basis by providing a comprehensive picture of the interdisciplinary competences that are needed in today's digitalised public sector. For a simulation game to fulfil its educational purpose, besides having elaborated on the competences as such, it is also important to investigate which *roles* are of importance in the digital transformation process of the public sector. As mentioned earlier, competences are embodied by human beings, i.e. public servants in the specific public sector case. Those competences that are important in an organisational context are bundled in organisational roles, where every employee can embody one or multiple roles.

Roles as Competence Repositories

Given the lack of scientific insights into the supply side of e-government, i.e. the structure of governmental institutions in terms of corresponding roles and responsibilities (Greger et al., 2014), we conceptualised relevant roles in German public administrations. Our study aimed at identifying relevant roles in a digital public sector as well as their corresponding competences. Moreover, once having established this reference role concept, the study also targeted providing practitioners easy to use instruments that can support the documentation of these competences (P2). In doing so, available competences can easily be identified and competence needs can be detected right away. Thus, measures can be promptly taken to counteract possible competence shortcomings like sending employees to trainings. In order to reach this aim, we analysed current public sector job advertisements on national level with IT relevance. We also examined organisation charts from the German federal and state level as well as IT strategies at those levels to fully capture the requirements that need to be met. For their refinement and streamlining, we additionally conducted expert workshops during each important development step with public sector practitioners and experts from academia. They helped to ensure that the results stayed close to the public sector reality and actually reflect practice needs.

With the experts' experience, we iteratively came up with a final role concept containing 19 reference roles (see Figure 4.4) that public administrations need to master their way in the digital transformation process.

Those 19 roles are grouped into four different categories. The first category subsumes the *Designers*, which are management-related roles, that can be split into general management-related tasks or tasks with an explicit IT focus. Nine roles are included in this category. The category *IT Coordinator* includes all roles that operate at the interface between the IT department and different internal and external stakeholders. Four roles belong to this category. *IT Specialist Tasks* are the roles responsible for the development, operation and support of the IT systems and applications. They also provide trainings for users. This category again contains four roles, that can either be located within the public administration or be outsourced. The fourth category *Specialist Task Manager* can be divided into Technical Application Supervisors and Users.



(Source P2)

Figure 4.4: Identified Roles

After the identification of roles, the competences needed to be mapped accordingly. For this reason, we again conducted focus group workshops and consulted the findings on competences from scientific literature, as identified in previous studies (P2, P3). In doing so, we did not only come up with the competences needed for each role, but also designed two instruments that enable a structured documentation of these roles. Those instruments are a *role fact sheet* that subsumes all characteristics of a role and a *competence matrix* to determine the appropriate level of the competences needed. These instruments constitute further ingredients on the way to designing the actual artifact, the simulation game.

Role Fact Sheet: An Instrument for Competence Documentation

In order to gain an overview of the competences that are available within an organisation and to identify competence gaps quickly, it is important to find a way of describing the roles in a structured and comprehensive way. For this reason, we developed a so-called *role fact sheet* (see Table 4.5).

Table 4.5: Template Role Fact Sheet

Role Fact Sheet	
Role Fact Sheet Number	-
Role name	-
Classification towards a role category	-
Role description (textual)	-
Tasks and responsibilities (bullet point list)	-
Professional competences	
Technical	-
Socio-technical	-
Organisational	-
Management	-
Political-administrative	-
Soft Skills	
Social Competences	-
Personality Traits	-

(Source P2)

Each role fact sheet is equipped with a role number and a dedicated role name to be easily identifiable. Moreover, it is assigned to one of the four overarching role categories (*Designer*, *IT Coordinator*, *IT Specialist Tasks/IT Services* and *Specialist Task Manager*). It offers a brief textual role description with a summary of the most important responsibilities. To facilitate a fast and simple overview, a bullet point format is used to list the main tasks and responsibilities again, similar to how they would appear in a job description, which eases a possible transfer towards such a description later on. The competences are divided into two categories: *Professional* competences and *Soft skills*. Professional competences contain work/and task-related competences. Here, we followed the example of Hunnius et al. (2015) and created five sub-categories:

technical, *socio-technical*, *organisational*, *managerial* and *political-administrative* competences. The second category are non-work/non-task-related competences, which refer to personal characteristics and can be subsumed under the term *soft skills*.

We grouped those competences in two sub-categories. On one side, this includes *social competences*, which are competences directed towards dealing with other persons. Examples are leadership or negotiation skills. On the other side, this also involves *personality traits*, which a person naturally possesses and which are shaped by a person's upbringing, culture and beliefs, amongst others. "Personality traits are defined as the relatively enduring patterns of thoughts, feelings, and behaviors that distinguish individuals from one another." (Roberts and Mroczek, 2008, p. 31) Those competences are directed towards a person's characteristics and, in contrast to social competences, can only hardly, if at all, be trained. Examples for personality traits are proactivity or curiosity. This neat description of the roles in the role fact sheets including tasks, responsibilities and competences eases both an overview of the needed candidate profile for the creation of job advertisements by using a standardised structure and an easy adaptation to the particular requirements. Their uniform structure facilitates a better comparability between different roles, too.

The reason for extending the competence list to non-work/non-task-related competences was that study findings showed the increased demand for these *soft skills* that need to be trained (P4–P6). The importance of those competences was already mentioned by Leitner (2006, p. 4) who points to the fact that "the main changes in skills are related to social and communication skills". Those competences have been repeatedly mentioned in many e-government related publications since then. However, they do not pass this stage of just being mentioned on to being incorporated into the set of necessary e-government competences. The majority of authors still focuses on professional competences such as Dawes (2004), Janowski et al. (2012), Janowski et al. (2013), Gunn et al. (2014), and Hunnius et al. (2015). Yet, the importance of soft skills seems to be of growing importance, since the topic has also found its way into higher education (Schulz, 2008; Carter, 2011). This elevated need for soft skills could be confirmed in a survey conducted amongst public sector professionals in Europe (P4).

Competence Training Needs for Public Servants

In order to examine the validity of the e-government competences as found by Hunnius et al. (2015), and to elaborate on the resulting training needs, we conducted a survey with European public sector professionals with the aim of identifying the competences sought by public administrations in Europe (P4). The survey was implemented using the online platform LimeSurvey[3] (see Appendix A.1 for the complete questionnaire). As basis, we used the just named competence categories established by Hunnius et al. (2015): *technical*, *socio-technical*, *organisational*, *managerial* and *political-administrative*. We measured the respective competence importance on a 5-point Likert scale from 'unimportant' to 'very important'. In order to allow respondents to name further competences, they deemed important, they could list those in a free text field. The survey was translated into six languages to make it understandable to a broad set of European countries. After a pre-test, it was sent out per e-mail to 12.000 target respondents in January 2016. In total, we received 2.155 responses, whereof 697 constituted complete and thus valid responses, which we used in the end to run the analysis with the help of the SPSS Statistics software.

While we could confirm the general importance of all five professional competence categories, with IT, administrative competences and management competences being mentioned most often, the open-ended responses also revealed that soft skills in the fields of leadership and communication are of prior importance for the digital transformation process of public administrations.

These findings could be substantiated by an interview study that we implemented in German public administrations (P5). Targeted at the identification of competence needs in public administrations, we conducted ten interviews to find out what kinds of trainings are currently provided and need to be provided in order to facilitate the digital transformation process. It was the goal to understand both their needs and the scope of currently offered trainings. Our findings indicate that Information Technologies have become an integral part of the public servants' work environment that are used in a manifold way in their daily work.

Therefore, not surprising it is IT skills that all public servants need. Yet, the answers from the interviews suggest that it is not the mere use of software what is meant by this, but that public servants need a basic understanding of and "feeling for IT",

[3] www.limesurvey.com

which also implies the need for "more courage in using IT" (quotes from two public servants in P5), i.e. trying and using different systems and in general, to be open to change. Besides those two elements, soft skills such as self and time management as well as increased communication skills were also mentioned as crucial competences in order to be able to cope with this 'new quality' of information flow and organisation of work, which accordingly have to be trained, too. According to a public sector interviewee (P5) "most trainings, about 90% are juridical ones". Role models are also an important factor in this regard, i.e. IT savvy employees, primarily in higher positions, who can support in smoothing the transition by communicating the change process as early as possible and continuously to all employees and maybe even more important, living the digital transformation themselves. An early and continuous communication from the management to the employees was identified as important ingredient that public administrations appear to be still lacking. A digitalisation strategy as another elementary component that provides a joint vision and guidance for all employees is something public administrations apparently lack, too (P5).

Despite the widespread belief that private sector organisations are much more advanced with regard to the use of IT (Sethibe et al., 2007), we conducted a comparative study with 17 interviews in German public administrations and private sector organisations (see Appendix A.2 for the interview guideline). Our aim was to find out, whether or not this was the case and if so, if the public sector could possibly learn from the private sector by adopting 'best practices' from it. After having conducted the study, we cannot confirm this assumption of the private sector as first mover. Our results partly even contradicts this assumption. Our aim was to analyse which digital competences are required by employees in both sectors and how they are equipped with these competences by means of trainings (P6). The findings indicate that private sector companies can be divided into two groups. Younger and smaller private sector organisations appear to be having a better understanding of the exigencies digitalisation poses and can react accordingly. This might be ascribed to the fact that digital technologies oftentimes form the basis for their underlying business model. In contrast, larger and more traditional private sector organisations react similar as governmental institutions in slowly responding to the digital change. In terms of competence needs, both types of organisations see an increased need for competence updates due to the changed requirements of the work environment by digital processes. In general, besides technical competences, both organisational

types highlight the increased need for soft skills such as time management, curiosity, flexibility and an understanding of the impact of the digitalisation on the offline world due to this digital transformation process (*impact awareness*). Within the process of identifying those competences, it became increasingly obvious that, although the same competences might be needed by different roles, they do not necessarily need to be mastered to the same extent. This is why we developed a competence matrix as another instrument in order to meet this demand.

Competence Matrix: An Instrument for Determining the Competence Level

Besides the role fact sheet, a competence matrix was designed as important instrument in governmental institutions to accommodate for the different levels in which the identified competences might appear. In contrast to a role fact sheet that is descriptive in nature, a competence matrix offers the possibility of contrasting the identified competences with different levels of mastery. We created the competence matrix because of the realisation that *roles* can have the same competence requirements, but might differ in the level that a given competence is needed in, depending on the role's specific tasks and responsibilities. Whereas a CIO for example needs detailed knowledge and competences to develop an IT strategy, an IT specialist with the focus on user training, might need to know that such a strategy exists but not what it entails in detail nor how it was set up.

Therefore, in addition to identifying the nature of competences, the competence level needs to be equally defined. For the identification of suitable levels of competences, we followed the competence classification of Benjamin Bloom (Bloom et al., 1956), as refined by Krathwohl (2002) that groups human learning into the six levels *remember, understand, apply, analyse, evaluate* and *create*. To facilitate the competence level determination for use in practice, we reduced those six levels to three levels, which are *know, apply, design*. *Know* refers to the original levels *remember* and *understand*, which implies a passive mastery of the competence without the need for its application. The level *apply* is the same as defined by Bloom et al. (1956), where the previously appropriated knowledge also needs to be actively used. Finally, the level *design* subsumes the levels *analyse*, *evaluate* and *create* in Bloom's original taxonomy (Bloom et al., 1956). This level goes beyond the stage of mere application. It also implies the critical analysis and evaluation of a given context and the ability to design meaningful solutions. A matrix in a table format served as a suitable format, where

the competence categories are shown on the vertical axis, which are contrasted with the competence levels on the horizontal axis, as shown in Table 4.6. The matrix contains the same elements as the role fact sheet, i.e. the role name, all (previously identified) competences – presented in the same order as in the description in the role fact sheets. An additional differentiation of required and desirable competences can be made by means of using different colours.

Table 4.6: Competence Matrix

	Role name		
Competences	**Know**	**Apply**	**Design**
Technical			
Socio-Technical			
Organisational			
Management			
Political-Administrative			
	Required		
Social			
Personality Traits			

(Source P2)

While this division into three different competence levels appeared meaningful for professional competences, we did not follow this division for social competences and personality traits, since those competences are either anchored in an individual or not. It is not possible to break them further down. A role may require creativity, for example. The individual who embodies the role has this ability regardless of the competence levels, since she cannot 'turn it off' when it comes to applying or designing. Therefore, we decided to focus on indicating in general whether a role requires certain social competences or personality traits or not. In contrast to the role fact sheet, the matrix offers a more detailed picture of the competences and can be used to highlight competences that are not crucial for the role but would represent a suitable, nice to have 'add-on'. Like this, competence groups that might be important for a certain group of roles or a department can be jointly gathered.

This facilitates the internal coordinatory efforts between the Human Resource (HR) department that is in charge of the identification of suitable candidates and the actual team, the candidate will be part of.

These conceptualised reference roles, the role fact sheet and the competence matrix are instruments deemed for the use in practice, i.e. facilitating the identification, documentation and preservation of competences in the daily work in governmental institutions. They can lead to the following advantages, if comprehensively applied (see 7.5):

- *Comparability and delineation:* Every role receives its unique role description, which makes the process of comparing and delineating different roles from each other easier. Users have a clear picture of what is expected and the HR departments receive indicators for training needs and assessments. If used by a large number of public administrations, efforts within administrations can be reduced. Managers can immediately see which roles and competences are available and better assess possible needs on this basis.
- *Assessment:* As roles can be compared more easily, the process of job assessment is facilitated and can be used as basis in (yearly) performance reviews.
- *Standardisation:* The consistent use of categories and competences can reduce coordination and communication efforts for the job description and respective evaluation.
- *Basis for training and qualification:* Role competence needs can help to determine qualification and training needs. This also facilitates the alignment of those needs with the offer of educational institutions: roles and competence profiles provide a basis for evaluation in terms of necessary and available competences (i.e. existing employees). Like this, public administrations can decide more easily if missing competences need to be acquired through (further) internal training or by involving external service providers.

This practitioner's need for gaining and retaining candidates who exhibit the necessary competences is a topic that translates into higher education, too. The need for a study programme that is tailor-made for the requirements of a changing public sector has been recognised and national as well as international universities have slowly started to design more targeted programmes.

Competence Training Needs in Higher Education: E-Government Study Programmes

Hunnius et al. (2015) investigated the existence and composition of e-government-related Bachelor and Master programmes in the German higher education landscape. In their sample, they analysed 91 programmes. Out of those 91 programmes, only 38 exhibited an actual focus on e-government-related topics. Their major findings include that different subject areas are not sufficiently connected to each other, but rather taught in an isolated way, not expanding contents to neighbouring disciplines such as law or politics that could bear implications linked to its implementation. Furthermore, especially for the German sector, they see a strong emphasis on legal topics. In contrast, technical topics receive an isolated consideration, if considered at all. Moreover, socio-technical contents that address the implications of introducing IS in an organisational context as well as organisational contents are barely touched upon. The authors sum up their findings by stating "e-government is still considered as a mainly operative issue and less as a strategic challenge and an instrument for a substantial transformation of the modern state" (Hunnius et al., 2015, p. 2119). In a similar vein, Sarantis et al. (2019) did a worldwide inventory of e-government related study programmes and found a huge variety concerning the disciplines the programmes touched upon. The findings of our European survey (P4) also show that the way e-government courses are delivered across Europe does not appear to be sufficient, because the competences of graduates – especially with regard to socio-technical competences – are not rated as satisfactory.

In order to find out, if there are study programmes that better meet the requirements of a digital public sector, we conducted a study of the Australian higher education landscape in the domain of e-government, that served as comparison to the study conducted by Hunnius et al. (2015) (P7). We chose the Australian example for two reasons: First, Australia has been repeatedly voted number two amongst 193 UN countries in the last editions of the UN e-government survey (e.g. United Nations, 2014; United Nations, 2016; United Nations, 2018). Second, the country ranks this high despite its federal structure, which oftentimes serves as an 'excuse' for Germany's more cumbersome national e-government development, currently ranking world's 12th, though making up three places as compared to rank 15 in the year 2016 (United Nations, 2016).

In order to gain an insight into the composition of the Australian e-government study programmes, we examined the publicly available module handbooks of the respective university websites. Our search included three main websites[4]. For the identification of relevant undergraduate and graduate programmes, we used the search terms *public administration*, *public management* and *e-government*. Finally, we also inspected the websites of the universities that provided the programmes, identified through the website search, to ensure having gathered all relevant study programmes.

In total, this analysis yielded 126 study programmes with different degrees including Bachelor and Master programmes, as well as diplomas and certificates, offered by 31 universities spread across Australia. Since it was the aim to compare the findings to the ones made by Hunnius et al. (2015), we followed their approach and only included full study programmes, aimed at receiving a Bachelor's or Master's degree. We furthermore eliminated all those that only offered fragmented information on the programme, those that are currently not offered (any more) and programmes that targeted health, which was out of our study's scope. In the end, a final dataset of 35 programmes remained for further analysis, thereof 29 Bachelor programmes and six Master programmes. These programmes included 515 courses, which we analysed using the computer software NVivo, based on the qualitative content analysis approach by Myers and Newman (2007). We deductively categorised the courses of the module handbooks to analyse them quantitatively afterwards. By extracting the information given on the course contents as well as the course-specific learning outcomes, we coded this information according to our deductively determined categories. They were again in line with the categorisation of e-government knowledge, skills and competences, as defined by Hunnius et al. (2015). We slightly extended the comprehension of one category in consideration of the material at hand. This adjustment concerned the *socio-technical* competence category. As there were hardly any mentions of the term *e-government*, which is a suitable example of the interaction between technology and human beings in an administrative context, demanding socio-technical knowledge, we defined the *socio-technical* competence category as relating to the application of technology in a given administrative context.

> "[A] socio-technical perspective requires a continuing recognition of the interaction that is taking place between technical, economic, organisational and social

[4] www.australianuniversities.com.au; www.bachelorsportal.eu; www.mastersportal.eu

> factors when systems are being designed and, afterwards, when they are being used by groups that need the data they can provide." Mumford (2000a, pp. 132 sq.)

Our findings (see Figure 4.5) show that the majority of courses is related to the *political-administrative* competence category with an absolute number of 378 courses (40%), followed by the *managerial* competence category with 349 courses (36%). 19% of the courses target *organisational* competences, thus ranking third most often. The *technical* competence category scores lowest with only 1% (13 in absolute numbers) of the courses that explicitly deal with the use or application of IT skills and IS. Even the *socio-technical* courses with 4% (40 in absolute numbers) surpass them. All competence categories are represented by a certain fraction of courses within the 35 programmes.

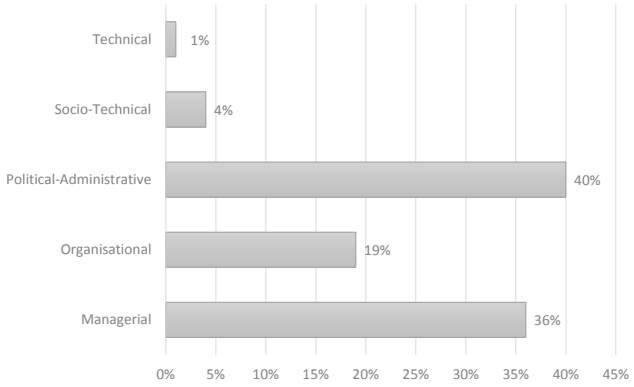


Figure 4.5: Distribution of Competences among All Offered Courses

(Source P7)

At first sight, the higher education landscape with regard to e-government and public administration in Australia seems to be very similar to its German counterpart, as can be seen in Table 4.7.

However, examining the Australian case from a closer perspective, there are certain differences that might make a difference in the end. Unlike Germany, where "social scientific topics are mostly taught apart from technical topics, so that questions and potentials of IT remain underappreciated" (Hunnius et al., 2015, p. 2119), in Australia only seven out of the 35 programmes do not offer any *socio-technical* courses. Strikingly, out of the 13 courses, classified as *technical*, eleven were also coded as socio-technical, which leaves only two that exclusively focus on technical contents without considering the application environment.

Table 4.7: Results of the Comparison

Category	DE%	AUS%
managerial	69	36
organisational	67	19
political-administrative	84	40
socio-technical	27	4
technical	13	1

(Source P7)

Even though this number still is rather low, its integration seems to be more profound and on a broader basis. Moreover, according to Hunnius et al. (2015), there is a low degree of interrelation between the different thematic foci and hence also a minor overall integration of the targeted competences in Germany. In Australia, the majority of courses touches upon more than one competence category in a course.

What we could confirm, though, is that *technical* courses remain largely disconnected from *political-administrative* topics: Out of all offered technical courses, only two also address political-administrative issues.

Another finding is that – despite its size and federal structure – Australia succeeded in agreeing upon a joint set of courses together with its neighbour New Zealand that the two countries found indispensable for a Master's education in the public sector. The *Executive Master of Public Administration*, offered by the Australia and New Zealand School of Government (ANZSOG) within a network of 15 Australian and New Zealand universities, spans national and international Australian borders. Besides, we found that practice orientation appears to play an important role in the higher education landscape. Out of the 15 universities offering study programmes in public administration, more than half of them offers internships and work placements and one third of those even entails them as compulsory part of the study schedule.

Overall, our findings indicate that in Australia e-government contents are barely taught in an isolated way, but are put into the context of the specific situation of public administrations. They address the institutional landscape as well as the particular surrounding conditions that shape the structure and functioning of governmental

institutions. This means that a single topic is being addressed from a set of possible perspectives and not limited to a single-sided view, for example the legal perspective. In addition, our findings unveil a higher focus on courses that target socio-technical competences, but are not limited to this perspective, either. An integral perspective applies for this competence category as well. Moreover, practical experience in public real-world settings appears to be of higher importance in Australia than in Germany. Hunnius et al. (2015, p. 2121) draw the conclusion for Germany that "the public administration has no clear image about what kind of educated staff they need in the context of e-government". In Australia this picture appears to be clearer, i.e. there is a need for an interdisciplinary set of competences to be able to cope with the diverse issues the public sector is currently confronted with. The courses offered in Australia appear to be better aligned to this demand.

Synthesis

Having elaborated on the different requirements that an artifact to support imparting e-government competences holistically should exhibit, this artifact ought to be designed in a way that is capable of attending to the needs of its stakeholders. For this, on the one hand, we examined this need from a practitioner's point of view: Public servants' competence needs and in how far the current training offer suffices those needs. On the other hand, we investigated in how far study programmes suffice the competence needs of future public servants. Thus, in line with scientific literature and our own findings, the following characteristics should be taken into consideration when imparting e-government competences:

First of all, the requirements for e-government competences have to be identified, i.e. the competence needs in a digitalised public sector. By means of the conducted studies, we came to the conclusion that e-government competences ought to be interdisciplinary in nature and need to be considered from a holistic perspective in order to prepare public servants for all the exigencies of their changed work environment (P2–P6). Furthermore, we identified a special focus on socio-technical competences and soft skills within this interdisciplinary competence mix (P4, P5).

Moreover, the findings from P2 indicate that for the specification of competences, the respective relevant roles that embody these competences in public administrations need to be identified in order to be able to map them to the respective roles and

vice versa. During this research it became also apparent that the documentation of employee competences appears to be of secondary importance in today's public sector reality. However, we identified this to be a significant prerequisite also in terms of competence preservation in a time of generation change and a considerable staff turnover in governmental institutions. For this reason, we conceptualised reference roles and designed a role fact sheet as well as a competence matrix that facilitate the process of identifying and documenting the competences.

Besides, as identified by Hunnius et al. (2015), the current competence delivery in higher education study programmes in Germany does only partly meet those requirements. For this reason, we examined the higher education study programmes in Australia (P7). Our findings suggest to include more practice-relevant elements within study programmes targeting e-government. Moreover, a competence delivery that considers relevant public sector topics from a variety of perspectives should be integrated, thus providing the elementary interdisciplinary view that is equally required in the later work environment of public servants.

Discussion

The two perspectives that have been opened up in the synthesis, are also discussed in this section: (vocational) training and higher education study programmes. In P5, we identified a lack of digitalisation strategy in public administrations and a lack of communication from the top to the bottom, which includes communicating early and at each stage of the digitalisation process. However, in order to involve every single employee and get everybody on board, this communication is indispensable, because oftentimes it is not a competence problem, but rather a perceived problem that can provoke fear, annoyance and a negative attitude towards the use of IT. Guiding principles and procedures, also regarding teleworking, can additionally support in this process in times of IT becoming more and more complex in governmental institutions (Rochet et al., 2012). Contingency plans for special occasions such as a system shutdown or a communication plan in not unanimously defined situations can be examples for this. It is very important to prepare managers to become role models in the digital world. They should act as digitally-savvy individuals leading the digital change.

Furthermore, in P5 and P6, we identified that training and sensitising employees early and continuously are of major importance in times of digitalisation. This is true for any kind of organisation, be it private or public. Yet, the "nature of the environment determines the amount of investment in training and the level of employee participation, irrespective of the sector in which the organization operates" (Harel and Tzafrir, 2001, p. 346). Moreover, training efforts should not be reduced to technical competences in order to achieve a comprehensive IT proliferation in public administrations (Leitner, 2006; Rochet et al., 2012). This also involves creating awareness and consciousness on the employees' side. Training also supports in making employees more acknowledgeable by better informing them. The more acknowledgeable the employees are, the less likely they will have false perceptions and insecurities. Likewise, to the extent that IT systems are perceived as easy to use, the less work load will be probably perceived by the employees. This also is in line with Carte et al. (2011), who show that after having participated in a training, employees are more strongly aware of IT, have advanced their IT competences and exhibit a higher degree of computer self-efficacy.

In a similar vein, Kim and Kankanhalli (2009, p. 579), who investigate user resistance to IS-induced change, find that besides training to enhance the employee competences, key users should serve as "champions of the change". Additionally, the "switching benefits need to be communicated clearly to users before the new system release". Clear operational objectives and guiding principles can ease this change process, too. This is also confirmed by Keen (1981, p. 30), who proposes as remedy towards possible resistance to make this change a strategic decision and get an early buy-in of the employees by listening to their concerns ("seek out resistance and treat it as signal to be responded to") and involving them at an early stage of the change process ("coopt users early"). Moreover, he suggests to become the face of this change ("become an insider and work hard to build personal credibility").

Janowski et al. (2012), too, acknowledge the importance of training and extend the competence and training needs to soft skills and personality traits, such as teamwork, self-organisation, self-reflection and process redesign. They also propose a variety of training formats like workshops and seminars delivered by professional institutions, competence centres, consultancies and also in-house trainings delivered by colleagues. In addition to those rather traditional training formats, in P5 and P6 we identified that 'multipliers' play an important role in training efforts. These multipliers are employees who are acknowledgeable in certain technologies

and are also open towards the use of (new) IT. They can help to transfer knowledge to more reserved colleagues (Carte et al., 2011). In order to nevertheless teach IT competences, a suggestion by Carte et al. (2011) is to use IT as a *tool* instead of as *course content*, following the dictum of "learning by doing". For such purposes, the reference roles, the role fact sheet and the competence matrix, designed and illustrated in P2, can represent useful concepts and tools to identify those individuals in an organisation.

While scientific literature suggests that the private sector is ahead of its public counterpart (Sethibe et al., 2007), this could not entirely be confirmed in P6. A distinction between mainly younger and smaller companies on the one hand, and larger and more traditional companies on the other hand has to be drawn. In terms of competences, irrespective of the sector, a priority area again appears to be soft skills that seem to gain in importance as well as a general need for more competences in times of rising digitalisation within an organisation. Soft skills, such as curiosity, problem-solving and flexibility should be delivered as early as possible to prepare future employees for their digital work environment. Given the need for those competences, joint efforts of targeted training strategies could also be a means to close the competence gap. Furthermore, in P6 we extended an existing competence framework on digital competences by Vieru et al. (2015) with the new dimension *impact awareness*, which refers to the individual's ability to evaluate the impact of digitalisation on processes and activities outside of the digital world. This is a competence that is of particular relevance to managers, who need to be sensitised on the impact that digitalisation can create to appropriately communicate and support digitalisation processes in the organisation. "If the superior does not create the framing conditions that the employee can apply the newly learnt behaviour patterns, that is strictly for the birds." (quote from a private sector employee in P6)

Regarding the higher education landscape, the comparison with the Australian higher education study programmes in the domain of e-government (P7) sheds light on a number of subtle differences that are worthwhile considering for possible adoption. First of all, the socio-technical competence perspective plays a much more vital role in the orientation of the Australian study programmes, thus considering technical and social aspects jointly and thereby safeguarding that the requirements of both dimensions are equally fulfilled and lead to a mutual benefit. Moreover, hands-on experience has a higher priority within those programmes, too, hence preparing the students for their future work environment. An executive Master's

programme in public administration offered by the ANZSOG that bridges national and international borders by delivering identical courses in the two countries concerned, unifies the competence delivery by establishing a kind of standard. Those three characteristics could serve as best practice for a more holistic and better targeted e-government competence delivery.

4.4 Artifact Design, Demonstration and Evaluation: Let's Play E-Government

In line with Peffers et al. (2007, p. 55), who demand to "[i]nfer the objectives of a solution from the problem definition and knowledge of what is possible and feasible", we laid the basis for the design of the simulation game by defining the necessary competences and training requirements as a basis for its set-up. As components on the way to designing the simulation game, we conceptualised reference roles in public administrations and along with it, we developed a role fact sheet and a competence matrix for the uniform description of the necessary competences for these roles. These reference roles and the role fact sheet as template facilitated the design of the different roles that formed the core of the simulation game.

For the design of a simulation game, experiential learning theory (ELT) "can serve as a useful framework to design and implement management education programs in higher education and management training and development" (Kolb and Kolb, 2009b, p. 42), and thus makes it ideally suitable for use in e-government study programmes and in vocational training.

According to de Freitas and Oliver (2006), before deciding on the competence delivery mode, it is imperative to think about the context, the constitution of learner(s), pedagogical implications and the tools that are most appropriate to be used. For this reason, they developed a framework for determining the adequacy of educational games for a given context, which should be considered *before* making a concrete choice for a game or simulation, as depicted in Table 4.8.

Table 4.8: Checklist for Evaluating the Use of Games or Simulations (adapted from de Freitas and Oliver, 2006)

Checklist for Evaluating the Use of Games or Simulations

Context	Learner specification	Pedagogic considerations	Mode of representation
What is the context for learning (e.g., school, university, home, a combination)?	Who is the learner (group)?	Which pedagogic models and approaches are being used?	Which software tools or content would best support the learning activities?
Does the context affect learning (e.g., level of resources, accessibility, technical support)?	What is their background and learning history?	Which pedagogic models and approaches might be the most effective?	What level of fidelity needs to be used to support learning activities and outcomes?
How can links be made between context and practice?	What are the learning styles/preferences?	What are the curricula objectives? (list them)	What level of immersion is needed to support learning outcomes?
	How can the learner (group) be best supported?	What are the learning outcomes?	What level of realism is needed to achieve learning objectives?
	In what ways are the groups working together (e.g. singly, partially in groups) and what collaborative approaches could support this?	What are the learning activities?	How can links be made between the world of the simulation and reflection upon learning?
		How can the learning activities and outcomes be achieved through existing games or simulations?	
		How can the learning activities and outcomes be achieved through specially developed software (e.g., embedding into lesson plans)?	

Continued on next page

Checklist for Evaluating the Use of Games or Simulations	
	How can briefing/debriefing be used to reinforce learning outcomes?

Closely reviewing the four categories of this framework, we decided on a simulation game as the ideal competence delivery mode. Simulations are closely connected to the content of a course, where students are encouraged to immediately apply theoretical contents and hence gain a better understanding, they are ideally suited to promote competence (Sauvé et al., 2007). In contrast to a game in the original sense, where the emphasis is on entertainment, a simulation game puts emphasis on reality instead, concentrating on tasks and scenarios, rather than on storylines (Tobias and Fletcher, 2007). Besides, a simulation game does not follow a competitive approach, but pursues the role's respective task completion (Gredler, 2004; Tobias and Fletcher, 2007). According to Garris et al. (2002), even though it also contains a storyboard with rules and strategies, it is much more flexible in the actual course of the game and allows for changes and alternative developments within. Thus, a simulation game involves the nuance of freedom, where the players can freely decide depending on the evolving situation, shaped by the variables and the players' (re)actions. "The goal for all participants is to each take a particular role, address the issues, threats, or problems that arise in the situation, and experience the effects of their decisions." (Gredler, 2004, p. 571)

Simulation games are particularly useful to gain knowledge and insights into complex systems and contexts (Kriz, 2003; Fumarola et al., 2012). They also constitute a powerful tool when used in an organisational context, because they help transforming organisational structures and cultures (Kriz, 2003). This flexibility and openness does not only render a simulation game particularly useful for the comprehension of complex contexts in any educational setting in general, but also makes it applicable to different contexts within the e-government domain. This is an important requirement, since the simulation game was instantiated for two different settings. The first instantiation is designed for a Master's course in e-government directed towards international Master's students who should receive insights into the peculiarities and difficulties of decision-making in e-government in a federal system (P8).

The second instantiation (P9) has a similar topic focus, but was designed for use in a governmental institution, e.g. a public administration, and therefore needs to

be adapted and fit to the time and resource constraints of the working routine of public servants. It is not limited to the German context, but opens up the perspective by describing the scenario in a federal system in general to be applicable in other countries, too. The main focus in this thesis will be on the simulation game for the international e-government Master students (P8), since it goes beyond the stage of pure conceptual development. It is currently implemented for the second time and has also already received evaluations from the learners. The three steps *design*, *demonstration* and *evaluation* will therefore mainly relate to this instantiation. Whenever there are necessary adaptations for the practitioner's game, they will be explicitly mentioned.

Simulation Game Design

According to Yadav (2010, p. 2), who refers to conceptual research as "the conception of new ideas (e.g. new constructs) [...] the creative synthesis of existing ideas (e.g. new relationships between well-accepted constructs)", we designed a simulation game in two instantiations, thus creatively but meaningfully assembling the different findings on the topic of imparting e-government competences. With this game, we aimed at mirroring e-government in its implementation as realistic as possible, because as Klievink and Janssen (2010, p. 4) point out, a simulation game is an "abstraction of reality and should capture the main complexities that need to be addressed when developing e-government."

Tobias and Fletcher (2007, p. 22) derive 13 recommendations enhancing the pedagogical effectiveness of game use for instructional purposes from scientific literature and put special emphasis on the role of guidance and support during a game as well as continuous reflection, since "[g]uidance without reflection improved recall only marginally, but had a larger effect on transfer". Dewey (1938) underpins the importance by pointing to the fact that experience needs reflections in order to enable learning.

Fumarola et al. (2012), as one of the few authors, offer a detailed ten-step approach for the design of a simulation game. Within this approach, the first five steps concern the game's conceptual development (*decision situation*, *underlying model*, *concrete case*, *structured data* and *raw data*) and the subsequent five steps (*data carrier*, *database*,

knowledge management, *simulation* and *game*) rather target the system facilities and its digital implementation.

Our simulation game uses a system support in the form of a Moodle platform, where necessary pieces of information are published and can be directly shared between lecturers and players. The players can also use the platform to privately interact with other players by sending messages. This simulation game, however, is not primarily played *online*. Therefore, the focus is on the first five design steps, which are outlined in the following paragraph:

1. Decision situation
2. Underlying model
3. Concrete case
4. Structured data
5. Raw data

In the first step, *decision situation*, a decision on the overall theme of the game is to be made. "A well-described decision situation provides both context and purpose to the simulation game design, and ultimately the simulation game." (Fumarola et al., 2012, p. 3) Simultaneously, the game designer(s) need(s) to define one or several clear objectives to be achieved with the game's implementation. What are the (major) takeaways, the learners should have? The objectives of a game can vary considerably. A game can, for example, primarily serve to improve the teamwork and create a mutual understanding, putting the knowledge perspective rather to the background. It can also be implemented with the primary objective of transferring knowledge, for example, comprehending complex issues, that are normally difficult to get an insight into via traditional teaching formats. Then, the game duration should be set. Should the game be a one-off experience or should it run over several days/weeks? This decision also depends on the setting, the game is embedded into, the complexity of the topic and the objective(s) defined. Finally, it has to be decided, how many different roles the game should ideally feature and if one player embodies one role each or if there are groups of players that play together.

After the overall theme has been set, the *underlying model* (step 2) can be determined. Here, the simulation game's rules and dynamics/relationships between the players need to be decided upon.

Based on this model, the *concrete case* can be designed (step 3). This involves breaking the overall theme down into a realistic case scenario, including as many real-life facets as there would be in a real-world setting. This also means concretely deciding on the number of players that need to be involved or determining the minimum number of roles that is needed to make the game fulfil its purposes. Besides the number of roles, the number of occasions, the players will need to meet (physically) and interact must be determined.

In the fourth step *structured data*, a data structure needs to be developed. Deciding on the data needed for the implementation of the game and on the amount and nature of (real-life) data given to the learners at which point in time is crucial within this step. This also involves thinking about the target group. What is the group's constitution (homogeneous or heterogeneous) and prior knowledge? Do the learners require more context information than the actual decision situation offers, since they are unfamiliar with the setting in general? On the one hand, datasets can be enriched with further information and exceptions, if those help to stimulate the discussion and thereby better achieving the simulation game's objectives. On the other hand, a reduction of the data used can similarly make sense in order to avoid an information overload (Tobias and Fletcher, 2007).

Step 5 comprises *raw data*. Those constitute the variables that need to be defined and that account for the dynamics within the simulation game. They shape its character and determine the course of action.

Demonstration

In the first instantiation (P8), which took place as part of an international Master's programme in e-government, the decision situation was characterised by the decision-making process for e-government in a federal system (*step 1*). As timeline, we stipulated the duration of one semester (approximately lasting three months), where the students simultaneously received a lecture on the topic of e-government in Germany in order to provide them with information on the scenario and peculiarities of the system. We aimed at creating a scenario as realistic as possible with regard to the German e-government context in order to be able to train the competences needed in this environment. At this, we oriented ourselves on the four different competence categories by Hunnius et al. (2015): *socio-technical*, *managerial*,

organisational and *political-administrative* competences. We intentionally left out the technical competence category as it was addressed by technical lectures the students received during the semester. The accompanying lecture on e-government served as first-hand information provider for the simulation game. By means of the different game elements, the inherent conflicts as shaped by the events and opposing opinions, soft skills such as presentation and communication skills completed the competence mix.

For the game's use as training instance in governmental institutions (P9), concessions have to be made in terms of the overall duration of the game, which needs to be shorter. As public servants are already familiar with the e-government context by means of their daily work experience, less support in terms of introductory information is needed.

Regarding the roles and rules of the game (*step 2*), we decided to have one designated role for each learner including basic information about the learner's role, her background, and (if applicable) her political positioning. This information briefly touched upon the player's general attitude and personal (hidden) agenda with regard to the case scenario as well as her fears. In total, we included 16 roles in this game, situated at different federal levels (cf. Figure 4.6). For public sector use (P9), the game should feature fewer necessary roles.

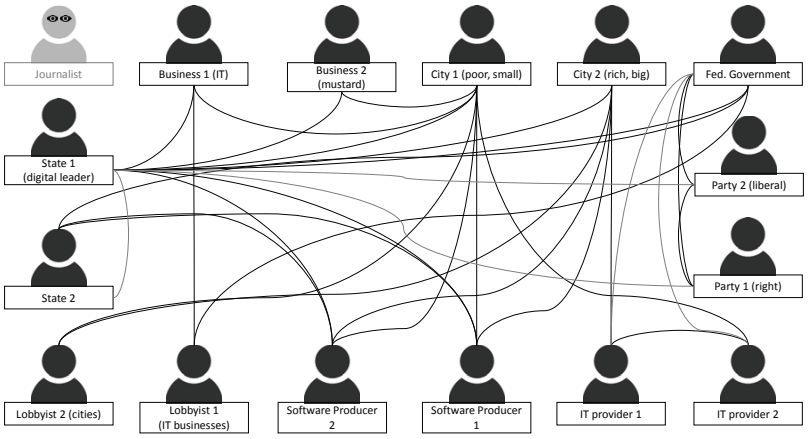


Figure 4.6: Game Roles and Relationships

(Source P8)

In order to enable as much interaction as possible, the rules were limited to a minimum. Those rules contained that the learners needed to act according to their role,

even if that meant against their own beliefs. They were not allowed to exchange the information they received on the characteristics of their roles and they needed to do some research on their role to become more familiar with the topic. As a concrete case scenario (*step 3*), we selected the upcoming nationwide introduction of service accounts in Germany, since this is a topical issue in Germany and involves a variety of different stakeholders. Within this scenario, we created five events, where all or a fraction of the players had to physically interact and take decisions. Each of these events had a fundamental influence on the initial scenario, which demanded the players' immediate (re)action (see Table 4.9).

If used in a public sector context (P9), the number of events can be reduced and each event should be designed as a stand-alone case to allow for temporary staff unavailability.

Table 4.9: Simulation Game Events

Event	Rationale
Conference on the Digital transformation of public administrations	Overview of roles and their positioning, identification of possible opponents and collaborators
Data leakage at the Federal Ministry of the Interior	Importance of privacy and security as well as technical aspects in e-government that need to be considered when attempting to reach a nationwide implementation
TV talk show debate on the bankruptcy of Bautzen	Financial austerity of German municipalities as inhibitor of successful e-government implementation
State elections in Saxony	Shift in political powers might alter political priorities and hinder digitalisation efforts
Digital summit	Vision on e-government future and reflection on events

For the design of the events employed in the simulation game, we gathered as much real data as possible and sorted them for the use in the different events. We additionally used the element of exaggeration and added information in order to make the situation better tangible for the players (*step 4*).

A case scenario should ideally contain open conflicts to bring about decision situations, which can either be done in the form of the topic that lends itself to discussion and/or by the careful choice of roles that embody those conflicting interests. We opted for including opposing roles, that – in the chosen scenario – guaranteed a

lively discussion throughout the game (*step 5*). Following the recommendations of Tobias and Fletcher (2007), we included three reflections (beginning, middle, end of the game) to measure the learner's expectations and collect feedback on the game. In order to be able to evaluate the learner's individual performance, we also employed written assignments that each learner had to deliver at some point during the game. One facilitator was present during each event, who surveyed the game flow, jumped in where the game flow stagnated, and took care of the players obeying the rules.

Given the fact that there is considerably less time for preparation and follow-up of a simulation game in the daily routine of public servants (P9), more information needs to be provided and a higher degree of guidance by a facilitator or game master is advisable.

Evaluation

As Peffers et al. (2007, p. 56) point out, the evaluation of an artifact "involves comparing the objectives of a solution to actual observed results from use of the artifact in the demonstration." This evaluation can take a variety of forms, one of which is a satisfaction survey or client feedback. As already mentioned, the regular reflections that were received before, during and at the end of the simulation game already provided valuable insights into the satisfaction of the learners towards the game. Points raised in those reflections included the call for more background/context information to be able to better play their roles, the concern regarding the degree of knowledge actually transferred by means of this teaching approach, and the formats and number of the written assignments throughout the game. One fact that already stood out in those reflections was the learners' unanimous estimate that the simulation game considerably contributed to improving their soft skills. Additionally, in order to capture in how far the competences were addressed by the simulation game as planned beforehand, we handed the players an anonymous survey, which we designed using the online platform LimeSurvey[5]. Each competence category we intended to impart was addressed with four to six statements that the respondents could rate on a 5-point Likert scale, ranging from 1 – completely disagree to 5 – completely agree. An overview of the exemplary statements for the respective competence categories as displayed in the survey can be found in Table 4.10.

[5]www.limesurvey.com

Table 4.10: Exemplary Statements for the Evaluation of Trained Competences

Category	*Exemplarily assigned knowledge, skills, competences*
technical	- not addressed by the game -
socio-technical (soctec)	The simulation game helped me to understand the change processes induced by increased technology use.
organizational (orga)	The simulation game helped me to understand the interdependencies between the different organisational stakeholders involved.
managerial (man)	The simulation game helped me to understand IT management processes.
political-administrative (polad)	The simulation game helped me to understand the influence of political will on e-government projects.
soft skills (soft)	The simulation game helped me to improve critical thinking skills.

(Source P8)

In total, we received 14 valid responses. The results show that the learners indicated having mainly improved their socio-technical, organisational and political-administrative competences. Although soft skills appeared to be the best covered competences in the reflections, this was not the case in the survey. At the very rear were managerial competences, see Table 4.11.

Table 4.11: Evaluation – Descriptive Statistics

	soctec	**orga**	**man**	**polad**	**soft**
Mean	3,15	3,29	2,46	3,23	2,85
Median	3	3,33	2	3,2	2,6
Min	1,25	1,16	1,5	1,2	1
Max	5	4,5	4	5	4,4
SD	1,27	0,91	1,07	1,23	1,15

(Source P8)

In general, it can be concluded that the game fulfilled its purpose, but that there is also room for improvement. According to Peffers et al. (2007, p. 56), at this point, the researchers "can decide whether to iterate back to activity 3 [design and

development] to try to improve the effectiveness of the artifact", which is what is currently being evaluated.

Synthesis

With the findings of all previous research steps, a simulation game as a tool for imparting of e-government competences was designed in two instantiations. The first instantiation was designed as a one-semester-spanning game for international Master students pursuing a degree in e-government. This simulation game was accompanied by a lecture on e-government in Germany. It was run in the summer term 2018 and evaluated afterwards by the student cohort. The evaluation revealed that all targeted competences were actually addressed, primarily socio-technical, organisational and political-administrative competences followed by soft skills and managerial competences. Thus, although certain improvements are still to be made, the effectiveness of the simulation game could be demonstrated in this case. The second instantiation was designed and adapted for use in governmental institutions, taking into consideration the time and resource constraints of public servants in their daily work, especially featuring fewer roles, less preparatory and follow-up efforts and shorter as well as fewer events.

Discussion

Although this instantiation of the simulation game demonstrated its effectiveness from a learner's point of view, researchers have reported mixed findings. Randel et al. (1992), for example review empirical studies targeting a comparison between simulations/games and conventional instruction formats (i.e. traditional classroom teaching) over a period of 28 years and find that more than half of those studies (56%) revealed no difference between the gamified approach and conventional forms of instruction. These results are even worse for social sciences, where 33 out of 46 games/simulations did not deliver any differences to traditional instruction formats. However, many of the simulations and games examined reported to have a greater retention over time than conventional formats and the majority concluded by acknowledging the strength of simulations to increase the learner's motivation as compared to classroom instruction.

Overall, the authors find that the success also highly depends on the subject matter: The more specific the content, the more likely a gamified approach will have positive effects. More recent works acknowledge the value and effectiveness of gamified over traditional learning approaches, which can be further enhanced by a meaningful blended learning mix (de Freitas, 2018). In a similar vein, Zhonggen (2019) reports on the effectiveness of games for educational purposes, whilst also pointing to some negative examples. The author likewise analyses the development of publications on gamified approaches in education over a ten year period and reports steadily rising numbers, which is another indicator for their effectiveness.

Despite the high number of studies acknowledging the merit of simulation games (e.g. Salas et al., 2009; Garris et al., 2002; Kim and Watson, 2018; Klievink and Janssen, 2010; Zhonggen, 2019), a lot of different factors play a role that are intertwined with its success. Bredemeier and Greenblat (1981), for example, identify a set of variables that can have an influence on the outcome of a simulation game:

- administrative variables (role of the instructor and her attitude and abilities towards administering the game)
- internal game variables (design process, degree of representation of reality)
- group variables (group size and dynamics)
- personality and cognitive style variables (game adequacy for personal learning style)
- game ability and academic ability (capacity to think in abstract ways, competence, verbal and mathematical ability)

According to de Freitas and Oliver (2006), it is important to take four perspectives into consideration before deciding on the content delivery mode, as presented at the beginning of this section. Those considerations are imperative, as the development of a simulation game comes along with some challenges, that might prevent instructors from adopting it as instruction method. First, the design and implementation of a simulation game is very time and resource-consuming (Faria and Wellington, 2004; Klievink and Janssen, 2010; Mohsen et al., 2018). Although it allows for a lot of flexibility, it has to be adapted to the respective learner group, since it is not a 'one-fits-all' solution. What is more, instructional support of the learners throughout the game experience is indispensable for shaping an effective learning environment (Garris et al., 2002). Then, limited administrative and/or technical support can hamper its adoption (Lean et al., 2006; Faria and Wellington, 2004). Likewise, limited knowledge about the existence and especially the merits and possible outcomes of

these methods can also represent a factor of adoption reluctance. (Lean et al., 2006; Mohsen et al., 2018). They are also more difficult to grade and to be fit into a regular class schedule (Klassen and Willoughby, 2003). The latter restriction becomes even more important when considering using a game within the daily work routines, where there are no or very limited designated time slots for trainings.

As the competence delivery should also centre around the learner's needs, employing a simulation game might not be the ideal type of learning style for everybody and therefore learning performance and effects can vary across the individuals in the learner group, depending on the learner's characteristics (Randel et al., 1992). As Bredemeier and Greenblat (1981) and Randel et al. (1992) point out, those factors play a decisive role on what is actually learned. This includes the learner's general attitude towards a game as a learning object in general, the concrete game scenario, personal relationships and/or prior acquaintance with other players and also the gender of the learner. While Hofstede and Pedersen (1999) encourage the involvement of players from different nationalities in simulation games to train their intercultural awareness, its effectiveness can vary, depending on the cultural context it is executed in.

Given that simulation games should be designed as realistic as possible to mimic real-life scenarios and offer an authentic preparation tool (e.g. Klievink and Janssen, 2010; Garris et al., 2002), they also need to be adapted to the current needs, which poses an additional challenge in view of the fast changing technological advances that characterise the working environment of today's public sector workforce.

Despite the laid-out points for consideration when intending to design a simulation game, this form of e-government competence delivery still appears to be very appropriate in light of the diverse exigencies that public servants have to meet. As pointed out earlier, in line with ELT, for real learning to happen, experience needs to be involved, i.e. learning by doing, rather than just listening and being told (Kolb, 1984; Kolb and Kolb, 2009a). Especially in terms of authentic preparation, the development of this simulation game represents a first important step that has the power to advance e-government competences in a holistic manner and can encourage further scholars to adopt this type of competence delivery.

5 Closure

5.1 Contributions

The overall research objective of this thesis was to design a tool for imparting e-government competences for (future) public servants. In order to achieve this objective, several individual research steps were conducted, guided by the Design Science Research Methodology (DSRM). In total, nine studies were implemented for this reason (P1–P9). The main outcomes of this thesis will be shortly summarised in the following paragraph.

As a starting point, we conducted several types of literature reviews in order to uncover gaps in literature and identify relevant e-government competences that have been addressed in scientific contributions so far (P1–P3). Although many scholars acknowledge the importance of competences for successful e-government, only few of them treat this topic as main focus of their research. This importance has also been repeatedly echoed in the form of calling for more competence provision on the part of policy makers worldwide. The results of the literature reviews indicate that e-government competences constitute a topic that has received limited attention from a scientific point of view, judging on the number of identified articles. Summarising the findings of the three literature reviews, it can be stated that the identified competences span across different disciplines. Within this competence set, an interdisciplinary mix of professional competences plays a crucial role. However, those professional competences just represent one side of the coin. The pursued studies unanimously showed that it is especially social competences that become more and more important. In general, our studies indicate that an increasing degree of digitalisation also demands more competences. Another finding is that many researchers considered the term competences very narrowly, i.e. focusing on few individual roles within governmental institutions or specific kinds of competences.

This scant and fragmented consideration and understanding of the needed competences in scientific literature also translates into public sector practice. This represented a major finding in P2, P4, P5 and P6. For a more holistic consideration of e-government competences, in P2 we conceptualised reference roles in public administrations that form the repositories of competences in governmental institutions. These roles can help to create an inventory of competences an organisation either exhibits or lacks. This conceptualisation included a total of 19 reference roles, which were divided into four overarching categories: *Designers*, *IT Coordinators*, *IT Specialist Tasks/IT Services* and *Specialist Task Managers*. To give an example, one role within the designer category is the *change manager*, who is responsible for aligning the organisation to its strategic goals and for communicating the necessary changes to all involved stakeholders. We instantiated these roles for German public administrations. This inventory is not only important for identifying the training needs within an organisation, but also offers an overview of competences as *the* strategic assets in an organisation, whose presence is pivotal for organisational prosperity. We also designed a role fact sheet and a competence matrix as instruments that facilitate the unambiguous and easy identification and documentation of competences. They also offer the possibility of determining the competence level of those identified competences.

As the provision of competences does not only play a crucial role for developing the current public sector workforce, but is also decisive for educating future public servants, higher education programmes in e-government should equally take up all of the identified competences within their competence delivery. In order to benchmark with a country that is highly developed in terms of e-government, where e-government as strategic means has become a normal procedure when dealing with public entities, we conducted a comparative study with the Australian higher education study programmes in e-government (P7). As this country has been repeatedly voted world's second in terms of e-government development, a comparison of how Australia prepares its future public workforce by means of training was sensible in order to derive implications from it. Due to its federal structure, its public sector system operates similar to the German system. This study showed that all needed competences are addressed in a more balanced manner, although this does not hold true for all examined programmes. Furthermore, we identified a more profound focus on courses that target socio-technical competences, than it is the case in German study programmes in higher education. Our most important finding here was the

focus on education in context, i.e. addressing a topic or a complex issue from all involved angles, such as the legal, managerial and organisational perspective. This integral perspective, close to the public sector reality, sustained by mainly mandatory internships, is what makes a difference in the competence delivery within the e-government study programmes in Australia.

Practical experience thus constitutes an important ingredient for a targeted competence delivery in the public sector. This also implies becoming active instead of solely listening and being told. As simulation games are particularly useful for addressing changing competence needs in the digital age, which is especially the case in the e-government domain, we designed a simulation game that is capable of mimicking public servants' reality and, in doing so, can help to sharpen the understanding of the topic in question. It allows to 'learn by doing' without running the risks that would occur in real life. The designed and implemented simulation game's overall topic is the countrywide introduction of service accounts in Germany, which represents a topical issue in the German e-government reality, constituting an element of its digitalisation agenda. We designed this game for international students pursuing a Master's degree in e-government as introduction to the complex German e-government landscape, shaped by its federal structure. The game ran over a period of three months, accompanied by a 'traditional' lecture on e-government. In total, 16 roles at different federal levels with partly opposing opinions and individual agendas were included in this scenario. The core was formed by five events that fundamentally influenced the course of the game and hence the situation of the roles that needed to (re)act accordingly. In doing so, the players did not only learn about e-government processes and impediments, but also practised different relevant e-government competences. The evaluation of this game demonstrated its effectiveness in delivering those competences.

In general, simulation games as a tool for imparting competences should be increasingly used in higher education as well as in training programmes for e-government in order to, on the one hand, introduce future public servants early to the interdisciplinary environment, they will be employed in, and on the other hand, to update the competences of current public servants in an easily accessible manner. It is indispensable for practitioners to understand the importance of the specific context in which they are working in order to be able to bridge the existing gaps and, in the end, to create a better e-government reality.

5.2 Implications for Research and Practice

Implications for Research

The findings and outcomes of this thesis contribute to existing research in several ways. With the help of a quantitative literature review (P1), the ten topics that shaped the scientific e-government debate since the year 2000 were highlighted. E-government scholars can use this as a basis for their own research endeavours in the broad e-government domain. The entirety of literature reviews (P1–P3) revealed that e-government competences are so far seldom addressed by scholars in scientific literature within the e-government domain. This thesis addresses this gap by pointing to their importance and providing a holistic overview of the interdisciplinary competences in need by validating and extending the competence framework from Hunnius et al. (2015) and thus, the body of knowledge in this area. Since e-government constitutes a domain with constantly changing competence needs, this extension forms a basis for further research in this area.

Both the conceptualised reference role set as well as the instruments (role fact sheet and the competence matrix) (P2) can support in mastering the digital change process that governmental institutions are confronted with. Those contributions can serve as a basis for further exploring the change processes in governmental institutions. New roles might need to be designed while some other roles may become obsolete due to the ongoing technological advances.

The survey (P4) and the two interview studies (P5, P6) exhibit an increasing need for social competences on the part of public servants, when digitalisation efforts set in. Besides professional competences, the interview study (P5) also offered an extension to an existing model by means of adding a new dimension to digital competences: *impact awareness*, which can be used by other e-government scholars for its validation and further development.

Moreover, the designed simulation game as central artifact and major outcome of the thesis offers a tool for a targeted competence delivery in a digitalised public sector (P8, P9). Due to its flexibility in terms of content and structure, it can serve as a blueprint for using simulation games for educational purposes in general and for e-government education in particular. E-government scholars can use this blueprint

to evaluate the effectiveness of this game-based approach for the knowledge acquisition in this domain. In general, all outcomes of this thesis can be built on in order to advance the scientific body of knowledge in the area of e-government competences.

Implications for Practice

This thesis also exhibits several contributions for practice, i.e. governmental institutions. First of all, governmental institutions as well as educational training providers can make use of the identified e-government competences and offer more targeted trainings that address the interdisciplinary competence needs in order to have a workforce that is prepared for the digital change. The conducted studies have shown, that although digitalisation has arrived in the public sector, many governmental institutions do not (yet) know which competences exactly need to be trained. Besides purely professional and content-related competences, this thesis has shown that soft skills are at least as important as professional competences and thus, also need to be considered and adequately trained.

Second, the conceptualised reference roles as well as the role fact sheet and the competence matrix can help governmental institutions in facilitating their competence management since they represent 'hands-on' instruments that offer an easy application and can be adapted flexibly to the respective institution's needs. They can be used in order to identify, document and also safeguard existing internal competences and ensure a sound knowledge transfer.

Third, the conducted studies indicate an increased need on the part of the employees for more guidance when dealing with IT and IS. Guiding principles and procedures, also regarding teleworking, can support in this process, in times of IT becoming increasingly complex in governmental institutions. Department or agency heads should therefore take a leading role in communicating changes as early as possible and in involving their employees actively within this change process. They themselves should become IT-savvy role models that lead the digitalisation process.

Fourth, as the comparison with the private sector organisations revealed, those are not entirely different to public sector institutions. It is rather a matter of their size and whether they are more traditionally-oriented or not. Public and private sector

organisations should carry out regular cross-sector experience and best practice-exchanges in order to reduce uncertainties in dealing with the digitalisation and to encourage learning from each other.

Fifth, despite its absence in current higher education study programmes and (vocational) training efforts, the design and instantiation of the simulation game for e-government has demonstrated its validity in terms of providing a targeted and realistic imparting of the identified e-government competences. With necessary adaptations in terms of time and resources, this simulation game can also become a powerful tool for training purposes in governmental institutions. Higher education institutions as well as educational providers in general can enhance their competence delivery and training spectrum by offering such a simulation game, since it offers a valuable addition to the currently prevalent rather traditional forms of teaching.

5.3 Limitations and Outlook

This thesis exhibits several limitations and raises further research questions that are worth looking into. First of all, the majority of the empirical results has been gathered in the German public sector context. The comparative study with Australia showed that the situation there is different. This fact might also hold true for other countries, since the national public sector is shaped by the administrative culture and the political system it is embedded into. Therefore, a transfer of the outcomes to other countries needs careful consideration. For future research, the design and implementation of context-sensitive simulation games could shed light on their effectiveness and further points that need to be taken into consideration. At the same time, cross-country studies could serve as best practice-examples for governmental institutions in other countries and might encourage educational providers and governmental institutions alike to adopt such a gamified approach.

The designed simulation game was instantiated for higher education study programmes in e-government and for the use in public administrations. However, the second instantiation has only reached the conceptual stage. Only an empirical validation in a public sector institution will shed light on its effectiveness as training means there as well as point to possible further necessary adaptations for practice

implementation. This might also be an interesting future research avenue. The findings suggest that the use of innovative teaching methods in general, in higher education competence delivery and in (vocational) training, as well as its effects should be investigated from a scientific and practical perspective.

This research endeavour was limited to two educational forms: higher education and vocational training. In Germany, however, there is a third way of educating (future) public servants, which is by means of an apprenticeship system, including vocational college and enterprise experience. This type of education is a German specificity, which hardly exists in other countries. Future research could also take up the existing approach and evaluate its suitability for this type of education in the public sector.

Overall, designing a simulation game does not represent a 'one-fits-all' solution. It always has to be adapted to the respective context and target group. Yet, due to this flexibility and adaptability, the use of a simulation game can also be transferred to other sectors and contexts and be evaluated accordingly. Further application cases are close to infinite and could deliver more insights into the topic.

Having said this, it is crucial to find out who the targeted learners are and also define the characteristics of 'optimal' learner(s) for this kind of education with whom the implementation of a simulation game can leverage its full potential. Not every learner will respond equally well to a game as a learning approach and might prefer other individual learning approaches: "one learner simply may not adapt to the use of one kind of representation of information or may work better with another" (de Freitas and Oliver, 2006, p. 256). Moreover, to the best of my knowledge, there is limited research on how to concretely design a simulation game, which makes it difficult to maintain an overview of all necessary ingredients for its successful implementation. Thus, more research should go into collecting and validating the necessary requirements in order to provide a structure for scholars that seek guidance in designing such a simulation game.

In addition, we tested the simulation game in a small sample, demonstrating its effectiveness for one specific case. Yet, due to the limited use of simulation games in the e-government context, best practices are scarce and therefore more studies are needed that put the use of a simulation game to a test, also with regard to its possible use in other contexts, such as the implementation of a simulation game for training purposes in a public administration. What is more, even though the

participants of this simulation game were an international student group, the focus of the game was on the German e-government context. More research could also go into measuring the adequacy and acceptance of such a gamified approach in different cultural contexts.

Moreover, it remains a challenge to objectively measure the effectiveness of a simulation game, since participant evaluations only reflect their subjective satisfaction with the simulation game and might not suffice to reveal insights into its effectiveness. Therefore, measurements need to be developed that help to objectively measure the success with regard to constituting an effective learning means.

Likewise, more research also should target the influencing factors for using IT. Although, age is oftentimes referred to as one of the decisive factors for the inclination to use IT in literature, we could not unanimously confirm this finding. Instead, research should try to investigate personal characteristics, such as the personal use of IT in private life of employees as well as their attitude towards IT in general, since those seem to be more promising predictors of employees' inclination to use IT at work. Our results suggest that employees oftentimes find themselves in situations that are not unambiguously defined and therefore leave room for interpretations and mistakes, resulting in possible resistance. We identified fears that arise in terms of legal uncertainties in dealing with IT, the possible damage of IS because of its wrong usage and the fear of being substituted by IS.

Finally, the topic of imparting e-government competences naturally involves a technical component, which needs to evolve in line with the pace of technological advances. Longitudinal studies could help in analysing the changes that are needed to stay up-to-date with educational approaches in the field of e-government. Since the majority of my studies were qualitative in nature, implying small sample sizes and limited data, future research can put the presented findings to a test by exposing them to a wider basis.

5.4 Conclusion

This thesis set out with the question, whether the success of e-government is a self-fulfilling prophecy. The clear answer is 'no'. E-government just like any other technologically enhanced process or approach, is just a means and not an end in

itself. Technological advances can only be successfully and fully leveraged in an organisation to the extent that its employees are educated/trained in accordance with today's needs that also depend on the digital progress. "Without relevant competences, successful action is feasible by chance only, no matter what other resources the company controls or has access, too." (Nordhaug, 1993, p. 83). In a world of ever-rising political, social, and economic uncertainty digitalisation appears to be one of the few constants. Only if there are competent public servants who know how to make use of this 'constant', e-government can become successful, which is why the meaningful and comprehensive imparting of the necessary e-government competences remains a pivotal issue that is more topical than ever before.

Part B

"Supercalifragilisticexpialidocious!"

Mary Poppins

6 The Tale of e-Government: A Review of the Stories that Have Been Told So Far and What is Yet to Come

Fact sheet of publication P1

Title	*The Tale of e-Government: A Review of the Stories that Have Been Told So Far and What is Yet to Come*
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Publication Type	Conference Proceedings
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Abstract. *Since its first appearance, the concept of e-Government has evolved into a recognised means that has helped the public sector to increase its efficiency and effectiveness. A lot of research has therefore been done in this area to elaborate on the different aspects encompassing this concept. However, when looking at the existing e-Government literature, research mostly focuses on one specific aspect of e-Government and there are few generic publications that provide an overview of the diversity of this interdisciplinary research field over a longer term period. This study analyses the abstracts of eight e-Government journals from 2000 to 2016 by means of a quantitative text mining analysis, backed by a qualitative Delphi approach. The article concludes with a discussion on the findings and implications as well as directions for future research.*

6.1 Introduction and Problem Statement

It was in the 1990s, thus more than two decades ago, when governments started their endeavour to the online world and when the term *electronic government* (e-government) was coined (Anthopoulos and Reddick, 2015). One quite broad definition states that e-government is "the use of information and communication technologies in public administrations combined with organizational changes and new skills. The objective is to improve public services and democratic processes" (European Commission, 2006). One may dare to say that it has not only considerably changed the way public administrations are operating today (Gascó, 2003), but it has also become a broadly recognised concept that "holds tremendous potential to improve the way that governments deliver public services and enhance broad stakeholder involvement in public service" (United Nations, 2014, p. iii). However, there is also a downside to it: political, organizational, social and technological challenges like e.g. continuing low adoption rates (Akkaya et al., 2011; Hofmann et al., 2012; Kumar et al., 2007) or implementation issues (Hellberg and Grönlund, 2013; Müller and Skau, 2015) prevent it from tapping its full potential. The multitude of aspects e-government is confronted with – positively as well as negatively – justifies the growing body of literature that is exclusively dedicated to this domain: The Electronic Government Reference Library (EGRL)[6], hosted by the University of Washington, currently contains 7.899 peer-reviewed scientific contributions in the field of e-government. In 2015 alone, 664 entries were added to this overview of

[6]http://faculty.washington.edu/jscholl/egrl/

existing literature. The growing importance of e-government is also acknowledged by policy makers like e.g. the European Commission who actively promotes the development of e-Government services. According to the action plan 2011–2015 by (European Commission, 2010) it was the main goal "that by 2015 50% of EU citizens and [...] 80% of businesses will have used eGovernment services" (European Commission, 2010, p. 4).

A common vision that laid the foundation of a joint European e-government, - recorded in (European Commission, 2009, p. 1), envisioned for its future that by 2015 European public administrations will be "recognised for being open, flexible and collaborative in their relations with citizens and businesses. They use eGovernment to increase their efficiency and effectiveness and to constantly improve public services in a way that caters for user's different needs and maximises public value thus supporting the transition of Europe to a leading knowledge-based economy."

In that respect, research presents a key driver for innovation and progress. However, to understand what topics are yet to come, it is time to pause, look back on what has been done so far and evaluate on the current status and draw conclusions from that on possible future directions for e-government research. Even though research in e-government is rich, of diverse nature and discipline-spanning, many studies are concerned with one specific aspect of e-government like in Kumar et al. (2007), Müller and Skau (2015), Scherer and Wimmer (2014), and Yang and Maxwell (2011), just to name a few.

Quite limited attention has been devoted to gain a general overview of the research topics in the e-government field. Undisputedly, there have been and are literature reviews that also scan the current e-government literature like in Grönlund (2002), Madsen et al. (2014), Rana et al. (2011), Scholl (2014), and Scholl and Dwivedi (2014), where the authors take a broader approach. Against this backdrop, the questions to be answered in this study are, as follows:

1. *What were the main research topics in the field of e-Government throughout the last 16 years and how did they develop over time?*
2. *What research avenues can be accordingly addressed in the future?*

In order to grasp the plethora of existing research as well as to uncover possible research gaps, a quantitative text mining approach with topic modelling was identified as suitable research method, since text mining techniques "allow to automatically

extract implicit, previously unknown, and potentially useful knowledge from large amounts of unstructured textual data in a scalable and repeatable way" (Debortoli et al., 2016, p. 556).

The performed semantic analysis to get an overview of the existing literature was supported by a qualitative Delphi approach for the interpretation of the results and the succeeding discussion on future research directions. A Delphi approach is useful "for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem." (Linstone and Turoff, 2002, p. 3)

The combination of automated text mining with the support of humans for the analysis of the topics and their further interpretation is novel to this approach of analysing the extant research in the e-Government field as well as the extensive time period that, to the best of the author's knowledge, has not yet been considered in a literature review before. Hence, the aim of this study is twofold: It should provide an overview of the current body of knowledge in e-Government, facilitating the understanding of the actual state of research in this field and point to possible future research directions.

The remainder of this paper is structured as follows: In the next section, the research methodology and different steps of analysis are described in detail. Then, the results are presented in Section 6.3, followed by their discussion in Section 6.4. In the concluding Section 6.5 that also highlights constraints and limitations a short summary of the work done is provided, together with possible areas for future research.

6.2 Data Collection and Analysis Methods

6.2.1 Collection and Pre-Processing of Journal Articles

In order to guarantee a solid literature basis, it was decided to use selected e-Government journals proposed by the EGOV Community[7] which also organises the annual international IFIP Electronic Government (EGOV) conference, being described as "the European core conference in the domain of ICT [Information and

[7] www.egov-conference.org/journals-1

Communication Technology] in the public sector" (Scholl and Dwivedi, 2014, p. 232). First of all, the suggestions of Webster and Watson (2002) were followed, who did an extensive literature review in the Information Systems (IS) discipline. The authors advise to start identifying relevant literature by having a look at the relevant journals, since "[t]he major contributions are likely to be in the leading journals" (Webster and Watson, 2002, p. xvi).

This selection by no means claims to be complete in terms of considered publications, since e-government is not limited to the IS field, but is a rather interdisciplinary topic that is also of interest to such disciplines as public administration or politics. However, to get a first overview, those journals were chosen to make sure that all of the articles had a focus on the 'electronic' part of e-Government, which was crucial for the analysis.

In total, 2.269 titles and abstracts of scientific e-government contributions were considered. All journals together with the publication year of their first issue and the respective number of considered abstracts are summarised in Table 6.1.

Table 6.1: Considered Dataset

Journal Name	**1st Issue**	**# Abstracts**
Electronic Government, an International Journal (EG)	2004	266
Government Information Quarterly (GIQ)	2000 (1984*)	680
Information Polity	2002 (Vol.7)**	261
International Journal of Electronic Governance (IJEG)	2007	140
International Journal of Electronic Government Research (IJEGR)	2005	207
Journal of E-Government	2004-2007***	51
Journal of Information Technology and Politics	2007	215
The Electronic Journal of e-Government (EJEG)	2003	221
Transforming Government People, Process and Policy (TGPPP)	2007	228

* first issue | ** first considered volume | *** continued as Journal of Information Technology and Politics

The data was gathered in a time frame from January to April 2016 and encompasses the time period from 2000 until 2016. This period was selected because Liu and Yuan (2015) found that research on the use of ICT by public entities only slowly started to

be of academic interest before the millennium change. This evidence is supported by the fact that the EGRL contains only 84 references before the year 2000.

If not all journals were available from this point of time, they were added from the publication of their first issue. Two journals changed their name within this time frame: The former *Journal of E-Government* was renamed into the *Journal of Information Technology and Politics* and the journal *Information Polity* was named *Information Infrastructure and Policy* prior to 2002. Since the *Journal of E-Government* had a clear e-Government focus, it was equally incorporated whereas the journal *Information Infrastructure and Policy* was excluded since only two issues of volume 6 were published within the considered time horizon.

In order to ensure the text processing to be executed successfully, the data had to be in a certain format, which is why a relational database was especially designed for this purpose to aggregate the needed information (journal name, year of publication, title and abstract).

6.2.2 Text Mining Approach

It was decided to use the cloud-based, free-to-use tool MineMyText[8] for the text processing. MineMyText uses a Latent Dirichlet Allocation (LDA) algorithm, a statistical model that "reflects the intuition that documents exhibit multiple topics" (Blei, 2012, p. 78). This model filters the identified topics and groups them, with a topic being "a distribution over a fixed vocabulary" (Blei, 2012, p. 78). The software facilitates the analysis process by offering a convenient way of applying the LDA algorithm as well as a set of integrated tools. Next to topic modelling, it features natural language pre-processing to clean texts from frequent and unnecessary words and to increase the quality of interpretations by stop word removal, n-gram analysis and lemmatizing, which all have been applied in this analysis. Furthermore, it comprises visualisations for the different kinds of analysis like topic timelines that show the distribution of a respective topic over time. Those tools as well as how they were applied will be shortly explained in the following.

Using a LDA algorithm optimally fitted the objective of this research, i.e. identifying the topics e-government scholars have dealt with in the past. The main idea of topic

[8] www.minemytext.com

modeling stems from the insight that "words that occur in similar contexts tend to have similar meanings" (Turney and Pantel, 2010, p. 142). To give a very general example: co-occurring words like *online*, *citizen*, *service*, *public*, *government* could be interpreted as the topic "e-government". The result of the analysis is a set of such co-occurring words, which then have to be further interpreted to form topics, either by humans or by further statistical approaches.

Text mining techniques originated as a means to deal with the continuously increasing amounts of data that nowadays are to be found everywhere and cannot be processed manually anymore. This situation resulted from the ever-growing appearance and increased use of web- and cloud-based systems, mobile devices and social media as well as the online storage possibilities of information. New ways of analysing this massive information like text mining have therefore received growing attention in the last years and have already been successfully applied in research, including the IS discipline (Debortoli et al., 2016; Evangelopoulos et al., 2012; Gorbacheva et al., 2016; Vakulenko et al., 2014). In this respect, this approach represents a powerful tool, because it allows to go beyond the natural boundaries of manual data analyses (quantity-wise), and quasi de facto excludes humanly induced biases (content-wise) (Urquhart, 2001).

When carrying out the three mandatory steps to perform the analysis, i.e. (1) preparing and uploading the information, (2) deciding on a number of topics and choosing the appropriate pre-processing options and (3) interpreting the details, the suggestions and instructions by Debortoli et al. (2016) were closely followed. According to [12], words that appear in a high frequency can also be set as 'stop words', i.e. not considering them within the analysis. The terms *e-Government* (2.576 times) and *government* (2.062 times) were among those most frequent words, which is why they were excluded since those words would not have added further value to the analysis. Furthermore, the option "standard stop words" was chosen, eliminating frequent but uninformative words like *the*, *and* etc. The option 'lemmatizing' was enabled, too, to only use the dictionary form of a given word, thus avoiding the repeated appearance of a single word, e.g. singular and plural of the same word. Then, the option n-gram was used and set to two. In the course of applying the LDA algorithm, normally words are split into single units (one word at a time), while in this context, it is helpful to depict more complex expressions as *digital divide* instead of *digital* and *divide*. This option was another recommendation by Debortoli et al. (2016), if the latter interpretation was to be executed by humans, which is the case

here. After having set all these preconditions, it was the main task to identify the ideal number of topics.

6.2.3 Interpretation

For the choice of the appropriate number of topics, a qualitative small-scale Delphi approach was applied, since it "has proven a popular tool in information systems research for identifying and prioritizing issues for managerial decisionmaking" (Okoli and Pawlowski, 2004, p. 15). Six senior researchers from the IS field with expertise in e-Government research ('experts') participated in the Delphi study. Instead of questionnaires, which are typically used in a Delphi study, those experts were provided with the results of the text mining analysis. Five of them have an explicit e-government background, the sixth researcher comes from the related IS discipline. Their competencies are also quite diverse, going from the political perspective, technical e-Government characteristics, social media, and education to insights into adoption factors of e-government. The last researcher has a broad view of all IS topics and was important to bring in a more general IS-related perspective. This group was chosen because of the intended diverse research foci and differing time of affiliation to this domain, ranging from two to more than 15 years of experience. Their heterogeneity in experience and homogeneity in discipline made them share the same basic understanding, ideally complementing each other. This group played a key role within the elaboration of the topics as they were involved throughout the whole process: they (a) analysed the optimal number of topics, (b) interpreted suitable headings that, according to their opinion, best reflected the identified topics and (c) contributed by expressing their expectations on topic outcomes. During that time, they always operated on an individual basis, independently from each other. It should be mentioned that they received the respective information on what their task was at the time that task was due, not revealing the whole course of action from the beginning on. This was mainly done to avoid a selection bias. Given that not all of the researchers are located at the same physical location, the first rounds were executed via e-mail. The step-by-step procedure will be outlined in detail in the following:

In a first step, the researchers were asked to decide on the appropriate number of topics. For this, the 2 to 12, 14 and 16 topic distributions were explored by every member of the group individually, roughly scanning the word clouds and assigning

labels to all of them. In the text mining tool, a topic is represented in flower-like word clouds, as depicted in Figure 6.1. Colour and size of the clouds indicate the degree of relation of the given word to the respective topic.

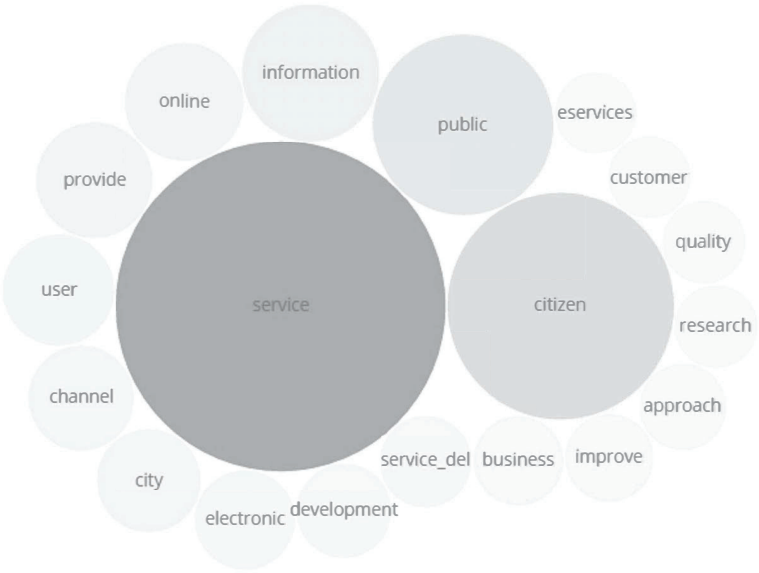

Figure 6.1: Most Relevant Words for Topic 10

It was found unanimously that the '10 topic distribution' would fit best the purpose of this analysis. This is in line with another recommendation by Debortoli et al. (2016) to choose a number of topics between ten and 50, if the latter interpretation was to be done by humans. The '2 topic distribution' was too generic to label it properly, whereas all topics beyond the '10 topic distribution' did not deliver any new information but rather intermingled previously stable topic compositions. After having made the decision on the number of topics, the next step was to interpret the topics by labelling them accurately. Besides the ten most relevant words for each topic, this included the afore-mentioned graphical representation of those words (cf. Figure 6.1).

Table 6.2 contains the topic overview of the ten most relevant words and the finally assigned topic labels per topic.

Already after the first round of classification, seven out of ten topics were defined and labelled relatively uniformly, only leaving nuances that needed further fine-tuning. For this reason, the group additionally received the five to seven abstracts best explaining the respective topics. Those abstracts were automatically assigned

Table 6.2: Topic Overview

Topic	Words
1	online, political, social_media, internet, campaign, communication, party, election, medium, candidate *Label: E-Participation*
2	factor, adoption, model, research, trust, citizen, influence, system, study, level *Label: E-Government Adoption Factors*
3	information, access, privacy, public, agency, law, policy, electronic, act, security *Label: Governmental Information Management*
4	research, study, framework, approach, development, analysis, model, perspective, provide, literature *Label: E-Government Research*
5	community, broadband, digital_divide, access, data, information, service, internet, state, development, state *Label: Socio-Economic Factors and Digital Divide*
6	system, process, model, data, application, information, approach, problem, interoperability, support *Label: IT and Systems Support for E-Government*
7	implementation, process, organization, project, factor, management, system, challenge, public_sector, organizational *Label: Implementation and Management of E-Government (Projects)*
8	policy, information, public, citizen, governance, technology, ict, political, transparency, participation *Label: Public Governance and Open Government*
9	data, website, information, web_site, open_data, web, quality, content, user, study *Label: E-Government Websites*
10	service, citizen, public, information, online, provide, user, channel, city, electronic *Label: E-Government Services*

to the topics by the tool. Depending on the words' frequency of appearance, they received a certain percentage score: The higher the score, the better the abstract explains the topic. With the help of those best explaining abstracts, everyone was able to reassess the first decision. The idea was to provide the group with more information to better estimate the adequacy of their principal classifications, which had to be made purely on the basis of the ten most relevant words. This was done again on an individual basis. This time, however, the first round's decisions of the others were additionally disclosed. The presentation of these results as well as the

insights into the best explaining abstracts helped to harmonise the chosen topics. An excerpt of the topic 10 abstracts is exhibited in Table 6.3.

Table 6.3: Best Explaining Abstracts of Topic 10 (Excerpt)

%	Abstract
96.67% Pieterson (2010)	**Citizens and Service Channels: Channel Choice and Channel Management Implications** The arrival of electronic channels in the 1990s has had a huge impact on governmental service delivery. The new channels have led to many new opportunities to improve public service delivery, not only in terms of citizen satisfaction, but also in cost reduction for governmental agencies [...] The authors will explore the channel choices of citizens and further converse on how these findings may help in improving channel strategies and marketing and thus help in improving citizen satisfaction and reduce cost of governmental service delivery.
95.79% Al-Sebie et al. (2005)	**Issues Relating to the Transaction Stage of the E-Government System** E-government systems pass through stages until they reach the highest potential of providing customers [...] with full online interaction with their governments thus enabling them to obtain government information and services from a single point of access. The transaction stage of e-government is one of the most important to the implementation of an e-government system as it represents the highest level of internal interaction between customers and governments [...]

In a final step, to synchronise and check those results, the top 50 abstracts, available in the tool, were consulted and the topic(s), if necessary, sharpened.

6.3 Results

The final decision on the ten examined topics is presented in Table 6.2. This list already provides a good picture of the diversity of topics that have been addressed in the last 16 years, ranging from current issues on how to increase the number of active e-government users by identifying the factors that lead to adoption and use of e-government (topic 2) to a more political perspective (topic 1) by analysing the political activity in social media to foster civic participation by direct communication through various social media products (e.g. Facebook, Twitter, YouTube etc.). The analysis of the 50 best matching abstracts that put the correctness of the topic allocation to a test, now allows for a breakdown of each topic into the more precisely shaped facets that have been touched upon.

The first topic is about an element of e-democracy, namely e-participation. To understand this broad concept, Macintosh (2004, p. 1) states that it is important to know that "e-democracy can be divided into two distinct areas – one addressing e-participation and the other addressing e-voting." The main difference between the two concepts, according to Government of the United Kingdom (2003, p. 14), lies in: "Implementing ICT in voting is mainly a question of offering a package of electronic services, such as online voting and online registration, although there are important questions of building voters' confidence in the robustness and security of the technology. Using ICT to open new channels of participation between elections, on the other hand, is much more complex." It becomes clear that this topic is predominantly concerned with the use of the internet and social media as communication means in electoral processes to foster the dialogue, engagement and active e-participation of voters, as in the study of Bode (2012). This study analyses, if the use of social media has implications for the degree of participation in political contexts. Looking at this topic's development over time, its importance has increased from initially 2% in the year 2000 to 17% today.

The second topic deals with e-government adoption. The studies in this category identify factors that affect the acceptance and adoption of particular e-government services like a tax filing system (Hung et al., 2006), oftentimes based on well-known underlying acceptance models like the Technology Acceptance Model (TAM) or the Theory of Acceptance and Use of Technology (UTAUT), which tend to be expanded by the authors according to their specific unit of analysis. In Carter (2011), for example, variables from UTAUT were combined with factors of personal perception to explain e-file adoption. Some studies also focus on one particular variable, e.g. trust like in Das et al. (2009). Here, the impact of this special factor on e-government is examined. This topic also has gained in importance throughout the considered period, starting with a share of only 1% up to more than 12% today.

Topic 3 is about the handling and management of governmental information, i.e. reporting about records or certain types of governmental information like in Bernholz and Ellis (2006). Studies also discuss how governments enable or restrict the access to governmental information. Amongst others, (lacking) access and transparency of governmental records and decision making processes as well as legal conditions, security and privacy concerns that play a role in this respect like in Hogenboom (2008) are targeted. According to its timeline, this topic had a share of more than

30% in the year 2000 and since then, except for a strong increase in 2002, has fallen to a share of just 4%, thus being less likely to be targeted.

The next identified topic (4) deals with e-government research. It comprises studies about the design, theoretical foundations, methodologies and research questions that have been addressed. Retrospective literature reviews like Rana et al. (2011) provide a summary of research trends, theories and theoretical constructs. This topic started with a share of roughly 6% and has grown up to more than 20%.

Topic 5 *Socio-economic Factors and Digital Divide* encompasses studies that examine the preconditions to implement e-government, i.e. factors that exhibit barriers to the access and use of e-government like the broadband provision in rural areas. According to Bélanger and Carter (2009, p. 132) "The digital divide refers to the distinction between the information haves and have-nots; the gap between the computer literate and the computer illiterate. More specifically, it can be argued that two major divides exist: an access divide and a skills divide." Digital divide was initially a frequently appearing topic, i.e. about every fifth contribution addressed this type of research question. Ever since its relevance has decreased considerably to just 5%.

The sixth topic adopts a rather technical perspective and describes the application of ICT systems and tools, as well as methodologies and ICT architecture for the support of e-government. Many of the abstracts in this topic focus on the use of business process management approaches like in Freiheit and Zangl (2007) to streamline the processes of public administrations. Another element to be found here is interoperability questions and issues, i.e. discussing the degree of integration of products or systems to exchange and share their data like in Hellberg and Grönlund (2013). A third aspect that is being addressed is the "technical" part of e-democracy, namely e-voting. Abstracts are about the use of ICT to enable, facilitate and secure e-voting. Despite a strong increase in 2001, topic 6 has experienced a relatively constant development, ranging between 8 and 10%. Since 2013 it has been exhibiting a slight downwards trend down to 6%, though.

The following identified topic (7) examines e-government from an organizational point of view by addressing the implementation and management of e-government (projects). Studies in this category present the different sorts of challenges and how they can be overcome or why implementations projects failed in mastering those obstacles like in Al-Sebie and Irani (2005). Implementing and managing e-

government has also undergone a quite constant development with 12% to 14% until today.

Topic 8 embraces a policy perspective. The studies at hand deal with public governance to foster openness and transparency, thus promoting the democratic process and participation by the proactive use of social media in e-government like in Bertot et al. (2010). This is in line with the principles of open government that, according to White House (2009, p. 1) creates an: "unprecedented level of openness in government. We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration. Openness will strengthen our democracy and promote efficiency and effectiveness in Government." This topic had its peak in 2003 with a share of about 21% and since then has experienced a decrease to a range from 12% to 14% since 2008.

The penultimate topic (9) deals with e-government websites. Topics under this umbrella include governmental websites as primary source of information and their contents like in Yu and Parmanto (2011), accessibility and usability aspects of the so-called virtual town halls. This topic, having started with a share of 12%, has fallen notably to 3% between 2002/2003 and since then started to increase steadily to a share of 9% today.

The tenth topic is about the provision of e-government services or more specifically about public service delivery including service channels, benefits and obstacles, as characterised in the abstracts shown in Table 6.3. This topic started with a relative share of 5% and since 2007 holds steady with a share between 8 and 10%. An overview of the development of all ten topics is given in Figure 6.2.

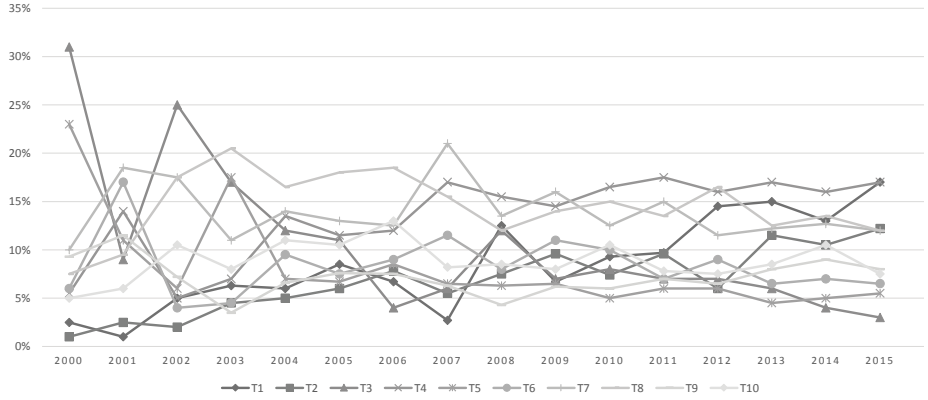

Figure 6.2: Development of the Ten Topics over Time

Summing up, it can be stated that the identified topics developed quite differently over time. Interestingly enough, all of them had a peak at some point of time like topic 7 in the year 2007 and then again were in line with their previous development. The majority of topics has gained in importance or at least maintained a constant development over the time horizon in question, which is in line with the general development of e-government abstracts. The number of abstracts increased from initially less than 30 publications in 2000 up to more than 160 in the year 2015. Except for a peak in 2009 of more than 230 publications, it exhibits a quite constant increase throughout the considered timespan.

6.4 Discussion

When taking a look at the respective topic distributions, there are two topics that oppose the outlined development: topic 3 *Governmental Information Management* and topic 5 *Socio-economic Factors and Digital Divide* have not only experienced a slight downwards trend, but a strong continuous decline, leading to the assumption that those topics are not in the focus of e-government scholars anymore.

Concerning topic 3, the loss in importance might have two possible causes: privacy, access and security concerns have been probably primarily high at the very beginning of the internet era because of the new worldwide coverage and use of this medium. Furthermore, only limited or no information and experience were available and could be gathered about its potential and possible threats of the services that were suddenly available by providing personal information via online channels. Due to the meanwhile worldwide availability, more than a decade of user experience(s) and especially the change of governments from restrictive information sharing to increasing their openness and transparency under the name of *Open Government*, as addressed in topic 8, topic 3 has considerably lost its topicality throughout the last five years, whereas topic 8 still is in the two-digit range.

Topic 5, addressing socio-economic factors and the digital divide, has followed a similar development as topic 8. Here again, two possible reasons can be identified: when the concept of e-government was introduced, this topic was one of the most frequently cited ones. Technologies to implement and use new services were innovative and expensive, which did not grant automatically access to everybody.

Furthermore, connection problems in mainly isolated, rural areas also impeded proper access to the internet in general and consequently to the use of e-government offers. Since that time, the technology has constantly progressed, which did not only lead to advances in area-wide broadband provisions, but also to enormous price cuts in the acquisition of computers, laptops and mobile devices, thus making ICT available to a greater share of people.

To analyse the results gained by this study in more detail and check its validity, the study by Scholl (2014) mentioned earlier is investigated that also uses a text mining approach to identify ten keyword clusters amongst the EGRL publications from 2009 to 2013 (cf. Table 6.4). When comparing the results of the two studies, six out of ten topics (1, 2, 3, 5, 6 and 10) can be clearly assigned to each other, e.g. keyword cluster 8 and topic 10 both target *services*. Two more topics conform at least partly. Keyword cluster 3 is a mix of topics 1, 6 and 8. It combines elements of e-participation, the use of IT systems and public governance. Clusters 9 and 10 are summarised in topic 2. The last two assignable keyword clusters 6 and 8 contain superior terms, such as *e-government* and *government, public administration* that do not have a counterpart in this study. This is due to the fact that these words have been excluded from the analysis right from the start, given their little added value to the analysis.

What is missing completely in Scholl (2014) though are the topics *e-government websites* (9) and the *implementation and management of e-government (projects)* (7). Also the topic *e-government research* (4) seems to be only partly tapped by keyword cluster 10, where it is about (user) acceptance as well as the technology acceptance model.

All these findings lead to a set of possible conclusions: First, besides helping to gain an overview of e-government research that was dealt with throughout the last 16 years, this study also identified trends of the respective topic developments by considering their distribution over time. Second, the comparison supports this study's validity, leading to very similar results, despite the use of different tools, their diverging time horizons and the consideration of different outlets. This might also shed light on the fact that the identified topics could possibly prove to be stable, also when considering different types of publications, given that those were already included in Scholl (2014). Third, the identified deviations in topic outcomes are either caused by the differences in approach or they already hint at an advancement of the body of knowledge, since this study was conducted in 2014.

Table 6.4: Identified Keyword Clusters*

#	Words
1	e-government, internet in public administration
2	information & communication technologies
3	e-democracy, democracy, e-voting, internet voting
4	e-participation, political participation, civic engagement
5	electronic-government information, public-sector in
6	government, public administration
7	access to information, accessibility, digital divide
8	information services, web services, service delivery
9	adoption, technology adoption, diffusion
10	(user) acceptance, technology acceptance model

*clusters shortened and summarised by the author

The study at hand suggests current and future core areas of e-government research like e-participation (topic 1), adoption factors (topic 2) and public governance and open government (topic 8) that scholars can dig deeper into since they hold a lot of potential within the future development of this domain, as has also been acknowledged as key areas in strategic documents like United Nations (2014). Those topics are regarded as indispensable for a globally sustainable development and will therefore shape the design of e-government services and how governments will interact with their stakeholders. This also sheds light on how political processes with regards to public participation are currently and will keep changing in the future. Moreover, this study equally helps to identify topics that, primarily due to technological advances, seem not to be of primary research interest any more, at least at the moment and might become even less important with the ongoing technology development like issues in *Governmental Information Management* as well as *Socio-economic Factors and Digital Divide*. Nevertheless, those topics should neither be neglected nor underestimated since they are prone to societal changes as by unforeseen and exceptional circumstances like war or natural disasters that might change the preconditions for its implementation.

Besides identifying the topics of greatest interest, this study also reveals areas that none or only limited attention has been paid to so far. In a semantic analysis this can happen, if a topic is a trend that has only recently emerged and therefore could

not yet be picked up in e-government journals. Then, the topic might be of special interest for a limited audience or it merely represents a more specialised subtopic of a superordinate area. The latter finding was also flagged by the experts, when gathering the final topic sets. Some experts stated that they would have expected such topics as the legal conditions of e-government or interoperability-related topics to be more present, which only appear as integral parts of the superordinate topics 3 and 6.

Another topic that the experts would have expected as a key topic, also identified by Schuppan et al. (2015), is the topic of e-government education. This topic is also apparently too young in terms of appearance in scientific contributions. Though being a necessary prerequisite for successful e-government implementation, providing for more efficiency and effectiveness, it has gained limited attention so far, except for recent ventures like Estevez and Janowski (2013), Hunnius and Schuppan (2013), and Hunnius et al. (2015).

Despite the topics that are to be unveiled yet, there are other emergent topics that will possibly increase in importance. An example for this is the omnipresent topic of demographic change and the handling of the triangle ICT, government, and an aging population, as being addressed by Niehaves (2011). Further possible upcoming topics are being addressed by e-government conferences, featuring tracks on new and emerging topics like the HICSS 2017 minitrack: Emerging topics in Electronic Government. Here, topics as, e.g. “robotic technology in and for government”, “mobility and e-government transformation: challenges and opportunities” or “e-law and e-justice”.

How to treat all these topics, those that are new, subordinate to other topics or those that might need to form proper topics in the future because of their increasing relevance, represents an area for future research endeavours.

This topic variety shows that the field of e-government is still far from being fully explored. New and innovative ideas are being constantly brought up to improve government’s online services and user focus.

6.5 Limitations, Critical Reflection and Conclusion

Limitations. This research is also subject to some limitations. As mentioned in the beginning, only designated e-government journals have been examined here. Other outlets like renowned IS journals, e.g. the journal *Management Information Systems Quarterly (MIS Quarterly)* or renowned journals in related disciplines, like the public administration discipline, where e-government also has been a topic of discussion and research, were completely neglected in this article as well as important conference proceedings that equally present novel and important research in the field.

Another limitation of this study is the diverging number of abstracts of the journals at hand. The journal *Government Information Quarterly (GIQ)* by far outperforms the other considered journals with an abstract number of 680 whereas the others range between 140 and 260. As a corollary, this has also implications for the shape of the modelled topics, i.e. the abstracts of the GIQ naturally had a greater stake in the analysis and thus will most probably have greatly influenced the topic composition. Given that the GIQ also forms part of the designated e-government journals, the published contributions are in line with the other journals, which is why this bias is not of greater concern here.

The last limitation is about the applied methods. Due to the fact that the underlying algorithm of the text mining tool is nondeterministic, every time the analysis is run again, it might deliver slightly different results with partly differing words. However, it was possible to re-identify practically all the topics again, which also sheds light on the topics' quality and robustness. Then the topic identification and interpretation is naturally prone to the subjective opinions of the respondents, which was attempted to minimise by involving a diverse group of people.

Having said all this, these limitations equally depict possible future research opportunities for deeper investigation: First of all, different types of analysis (qualitative and quantitative) could be applied to redo this study and safeguard its validity. Then, outlets from related disciplines should be certainly considered in a next step e.g. comparing these topics with the ones of related disciplines to see whether they cover the same or different aspects. This holds equally true for different types of publications like conference proceedings or book chapters, which should be taken into account, too. The questions to be answered will, amongst others, be: Will those address similar topics or are they different to what is being addressed here?

Critical Reflection and Conclusion. The main objective of this research was to identify a set of topics that best represent the e-government research of the last 16 years. The ten topics derived from the analysis shall enhance the understanding of the actual state of research on e-government. The presented topic overview is a first indication of the topics that are well represented and all those that are lacking here, either because they cannot even be thought of at this stage of time, or because they represent relatively young trends that need to and probably will gain more attention.

Those ten topics actually are the stories that turned the field of e-government into what it has become today. On the one hand, they offer scientific implications on further research directions. On the other hand, they can also provide practical guidance for governments on how to position themselves in this context, i.e. which topics to prioritise and subsequently which strategies to pursue with regards to governmental policy, user focus and amelioration of service delivery. This study can be seen as the starting point for further reviews to reassess how the research in this discipline will have evolved and/or changed by then in terms of focal points as well as importance. Will e-government as a discipline stay as important as it is perceived today or will it be substituted by something else? On the basis of this study, possible future research paths were identified for e-government scholars to build on and extend its body of knowledge, thus continuing to tell the stories of the future.

7 How to Master the "E": Tools for Competence Identification, Provision and Preservation in a Digitalized Public Sector

Fact sheet of publication P2

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Abstract. *The digitalization of every aspect of life is in full swing and becoming an all-embracing societal phenomenon. Public administrations worldwide, eager to increase their efficiency and effectiveness, are in a change process, induced by the pervasiveness of technological advancements. This development does not only mean the substitution of analogue processes by the integration of information technologies, but first and foremost leads to changing demands on the tasks, roles and competences of the ones, who need to implement those changes, i.e. the public servants. This study therefore explores relevant roles and respective competences with regard to IT in public administrations and offers tools for their successful preservation to master this e-induced change: Based on a literature review, document analyses and expert workshops, 19 reference roles in public administrations are identified that are important for the implementation of e-government. In addition, we develop role fact sheets and competence matrices as possible means for the identification and documentation, which in turn can be supportive of a possible future competence preservation.*

7.1 Introduction

Technology is the number one enabler and driver of (business) innovations. The impact of technology on any context can be also described as digitalization, which sums up "the manifold socio-technical phenomena and processes of adopting and using these technologies in broader individual, organizational, and societal contexts (Legner et al., 2017, p. 301)." Not only does the private sector make use of new technological possibilities to boost the business. Governments worldwide have equally realized the potential the introduction of digital technologies can have for both the efficiency with regard to their internal processes and for the good of public sector stakeholders because of possible effectiveness gains. This seems of special importance, given the financial bottlenecks, public administrations often-times see themselves confronted with (Kickert et al., 2015). Similarly, policy makers ascribe great potential to the use of digital technologies to fundamentally transform the public sector (e.g. European Commission, 2018a; United Nations, 2018). E-government serves as the umbrella term to describe the changes induced by digital technologies. It means "the use of information and communication technologies in public administrations combined with organizational changes and new skills. The objective is

to improve public services, democratic processes and public policies." (European Commission, 2006)

The European Commission, for example, describes in the eGovernment Action Plan 2016–2020, next to the mentioned increased efficiency and effectiveness, societal and economic opportunities to be leveraged for society as a whole by the use of digital technologies (European Commission, 2016c).

The United Nations acknowledge the improvements digital technologies in the public sector have brought to participatory processes and transparency in the public sector, too. (United Nations, 2018) At the same time, however, they point to the importance of the human element amidst the technology focus: "We are at a critical juncture, in the middle of a digital revolution that is not just about technologies, but also about the centrality of people and the planet." (United Nations, 2018, p. iii) Therefore, it should be a major concern to equip (future) public servants with the needed competences. According to the European Commission (European Commission, 2016b, pp. 76 sq.) "[s]uccessful digital transformation does not come from implementing new technologies but from transforming an organisation to take advantage of the possibilities that new technologies provide. Besides leading the change, this also requires that all people in an organisation – leadership, IT professionals, employees in other divisions – obtain the skills to embrace technology." A competence can be very broadly defined as the combination of work-related knowledge, skills and abilities held by an individual (Nordhaug, 1993). With the rising use of information systems in the public servants' work, aiming at an improved service delivery, by definition a changed set of competences is needed (European Commission, 2006). We label all those needed competences that are affected by the increased use of IT, as e-competences. Those competences go beyond mere technical skills, but involve all competences that are needed in a digital public sector. In any working environment, competences typically manifest themselves as mandatory or desirable characteristics of a role.

Due to the pace and pervasiveness of digital technologies, responsibilities and roles in the public sector already have shifted and will keep changing. New and changed roles will be necessary for the successful implementation of e-government. A role is "a prescribed or expected behavior associated with a particular position or status in a group or organization" (Business Dictionary, 2018). However, there are few

publications addressing changing roles and respective competences in depth in the public sector (e.g. Estevez and Janowski, 2013; Hunnius et al., 2015).

It is therefore important to identify today's and future relevant roles for the implementation of e-government in public administrations to be able to derive necessary competences. We put forward three guiding research questions to which the answers shall help to close this research gap:

RQ 1: What are public administration roles to be considered in a digitalized public sector?
RQ 2: How can we describe the roles and the respective competences in an easy and reproducible manner for future job postings and evaluations?
RQ 3: How can we determine and document the depth of a needed competence for the fulfilment of a given job or task?

The remainder of this paper is structured as follows. First, we introduce the current state of e-government research with a focus on the examination of role concepts and competence requirements in public administration. Then, we elaborate on the used data collection and evaluation method before presenting the identified roles in Section 7.3. In Section 7.4, we first present a possible structure for the description of the identified roles and the competences as well as a possible means to determine the needed competence depth. In Section 7.5, we discuss the findings before concluding with an outlook on further research needs in Section 7.6.

7.2 Background

7.2.1 Roles

In the context of e-government and the use of electronic services, the demand side, i.e. the user side (citizens, companies), is very well researched in practice and scientific literature. Users are categorised according to different criteria such as their general attitude towards the medium Internet, different usage preferences, knowledge about digital content or their access to the necessary infrastructure (e.g. Carter et al., 2016; Müller and Skau, 2015).

With regard to e-government providers, i.e. public administrations, there is, in contrast, very little attention towards the issue. A study by Greger et al. (2014) examined

different e-government stakeholders. They found out that public administrations are generally considered as one entity and not analyzed further in detail.

The description of role profiles in e-government appears to be gaining in importance, though, as can be seen from contributions that examine the role of the Chief Information Officer in public administrations and assign corresponding competences to this role (Estevez and Janowski, 2013; Marcovecchio et al., 2013). Overall, however, it can be stated that the roles of public administrations are only described in very fragmented terms and very often lack a concrete allocation of the necessary competences.

Different roles can share the same competences since they are innate to the same or similar job descriptions. Yet, despite this fact, those competences might not be needed in the same competence depth, depending on the respective job profile. Bloom et al. (1956) developed a taxonomy that divides the human process of learning into six levels: *remember*, *understand*, *apply*, *analyze*, *synthesize* and *evaluate*. Bloom's taxonomy is regarded as an established theory for describing teaching and learning processes. This framework experienced a revision in 2002 by Krathwohl (2002), who followed the original approach to update the taxonomy, changing the last two levels from *synthesize* to *evaluate* and *evaluate* to *create* to have it adapted to the current learning and learner's needs. According to this taxonomy, learners begin at the bottom of the learning pyramid and literally increase along it as higher levels of knowledge are attained, see Figure 7.1.

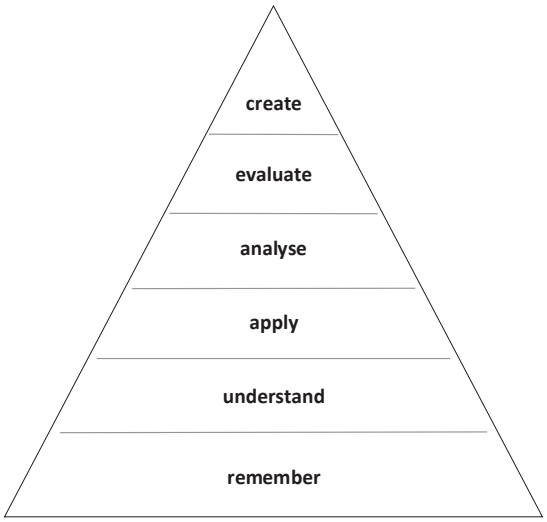

Figure 7.1: Revised Version of Bloom's Taxonomy (adapted from Krathwohl (2002))

This taxonomy is therefore particularly suitable as a basis for the development of teaching and learning environments, which have to convey the contents in varying depth depending on the specific needs of the learners.

7.2.2 Competences

With the intensification of e-government measures at the turn of the millennium, different views on necessary competences in this domain have arisen. Especially at the beginning of the emergence of e-government, Information Technology (IT) competences were at the heart of the discussion (e.g. Kaiser, 2004; Kim et al., 2011). It was only in the course of the years that non-technical competences were added. In particular, process management was emphasized and organizational and interdisciplinary skills were discussed.

To the best of our knowledge, there are only a few publications that offer a more holistic view on these competences and their classification (e.g. Hunnius et al., 2015; Janowski et al., 2013). There is a consensus that e-government competences have long not been given much attention in the international scientific debate (e.g. Scholl, 2013; Scholl, 2014; Wimmer et al., 2008). According to Leitner (2006) and Hunnius and Schuppan (2013), social competences/soft skills such as leadership qualities, communication or network skills are also important competence elements to be considered next to the purely professional competences. Yet, those authors are some of the few ones mentioning those competences at all.

However, the consideration of competences in the digital age has received more interest by researchers and practice in recent years. The European Committee for Standardization European Committee for Standardization (2019), for instance, released a framework with a collection of 40 competences required in the field of information and communication technology. Another framework detailing competences is the Skill Framework for the Information Age (SFIA) developed by the SFIA foundation (SFIA Foundation, 2017). It is a reference guide with 97 skills for employees in information systems-related roles of any type. This framework provides a reference model embracing two dimensions, namely skills and different levels of responsibility. Those two frameworks are very generic, though and not purely focused on the public sector.

Hunnius et al. (2015), in contrast, have dealt with competences in e-government in detail and divided them into five different categories: technical, socio-technical, organizational, management and political-administrative competences. Since this framework does not only allow a more differentiated view with regard to the required competences, but was developed specifically for the area of e-government, this framework is to serve as a basis for the categorization of the competences of the individual roles.

7.3 Method

In order to identify existing roles, we carried out a literature review as described by Webster and Watson (2002). The iterative approach is displayed in Figure 7.2. We searched the databases EBSCOhost and Google Scholar as well as scientific journals and studies in the fields of e-government and public administration. As search terms we used personnel/staff, roles and stakeholders combined with e-government or public administration. It turned out that there was hardly any scientific literature on this topic at that point of time (search period September/October 2015). Practical studies, we identified, in contrast, listed professional areas or roles to be filled. However, these mainly lacked in-depth explanations on the relevant competences. In addition, we carried out a document search, where we analyzed job advertisements from the public sector. Since this analysis was part of a project carried out in Germany for German public administrations in 2016, the focus was on current job advertisements from administrations in three different German states (Bavaria, Hesse and North Rhine-Westphalia) (Becker et al., 2016). We derived 37 different roles from these descriptions.

We enriched this search by adding relevant current nationwide job profiles from public service job portals, focusing on job advertisements with IT relevance, since those presumably could help to derive needed competences for working in today's digitalized public administrations. Out of this search, we included 66 job advertisements in our analysis. Finally, we analyzed exemplary organigrams of German federal and state administrations. In order to identify future-oriented roles, we scanned current German e-government and IT strategies of the public sector at state and federal level and matched these stepwise strategies against the requirements derived so far with the help of the expert workshops.

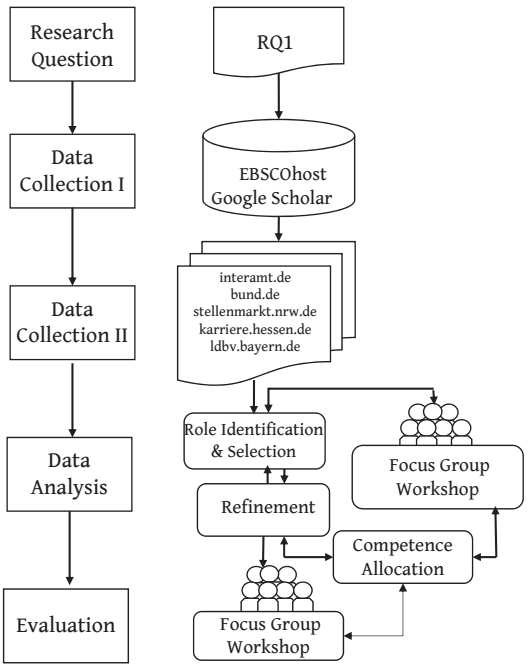

Figure 7.2: Research Approach for Role and Competence Identification and Selection

We compared the identified roles in terms of content and summarized similar roles. As can be seen in Figure 7.2, we discussed every role's in- or exclusion as well as their categorization with the help of focus group expert workshops. By means of this iterative approach, we were able to come up with four different role categories and a total set of 19 roles.

We followed this iterative approach with the help of focus group workshops throughout the whole project, i.e. all reached milestones (determination of relevant roles, fact sheet and matrix structure and contents) were iteratively developed and discussed with experts from different public administration levels, including different federal levels to assure the role set's implementation into practice later on. Besides practitioners from the field of public administration, experts from academia, knowledgeable in the area of quality assurance in teaching were part of this group to guarantee a multidimensional view on the results.

Concurrently with the role identification and selection, we developed a structure for describing the roles as well as a suitable model for the determination and documentation of the needed competence depth. In a second step, we then assigned those roles different professional competence categories, as described by Hunnius

et al. (2015) and added social competences as well as personality traits, since we deemed those very important, too. We used the categories of Hunnius et al. (2015), primarily because of their fit to the e-government context and second, because of the absence of other comprehensive frameworks for the competence classification in e-government.

7.4 Results

7.4.1 Identified Roles

We were able to identify four different role categories that are needed by public administrations in a digitalized public sector: (1) Designer, (2) IT Coordinator, (3) IT Specialist Tasks/IT Services and (4) Specialist Task Managers. Those four categories contain a total set of 19 specific reference roles, which are summarized in Figure 7.3. The individual categories are described in more detail in the following as well as the roles they contain. The designers' areas of responsibility are the IT landscape and IT deployment. They often act in an advisory capacity, e.g. in identifying and evaluating trends. In addition, they give impulses for the further development of the IT sector or develop existing applications and concepts themselves. This category is divided into designers with general management tasks and those with explicit IT management tasks. Designers with general management tasks are not necessarily anchored in the IT area, but can also be assigned to interdisciplinary tasks. Identified roles are the change/organizational manager, the process manager and the innovation manager.

IT coordinators are mediators between the IT department and various internal and external stakeholders. Their task is to translate the IT language into the language of the respective stakeholders, to communicate in a manner appropriate to the addressees in order to create a mutual understanding and to act as agent for the IT area and its applications. Distinctive communication and mediation skills therefore form the central element of this role in all its forms According to their interactions, the IT coordinators can be divided into four further categories: Coordinators between the IT area and the business area are necessary, for example, if requirements for business applications have to be determined. Coordinators between the IT sector and policy or office management represent the IT sector vis-à-vis policy or office management.

IT coordinators can also form the interface to external consultants and IT service providers. They monitor the creation of services and communicate the requirements of the public administration. Finally, IT coordinators communicate with citizens and businesses by, for example, recording citizens' and businesses' requirements for an e-government process or answering questions about a specific e-government process, in order to reflect this back internally to the relevant departments, which can then take appropriate action if necessary.

IT specialist tasks represent IT services that can be provided both by internal IT units and by external IT service providers. The decision as to whether this role is within the administration or external is up to the specific composition of each institution. The IT services are responsible for the development and operation of IT applications and systems as well as the support and training of users and, depending on the type of activity, can be classified into the categories of operation, support, development and training. Specialist task managers can be divided into two categories: Users carry out their professional administrative tasks using IT, they can have very different IT skills depending on their respective specialist task. Technical application supervisors supervise specific technical applications.

7.4.2 Role Fact Sheet

In order to be able to present and describe the roles in a structured and comprehensive way, we developed role fact sheets in which the competences are listed and categorized. The structure of a fact sheet is shown in Table 7.1 using the example of role No. 1. We developed the structure of the fact sheet on the basis of the state of research and expert workshops. Every role (see Figure 7.3) receives a role number and a role name, e.g. No. 1: Organizational/Change Manager and is assigned to one of the four categories. The role of the Change Manager, for instance, belongs to the category Designer - General Management Tasks. Then a brief textual description of the role with a summary of the most important responsibilities and tasks follows. To enable a quicker and easier overview, the main tasks and responsibilities are listed again in a bullet point format, similar to how they can appear in a job description, which facilitates a possible transfer to such a description later on. Technical competences include, for example, knowledge of IT or in the planning and design of IT. This knowledge ranges from general IT knowledge to in-depth programming skills. The so-called professional competences comprise

socio-technical, organizational, management and political-administrative competences. Socio-technical competences are, for example, knowledge of the effects of e-government or knowledge in the area of technology and e-government adoption. Competences relating to the organization include, for instance, knowledge of the structures of public administrations, organizational design or process management. Among the management competences, entrepreneurial competences as well as competences in project, finance, performance or change management are to be found. Political-administrative competences include knowledge of legal structures, administrative processes or e-policy, amongst others.

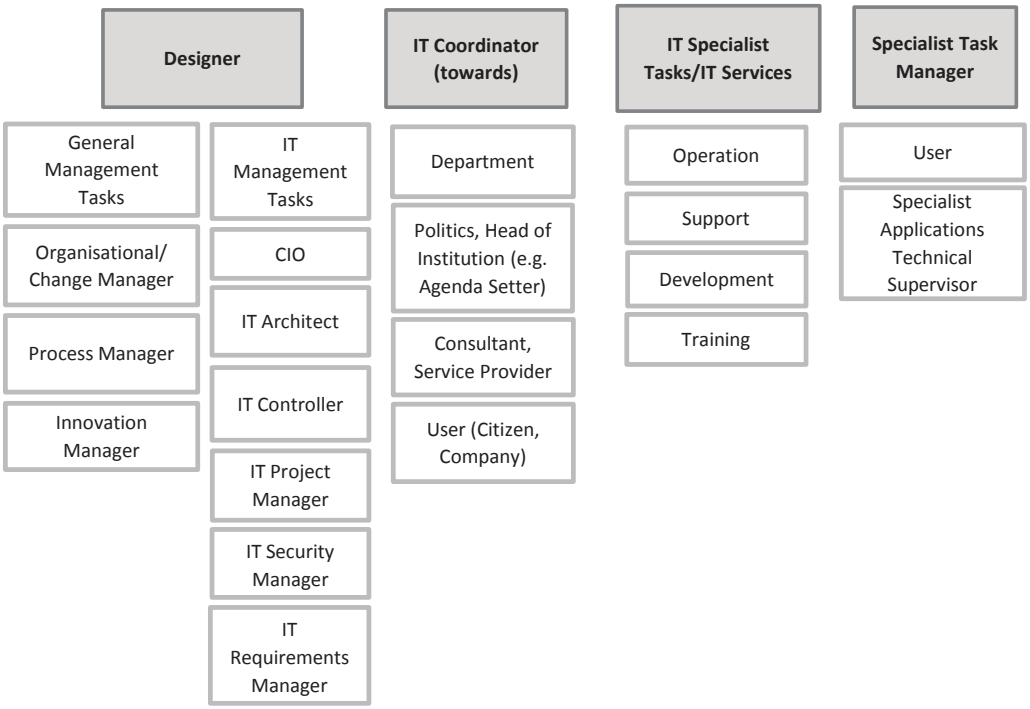

Figure 7.3: Identified Roles

Social competences represent competences in dealing with other people, e.g. employees or citizens. Examples are leadership, communication and conflict management skills or negotiation skills. Personality traits describe characteristics, a person naturally possesses, which in contrast to the social competences can only hardly, if at all be learned. This includes, for example, motivation, self-management or creativity.

The orderly and detailed description of the roles in fact sheets, stating tasks, responsibilities and competences, facilitates both, an overview of the requested job profiles

creation of job advertisements by means of the quasi standardized on the basis of these and to adapt them to the respective requirements. Their uniform structure also ensures a structured approach and better comparability of different roles.

Their uniform structure also ensures a structured approach and better comparability of different roles.

Table 7.1: Exemplary Role Fact Sheet of the Role Change Manager

Role Fact Sheet	
Role Fact Sheet Number	1
Role name	Change Manager
Classification towards a role category	Designer – General Management Tasks
Role description (textual)	Organizational/Change managers are responsible for the further development of the organization, the alignment of the organization with regard to new strategies and the communication of changes.
Tasks and responsibilities (bullet point list)	- Planning and implementation of the change process within the framework of IT projects - Conducting internal marketing to demonstrate the measures' usefulness - Preparing employees for strategic and process-related changes - Editing Change Requests - Preparing business requirement specifications and training documents
Technical	o ERP system, if applicable o Basic IT knowledge (e.g. Office) o Modeling (e.g. UML)
Socio-technical	o Development and preparation of necessary specification documents (e.g. specification sheets, use cases) o Stakeholder analyses o Systemic analyses
Organizational	o Knowledge of administrative processes o Organizational knowledge o Process management

Continued on next page

Role Fact Sheet	
Management	o Change management: Planning and using tools par o Marketing o Project management o Risk management
Political-administrative	o IT law
Social Competences	o communication skills o conflict management o ability to work in a team o persuasiveness o negotiation skills
Personality Traits	o assertiveness o conceptual and analytical skills o creativity o readiness to assume risk o self-management o willingness to change o trustworthiness o willingness for further training

7.4.3 Competence Matrix

As has been stated earlier, even though roles can have the same competence requirements, they might not all need to have the same competence depth, depending on the position and specific tasks, a public servant is dedicated/assigned to. Therefore, it is not only important to identify the nature of the needed competences but also to determine the competence depth for each existing role. To facilitate the determination of the needed competence depth for use in practice, we condensed the six competence levels based on Krathwohl (2002) to three competence levels, which are:

- Know
- Apply
- Design

The level *know* refers to the two levels *remember* and *understand* of the taxonomy. Accordingly, knowledge only has to be passively acquired and understood in this category, but a transfer to other application contexts is not necessary. For example,

organization/change managers need to know and understand the existing IT law, but they do not need to be able to transfer this knowledge to new legal situations.

The level *apply* refers to the same level in Bloom's revised taxonomy. In addition to theoretical knowledge about a specific area, knowledge must also be applied in new contexts. For example, specialists do not only have to theoretically know how to create a single document in an Office program, but also how to create different documents with different formats and structures depending on the context.

The third level *design* is a summary of the levels *analyze*, *evaluate* and *create* from Bloom's revised taxonomy. Besides knowing and applying knowledge, this level refers to both the analytical ability to identify problems and the ability to develop and implement solutions. For example, IT specialists in the field of development should not only be able to understand and apply their programming skills, but must also be able to develop solutions to specific new problems, assess their quality and, if necessary, revise those solutions.

In order to present the competence categories and the respective levels in a structured and clear manner, we chose a matrix format for their representation. Table 7.2 is an example of such a competence matrix where the vertical competence categories (technical, socio-technical, ...) are contrasted with the horizontal competence levels (know, apply, design).

For social competences and personalities traits we decided to omit the differentiation of competence levels, since these competences are either present in a person or not. They cannot be further broken down. It might be the case that a certain role requires (sufficient) creativity. The person who embodies that role has this ability regardless of the competence levels, since s/he cannot 'switch it off' when it comes to applying or designing something, for example. Therefore, we only indicated whether a role requires a social competence or a personality trait in its execution or not

The matrix has a similar structure as the role fact sheet. It contains the role name as well as all (previously identified) competences, which are presented according to the description in the role fact sheets. To support a further differentiation between required and desirable competence levels, which are also often part of a job description, a color-coding can be applied for the cells of the matrix. The color green can be chosen as the indicator color for all the competences that are absolutely necessary and yellow for all other desirable competences.

Table 7.2: Competence Matrix

	Role name		
Competences	**Know**	**Apply**	**Design**
Technical			
Socio-Technical			
Organizational Management			
Political-Administrative			
	Required		
Social Personality Traits			

7.5 Discussion

Based on the above-mentioned results, we now answer our three research questions. Furthermore, we explicate our implications for theory and practice.

RQ 1: Roles to be considered in a digitalized public sector

By means of a literature review, a document search and several workshops with experts in a focus group setting, we identified 19 reference roles that public administrations currently or in the near future will need, if they want to face the challenges posed by the public sector's digitalization. Only if relevant roles are identified and well-documented in terms of their characteristics, i.e. competences, it is possible to secure their sufficient provision in the longer term. The identified public sector reference roles and associated competences only reflect the current state and today's demands. Just as the strategic (political) orientations keep changing, current technologies may soon be outdated and new or altered competence demands will arise, as will the demands of citizens and companies towards the service portfolio of public administrations. Moreover, the claims of public administrations on themselves are changing, which again requires constant change of roles and competences of

public servants. This implies that an all compassing, universal definition of roles and competences fails to fulfil its purpose. Furthermore, those roles might not be found in every German public administration, since especially in small municipal administrations multiple roles might be taken by one public servant or certain tasks might be outsourced.

RQ 2: Description of roles and the respective competences in an easy and reproducible manner

For a comparable and consistent description of job profiles, we developed role fact sheets that include a short textual and bullet point description of the desired role, exhibiting all needed competences, split into the five different competence categories as well as social competences and personality traits. The fact sheets all follow the same structure and can therefore be easily compared with each other. They offer an easy documentation of needed and/or existing competences within the organization and can be used to identify competence gaps, which then can be addressed by internal or external training efforts. Furthermore, they can serve as building blocks for job descriptions. The advantage of this building block structure is that the individual parts can be combined in different ways, i.e. they can be grouped flexibly and according to the current necessities. The fact sheets offer very detailed, in-depth descriptions of demanded competences, especially with regard to technical and professional competences. If used for existing personnel, the fact sheets can also serve as a basis for evaluation, given their comparable structure. Due to this flexible structure, they can also easily be adapted if there is a change or expansion of competence needs.

RQ 3: Determination and documentation of the needed competence depth for a given job or task

The competence matrix provides a more concrete picture of the required depth of each competence that should or has to be available. Furthermore, it shows desirable further competences in contrast to only exhibiting absolutely necessary competences, as is the case with the fact sheet. A matrix can be used to jointly define the pool of competences, a role in a certain department or position has to exhibit, without the need to detail all the different elements. Therefore, it is ideally suited for internal coordination between the Human Resource department and the relevant division or within a project team.

In a nutshell, the reference roles, the fact sheets and the competence matrices as tools for competence identification, provision and preservation can bring about the following advantages, if used strategically:

Clear delineation and comparability: The role descriptions can be clearly delineated from and compared with each other. For the users, there are initial indications of the evaluation. If many public administrations use the building blocks for their job descriptions and advertisements, maybe even beyond state boundaries, ideally nationwide, potential applicants can also better estimate which job could be more ideally suited for them and thus submit better matching and accurate applications. In doing so, also efforts within the administrations is reduced, i.e. by receiving better-fitted applications. Executives can use the fact sheets to compare which roles and competences are available in their area and thus are able to better assess possible needs. In addition, based on the roles and competence profiles it is possible to evaluate, which competences are in need and which of those are actually available to the public administration. Like this, the public administration then can decide whether missing competences should be acquired through (further) internal training or by involving external service providers.

Standardization: The uniform use of categories and competences can reduce the coordination and communication efforts involved in describing descriptions and job evaluations.

Basis for training and qualification: With the help of the identified competences a role needs to exhibit, the qualification and training needs can be determined more easily and be aligned with the offer of educational institutions.

Basis for further development: The tasks and thus the roles themselves will keep changing because of the pace in IT development. Certain competences, e.g. social and overarching technical competences, but also personality traits will remain the same, only their characteristics will change. The identified building blocks are thus a good starting point and do not need to be completely changed.

7.6 Conclusion & Outlook

Public administrations are constantly subject to strong pressure for change, which is manifesting itself more and more as digitalization is turning into a societal phenomenon with regard to the omnipresent introduction and extensive use of IT. This development does not only mean the substitution of analogue processes by the integration of information technologies, but first and foremost leads to changing requirements regarding the tasks, roles and competences of public servants. This study shows how roles in public administrations undergo a fundamental change, as do their respective competence profiles. It is namely not only about the design and about the coordination of IT that is subject to rapid dynamic changes; it is ultimately about the users in the administrations themselves who have to work with this IT on an everyday basis. Therefore, also the user him-/herself becomes subject to constant change and lifelong learning.

When it comes to the introduction and use of IT, it becomes clear that the competences required to design, coordinate and use IT are not only of a purely technical nature. The literature review and systematic consideration of job advertisements as well as strategy documents shows that numerous additional competences are necessary for the successful implementation of e-government. Professional and social competences as well as personality traits are just as important- In some roles, they can even play a more important role than the purely technical understanding of new technologies.

The derivation and description of roles that are needed for the successful implementation of e-government with the help of role fact sheets and matrices must be seen as only the first step. Following up on this step is the further differentiation of the identified competences. Not every role requires a certain competence of the same depth. Rather, it is particularly important to further classify and categorize technical competences by using different competence levels. Depending on the specific role, it can be sufficient to have a basic knowledge about a competence such as process modeling in order to understand how to read a process model, while in other cases it is essential to be able to apply such a method. In order to keep the fact sheets in a manageable form, another format might be necessary.

This work can be seen as a starting point for future research on how to best combine the identified competences with suitable teaching forms so that the results can

be integrated into a training guide for (on the job) training in e-government. Not every competence can be taught in the same way. For example, competences such as social competences or personality traits might be more successfully taught in an individual manner and in smaller formats such as seminars or workshops, while pure knowledge of legal aspects or methods can be taught in eLearning formats, large-scale events like massive open online courses (MOOCs) or other comparable forms. Further research is needed to examine whether and how on this basis the training and further training needs of the public sector are prepared for these challenges and how these demands can be met by the relevant institutions. Moreover, more research should look into the competence development over time with regard to changing competences, especially in the IT area to better accommodate for a suitable competence management and maybe even to be able to predict future competence needs.

This work is also subject to a number of limitations: First, we conducted this research in Germany, which constrains the generalizability of the results. The influence exerted by political actors should not be left unmentioned in this context, either. In particular, federalism and state-specific e-government strategies in Germany are prone to bringing about possibly different foci on the roles and competences described, depending on the adopted policies and agendas. Even though national, European and international legal guidelines and recommendations are of great influence, there is a chance that visions, guidelines and goals may differ across states. This, on the one hand, can have beneficial consequences on the e-government development in general, because innovative concepts can be implemented independently of other states and regardless of the adoption of a national approach. On the other hand, this might as well lead to a scattered e-government landscape with many isolated solutions that might also put different emphasis on tasks, roles and competences.

Then, we used expert workshops as well as strategy documents and job advertisements for the identification of needed competences. Especially the inclusion of expert opinions is a possible source of bias due to the subjective assessments resulting from experience made in the German context. Each participant might have had his/her own ideas or hidden agenda on how the administration should align itself, both now and in the future, in order to address the many challenges posed by the digitalization. Furthermore, given the pace of technological developments, the collected job advertisements exhibiting technical competence requirements, which

we collected in a limited timespan in 2016, might soon render obsolete again and certainly do not represent a non-exhaustive list.

Despite those limitations, the results of this study prove to provide at least an initial orientation and guidance for practitioners on how to go about the identification and classification of roles and respective competences, since it has already found its way into assessment and operationalization in some German public administrations (Zimmerling, 2017).

After all, the digitalization of public administrations has long since meant more than the use of stationary PCs, and this is becoming apparent at an ever-faster pace. The most important competence that public servants must possess today and in the future is openness to change and the willingness to undergo further training in the sense of lifelong learning (Hofmann and Ogonek, 2018). It has become clear, that, in the future, no role will manage without at least some IT knowledge. The consequence of this is the necessity of creating public servant job profiles that accommodate those changed role requirements, especially with regard to IT. Even if the introduction of (new) roles in public administrations might be highly dependent on available budgets, the implementation of a role and competence concept within a public administration can help to bring about a true modernization that also satisfies the objectives policy makers have sought to realize by the implementation of e-government.

8 E-Government Competences revisited – A Literature Review on necessary Competences in a Digitalized Public Sector

Fact sheet of publication P3

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Abstract. *With the growing proliferation of digital technologies, organizations at all levels are faced with a changing environment to which employees and leaders have to adapt. Digital competences can be considered a key factor for the successful implementation of digital technologies in organizations of all kinds. Public administrations are exemption from this trend and are the focus in this study as a special organizational form. Despite the importance of these competences, extensive research on this subject is yet missing. To better understand the shape of knowledge contributions made so far, a structured literature review is conducted to uncover the state of the art of research on these competences. Results of this study indicate that only very few scholars have so far researched public administration competences more closely. Besides functional competences, a focus on so-called soft skills and personality traits is unveiled. Based on the findings, directions for future research are derived.*

8.1 Introduction

"[P]olicy makers face a race between technology and education, and the winners will be those who encourage skill upgrading so that all can benefit from digital opportunities" (World Bank, 2016, p. 23). This statement nowadays becomes a postulate amongst decision makers worldwide, given the growing realization that digitalization is not just a temporary phenomenon but rather a revolutionary game-changing intrusion: "The number of internet users has more than tripled in a decade – from 1 billion in 2005 to an estimated 3.2 billion at the end of 2015. This means that businesses, people, and governments are more connected than ever before" (World Bank, 2016, p. 2). On the one side, this offers great potentials, but at the same time organizations' and peoples' competences are heavily challenged by digitalization, needing to constantly adapt to an ever changing environment (Kim et al., 2011). This is equally true for all organizations that in large part have acknowledged the need for the right skills in a digital world, but when being asked if their employees embody these competences "[. . .] 53% rather or strongly disagreed with the statement" (Hoberg et al., 2017). The increased use of information systems has entered public administrations worldwide equally and governments also have started to recognize the potential benefits in terms of efficiency and effectiveness gains, if comprehensively leveraged. Yet, "[s]uccessful digital transformation comes not from implementing new technologies but from transforming an organisation to take advantage of the

possibilities that new technologies provide" (European Commission, 2016b, p. 4). Thus, the transformation needs to be thoroughly prepared and implemented, since it greatly affects the way the work is done and organized, and requires organizational adjustments (Gascó, 2003; Anthopoulos and Reddick, 2015). Böhmann et al. (2015) point to the fact that employees from all organizational layers need to refresh their digital skills as a prerequisite for digital transformation to be successful. Legner et al. (2017, p. 303) advocate for a better understanding of this changed environment in order to equip "[...] students with useful models, methods, and technical skills for customer-centric and service-centric information systems".

The basic assumption underlying this study is that competences are a key resource for the successful implementation and use of digital technologies. If public administrations wish to exploit the full potential of digitalization, the development of competences to deal with a diverse set of technologies should therefore be of equal importance as the development of the technology itself. Yet, in spite of the topic's importance, scientific contributions in this area, are only rarely to be found and do not seem to be among the domain's research priorities (Scholl, 2013; Scholl, 2014; Ogonek, 2017). There are few attempts that started the endeavor to structure the competence necessities for e-government education, e.g. Janowski et al. (2012), Janowski et al. (2013), and Hunnius et al. (2015). In this context, it is especially Hunnius et al. (2015), who are the only ones that offer a differentiated clustering of necessary competences. Their study, however, was already published in 2015. Therefore, we would like to find out, how this line of research has developed since then and put forward the research question: *Which competences do public administrations employees need from a research perspective?*

8.2 Research Background

Next to providing definitions of key concepts in order to establish a clear understanding, we also investigate existing research on competences. The term *competence* used throughout this study refers to the combination of an individual's work-related knowledge, skills and abilities (Nordhaug, 1993). In accordance with prior research (Albury, 2005), we propose that competences are a key prerequisite for the skilful use of Information Systems (IS). With the increased use of IS, the way public bodies act is and will keep changing considerably. In general, the organization's

technical infrastructure has the power to improve its performance significantly. "In particular, information systems are considered to be a major asset for leveraging organizational transformation owing to the disruptive nature of IT innovations, the deep digitalization of business, and their cross-organization and systemic effects, notwithstanding the amounts of investments in enterprise systems." (Besson and Rowe, 2012, p. 104)

Even though there are huge efficiency and productivity gains ascribed to the use of IS in public administrations (Danziger and Andersen, 2002), employees have to be provided with digital competences to be able to work in the digital age (Pérez-Escoda and Fernández-Villavicencio, 2016). The adequate preparation of public servants is therefore indispensable, because the success of implementing IT highly depends on the employees' skills and expertise (Estevez and Janowski, 2013; Hunnius and Schuppan, 2013). Despite its importance, as has been mentioned before, education in the area of e-government has not yet been a major topic of interest in research. However, there have been limited intents to identify the necessary competences. Early studies on required competences in the public sector mainly focused on IT competences, e.g. Kaiser (2004) and Kim et al. (2011). It is rather later studies that acknowledge the need for more diversified skill sets (Eshet-Alkali, 2004; Devaux et al., 2017). Yet, it seems that these competences are not very well covered. According to a report by the European Commission, almost one quarter (23%) of the total EU population has no digital competences at all. Although this ratio is better amongst the working population, where only 14% have no digital skills at all, 39% are considered to have an insufficient level of digital skills (European Commission, 2014a).

However, quite some practice frameworks have been set up to classify and cluster the necessary competences, notably in the context of the ongoing *digitalization*, which can be referred to as "[...] the manifold sociotechnical phenomena and processes of adopting and using these technologies in broader individual, organizational, and societal contexts" (Legner et al., 2017, p. 301) The SFIA, for instance, is a reference guide, describing 97 skills for employees in information systems-related roles of any type. It provides a reference model embracing two dimensions, namely skills and different levels of responsibility (SFIA Foundation, 2017). Another framework to cluster "e"-related competences is the e-CF (European Committee for Standardization, 2019). The framework, initially developed in 2005, is designed as a means for describing necessary IT professionals' skills and knowledge requirements. It

is based on 40 predefined competences, split into five ICT areas. It relates to the European Qualifications Framework with five different proficiency levels. Both frameworks offer guidance for practitioners working with IT, however they do not consider the peculiarities of the public sector, inhibiting their application to the domain of e-government.

Therefore, another study, developed by Hunnius et al. (2015), seems to be more promising, since it offers a categorization of different competence categories and is especially designed for the public sector. It builds on the findings from earlier studies in the same domain. Consisting of five different competence categories, which are composed of technical, socio-technical, organizational, managerial and political-administrative competences, it offers a more differentiated view on this topic. Technical competences are IT-related skills like the fundamentals, strategy and design of IS. Socio-technical competences encompass all the skills that are located at the interface of technical systems and human beings and involve both of them. Examples for such competences are framework requirements on the impact of e-government/technology. Organizational competences refer to the organizational integration of IT/e-government, organizational structures, process management etc. The category of managerial competences deals with business-related and management skills in the context of IT/e-government, like project, change and financial management. Political-administrative competences consist of skills that deal with the environment that IT/e-government is embedded in. Examples are legal conditions and policies. These competences seem to better grasp the competence diversity needed in the public sector. Although this framework is a valuable approach, it is one of the very few attempts to systematically cluster competences and derive explicit categories. Further systematic research on which competences public sector employees need for the digitalization, has not been put on the IS research agenda.

8.3 Methodology

In order to uncover the status quo of research on competences in the public sector, we conducted a structured literature review, following the guidelines by Webster and Watson (2002). Following their approach, we did not focus on one specific discipline, but widened the scope of our research. Contrary to the propositions by Webster and Watson (2002), we did not focus exclusively on journals but intentionally decided to

include different kinds of publications, because of the fact that research on competences just recently gained in academic interest in the public sector (Ogonek, 2017; Janowski et al., 2012). We first defined a set of relevant search terms that included synonyms to *competence* and *public administration* as well as *e-government*. We included the term e-government and variations of it, because a lot of research around the digitalization of public administrations is summarized under this umbrella term. In addition, we ran a second search in the database, this time reducing the search to articles also including keywords on digitalization, innovation or technologies. We used the database *SCOPUS* as it allows for various settings and includes a wide range of scientific outlets. The results were limited to outlets from the year 2000 onwards, because of the rapid changes technologies have undergone since then and it can be assumed that the needed competences have changed as well. As the study does not only aim at describing the status quo of research on competences in public administration but also on deriving an agenda for further research, this limitation is valid. Combining both searches led to a total set of 1235 articles. We excluded all results of doubtable quality, such as students' theses and grey literature as well as all non-scientific articles. Also, we only considered English articles, assuming that important research is published in English to make it accessible to a broader audience. We did, however, consider full as well as research in progress-papers and journal articles as well as conference proceedings and book chapters. Based on the title and abstract, we assessed the remaining articles with regard to their fit for this study's aim. The inclusion criterion was whether the development of *competences* in or for *public administrations* was a key topic of the articles. Although we rather included than excluded articles, also in borderline or unclear cases, in the end we only considered 63 articles to be relevant. We read these articles to evaluate whether they dealt with competences as a core topic or not. After a thorough pre-evaluation, a final set of 21 articles remained. 43 articles were not considered in the end, because they either purely focused on IT skills or they had a very specific target group that would not allow for comparability. We eliminated the majority of articles, because they only mentioned competences and/or skills on a side note, without specifying their nature and making them an explicit unit of analysis or the studies mentioned skills and competences as one factor influencing adoption decisions without further distinguishing the needed competences. With the remaining papers, we conducted a *forward* and *backward* search, applying the same inclusion and exclusion criteria as set forth above. All articles referencing one of the 21 articles were assessed which led to the inclusion of another 7 articles. For this search, we used *Google Scholar*

as it yielded considerably more citations than *SCOPUS*. In the same way, we also examined all articles cited in the first 21 papers and included another 14 articles as relevant in our final dataset.

8.4 Results

The final sample contains 43 articles (see Table 8.1). Out of these, 26 were published in journals, 13 of them were conference proceedings and 3 articles were book chapters. All articles were published between 2000 and 2018. Table 2 contains all identified sources, their shortened title, and outlet form. We also evaluated the extent to which the analyzed articles referred to each other as indicated by the columns 'citing' and 'cited by'. This analysis shows that only few articles refer to others in the sample and are frequently referred to by others such as Hunnius et al. (2015), Hunnius and Schuppan (2013), Gupta et al. (2017), and Leitner (2006). For the analysis, we intentionally decided against following the chosen categorization of competences by the authors, although most articles already included some kind of categorization. We decided for breaking them up to identify patterns or differences ourselves. We did this to first eliminate possible ambiguities that could exist due to the authors' different foci and chosen terms and second to not overlook any skills that we would not have expected in certain categories. The articles' categorizations were coined very differently, given the difference in focus of the respective article. O'Leary et al. (2012), for example, deal with skill sets of a successful collaborator, which is why their article naturally concentrates primarily on personality traits and soft skills. We found that similar skills were categorized differently in different articles; therefore, we summarized them in a new category.

Table 8.1: Articles Identified by the Literature Review

Authors	Outlet	Source	citing	cited by
Leitner (2006)	Cnf	D	–	Hunnius and Schuppan (2013), Schuppan (2010), Schulz and Schuppan (2011), Schulz and Schuppan (2012), Hunnius et al. (2015), and Janowski et al. (2012)
Estevez and Janowski (2013)	Cnf	D	Janowski et al. (2012)	Gharawi et al. (2014), Hunnius et al. (2015), and Ylinen and Pekkola (2018)
Banerjee et al. (2015)	Jnl	D	–	–
McQuiston and Manoharan (2017)	Jnl	D	Dawes (2004)	–
Michelucci et al. (2016)	Jnl	D	Noordegraaf (2000)	–
Marzullo and Souza (2009)	Jnl	D	–	–
Gharawi et al. (2014)	Cnf	D	Janowski et al. (2012), Estevez and Janowski (2013), Hunnius and Schuppan (2013), and Marcovecchio et al. (2013)	Ylinen and Pekkola (2018)
Hoefer (2003)	Jnl	D	–	–
Getha-Taylor and Lee (2008)	Jnl	D	–	Gupta et al. (2017)
Mancebo Fernandez et al. (2008)	Jnl	D	–	–
Auluck and Levin (2009)	BC	D	–	–
Awortwi (2010)	Jnl	D	–	Stare and Klun (2018) and Gupta et al. (2017)
Haq (2011)	Jnl	D	–	–
Gupta et al. (2017)	Jnl	D	Bhatta (2001), Brans and Hondeghem (2005), Getha-Taylor and Morse (2013), Virtanen (2000), Awortwi (2010), Hondeghem and Vandermeulen (2000), and Noordegraaf (2000)	–

Continued on next page

Authors	Outlet	Source	citing	cited by
Mincu (2017)	Jnl	D	Mincu (2016)	–
Hunnius et al. (2015)	Cnf	D	Thudugala and Weerawarana (2013), Leitner (2006), Hunnius and Schuppan (2013), and Schuppan (2010)	Estevez and Janowski (2013)
Yuryeva et al. (2015)	Jnl	D	–	–
Iwasaki (2014)	Cnf	D	–	–
Gunn et al. (2014)	Jnl	D	–	Darling and Cunningham (2016)
Hunnius and Schuppan (2013)	Cnf	D	Leitner (2006) and Janowski et al. (2012)	Ogonek et al. (2016), Reichard and van der Krogt (2014), Gharawi et al. (2014), and Hunnius et al. (2015)
O'Leary et al. (2012)	Jnl	D	Getha-Taylor (2008) and Williams (2002)	–
Schuppan (2014)	Cnf	D	Williams (2002)	Hunnius et al. (2015) and Schulz and Schuppan (2011)
Williams (2002)	Jnl	B	–	O'Leary et al. (2012) and Schuppan (2014)
Thudugala and Weerawarana (2013)	Jnl	B	–	Hunnius et al. (2015)
Virtanen (2000)	Jnl	B	–	Gupta et al. (2017) and Bhatta (2001)
Hondeghem and Vandermeulen (2000)	Jnl	B	–	Bhatta (2001), Brans and Hondeghem (2005), and Gupta et al. (2017)
Noordegraaf (2000)	Jnl	B	–	Marcovecchio et al. (2013), Michelucci et al. (2016), Bhatta (2001), Gupta et al. (2017), and Darling and Cunningham (2016)

Continued on next page

Authors	Outlet	Source	citing	cited by
Mincu (2016)	Cnf	B	–	Mincu (2017)
Marcovecchio et al. (2013)	Cnf	B	Noordegraaf (2000)	Gharawi et al. (2014)
Janowski et al. (2012)	Cnf	B	Leitner (2006) and Schuppan (2010)	Gharawi et al. (2014), Estevez and Janowski (2013), Hunnius and Schuppan (2013), and Ylinen and Pekkola (2018)
Schuppan (2010)	BC	B	Leitner (2006)	Hunnius et al. (2015), Janowski et al. (2012), and Schulz and Schuppan (2012)
Getha-Taylor and Morse (2013)	Jnl	B	Getha-Taylor (2008)	Gupta et al. (2017)
Getha-Taylor (2008)	Jnl	B	–	O'Leary et al. (2012), Getha-Taylor and Morse (2013), and Darling and Cunningham (2016)
Dawes (2004)	Jnl	B	–	McQuiston and Manoharan (2017)
Brans and Hondeghem (2005)	Jnl	B	Bhatta (2001) and Hondeghem and Vandermeulen (2000)	Gupta et al. (2017) and Reichard and van der Krogt (2014)
Bhatta (2001)	Jnl	B	Noordegraaf (2000), Virtanen (2000), and Hondeghem and Vandermeulen (2000)	Gupta et al. (2017) and Brans and Hondeghem (2005)
Stare and Klun (2018)	Jnl	F	Awortwi (2010)	–
Ylinen and Pekkola (2018)	Cnf	F	Gharawi et al. (2014), Estevez and Janowski (2013), and Janowski et al. (2012)	–
Darling and Cunningham (2016)	Jnl	F	Gunn et al. (2014) and Getha-Taylor (2008)	–
Ogonek et al. (2016)	Cnf	F	Hunnius and Schuppan (2013), Hunnius et al. (2015), and Noordegraaf (2000)	–

Continued on next page

Authors	Outlet	Source	citing	cited by
Reichard and van der Krogt (2014)	Cnf	F	Hunnius and Schuppan (2013), Brans and Hondeghem (2005), Virtanen (2000), and Brans and Hondeghem (2005)	–
Schulz and Schuppan (2011)	BC	F	Leitner (2006) and Schuppan (2010)	–
Schulz and Schuppan (2012)	Cnf	F	Leitner (2006) and Schuppan (2010)	–

Key: Jnl = journal article; Cnf = conference paper; BC = book chapter; D = database search; B = backward search; F = forward search

In total, we identified two overarching categories, i.e. competences and personality traits. Those were split again into 12 sub-categories, identifying the concrete skills. Table 8.2 exhibits all sub-categories with exemplary mentions and corresponding references. The first identified category contains competences, which can be subsumed as all the skills and abilities that are related to a certain professional area or field, i.e. functional competences. The analysis of those competences yielded eight sub-competence areas. *Business skills* are mentioned most often. 33 of the 43 articles relate to some kind of business expertise. Competences in this sub-category relate to the organization and management of a public agency but are not necessarily domain-specific. Exemplary competences are project, program, performance and strategic management, which are among the most often cited ones. HR, economic, finance and accounting and marketing skills also fall into this category. Besides those business-related skills, *IS/IT skills* are the second most often cited competences that appear in 28 of the 43 articles. Again, skills listed in this category are not necessarily domain-specific and could be applied to competence frameworks for private organizations as well. Whereas some authors describe this category very generic with 'IT content' (McQuiston and Manoharan, 2017) or 'Familiarity with ICT systems' (Banerjee et al., 2015), other authors elaborate more detailed on those skills, like Marzullo and Souza (2009), Gharawi et al. (2014) or Hunnius et al. (2015), who mention concrete competence areas such as architecture, cyber security and managing information systems.

The next category *organization* unites abilities that are centered in the organization itself and, thus, are domain-specific. Competences in this sub-category deal with

the characteristics of an organization, thus including skills such as administrative processes, organizational design or the identification with one's agency. This sub-category is mentioned in 23 articles and, thus, seems to be an important asset in the job profile of the public sector. *(Public) Policy* was mentioned in 21 articles and includes skills such as knowledge about an agency's policy area, policy planning and politics.

The category *law* occurred in 14 articles and is concerned with all legal aspects that arise in the work of a public administration. Those two sub-competence categories seem to be very specific to the public servant's profile. The next sub-category summarizes competences that were either rarely mentioned or could not be grouped in a meaningful way to any other competence category, but still we deemed them worth mentioning. They are grouped under the name *other* and include competences in research (2 sources), socio-technical skills (5 sources) and professional experience (6 sources). After having categorized all the 'hard'-knowledge based competences (functional competences), the last competence category lists all the *soft skills*, i.e. abilities that can be trained but do not count as knowledge. These competences are unrelated to any specific domain and include, for example, communication skills, teamwork, leadership, customer and service orientation and alike. It is noteworthy that those skills appear in 37 of the 43 articles and can thus be considered as highly important. Only in the categorization by Hunnius et al. (2015), they are not explicitly mentioned. Within this group, especially the soft skill 'leadership' is prominently mentioned in 25 articles. The second identified category are personality traits. Those traits are inherent to a personality and are not related to a specific (job-related) task. Furthermore, they cannot be acquired through formal education. We identified four sub-categories here. The most frequently mentioned one are *analytical skills*, which appeared in 24 articles. Analytical skills are more geared towards how a person tackles tasks and challenges.

Table 8.2: Identified Competences and Personality Traits in Identified Articles

Type	Area	Exemplary Competences/Personality Traits
competence	business	strategic planning (Leitner, 2006; McQuiston and Manoharan, 2017); project management (Banerjee et al., 2015; Williams, 2002); program management (Ylinen and Pekkola, 2018; Iwasaki, 2014); contact management (Schulz and Schuppan, 2011; Ylinen and Pekkola, 2018); finance (Michelucci et al., 2016); economics (Stare and Klun, 2018); accounting (Michelucci et al., 2016; Hoefer, 2003)
	IS/IT	management (information) systems (Hoefer, 2003), IT skills (Hunnius et al., 2015); information systems (Getha-Taylor and Lee, 2008; Stare and Klun, 2018); cyber security (Gharawi et al., 2014); enterprise architecture (Marzullo and Souza, 2011); technology management & assessment (Iwasaki, 2014)
	organization	organizational design (Janowski et al., 2012; Hunnius et al., 2015); administrative processes & workflows (Hunnius and Schuppan, 2013; Noordegraaf, 2000); coordination/implementation (Schulz and Schuppan, 2012; Haq, 2011); identification with agency (Hoefer, 2003), organizational theory (McQuiston and Manoharan, 2017)
	(public) policy	public policy (Gupta et al., 2017; Awortwi, 2010); knowledge of agency's policy area (Hoefer, 2003); social policy (Hoefer, 2003); policy planning (Auluck and Levin, 2009); politics & political processes (Williams, 2002); policy processes (Schulz and Schuppan, 2011)
	law	administrative law (Hunnius and Schuppan, 2013); legal aspects for data management (Michelucci et al., 2016); legal tools (Michelucci et al., 2016); legal aspects (Marzullo and Souza, 2011); legal framework (Marcovecchio et al., 2013); regulatory theory (Mincu, 2017)
	other	professional experience (Michelucci et al., 2016; Hoefer, 2003; Brans and Hondeghem, 2005); evaluation & research (Hoefer, 2003; Reichard and van der Krogt, 2014); socio-technical skills (Hunnius et al., 2015; Dawes, 2004; Marcovecchio et al., 2013)
	soft skills	leadership (Yuryeva et al., 2015); conflict management/negotiation (Thudugala and Weerawarana, 2013); (cross-cultural/unit, oral & written) communication (O'Leary et al., 2012); mediation (O'Leary et al., 2012); assertiveness (Mancebo Fernandez et al., 2008); influencing (Mincu, 2016); relationship (Getha-Taylor, 2008)

Continued on next page

Type	Area	exemplary competences/personality traits
personality	character traits	tolerance (Banerjee et al., 2015); continuous learning (Gharawi et al., 2014); creativity (Bhatta, 2001); commitment (Auluck and Levin, 2009; Virtanen, 2000); tenacity & perseverance (Mancebo Fernandez et al., 2008); flexibility (Brans and Hondeghem, 2005)
	analytical	critical thinking (Gunn et al., 2014); analytical thinking (Thudugala and Weerawarana, 2013); strategic & innovative thinking (Getha-Taylor and Morse, 2013); decision-making (Bhatta, 2001); problem-solving (Haq, 2011); abstraction (Ylinen and Pekkola, 2018)
	self management	self-organization (Schuppan, 2014); self-control (Gupta et al., 2017); self-awareness (O'Leary et al., 2012); self-confidence (Getha-Taylor, 2008); self-reflection (Schuppan, 2014)
	other	psycho-social stability (Auluck and Levin, 2009)

This category subsumes employee qualities indicating a view behind one's own horizon, i.e. critically reflecting on past events but also planning and envisioning scenarios, which requires thinking out of the box. The next sub-category consists of *character traits*. In contrast to the analytical skills, the articles here mostly describe more than one character trait and mention certain types of personality that public agencies need or look for. Character traits named here are, for example, tact, respect, patience, tolerance, and alike. Those seem to be preferable character traits in public administrations. This personality trait appeared in 23 of the 43 articles. The third sub-category of personality traits, mentioned in 14 articles is some kind of *self-management*. Again, competences in this category are more related to an employee's professional behavior. Those characteristics include self-organization, self-control and self-reflection, amongst other similar traits. The last sub-category under personality is coined *other*, which includes psycho-social stability. This sub-category was deemed so special, although it only appeared in one sole article that we decided to add it.

8.5 Discussion

The purpose of this research was to identify which competences public sector employees need from a research perspective. The analysis of articles allows drawing several conclusions, which we present in the following.

First, the literature review shows that only very few articles deal with the development of competences in the public sector. Moreover, only seven articles were published after or at the same time as the study by Hunnius et al. (2015), which was a review of prior research on competences in the public sector as well. Although organizations such as the EU have recognized the need for the development and education of administration specific competences (European Committee for Standardization, 2019), this area has so far received only little scientific interest. While e-government scholars often mention competences as an important driver of the digitalization of the public sector, the study of competences in the public sector is still in its infancy. Although only few articles deal with the training of competences in the public sector, these studies analyzed a variety of different competences that public administrations need. Moreover, the studies do not differentiate whether the competences are needed everywhere to the same degree or not and if one employee should be trained equally in every competence category. Although. on a higher level, they differentiate between leaders in the public administration, e.g. O'Leary et al. (2012) and employees, e.g. Mancebo Fernandez et al. (2008) and between IT-related jobs, e.g. Marzullo and Souza (2009) and non-IT-related jobs, e.g. Gunn et al. (2014), finer grained differentiations are not applied. For example, it remains unclear, whether the identified competences are needed in the public administration in general or whether they are task-specific. For example, an accounting clerk may need different competences than does the caseworker. Furthermore, ambiguities exist with regard to the relevance of specific competences for the different administrative levels. While some studies focus on a specific administrative level, e.g. Gunn et al. (2014), most of the articles do not provide information on whether the need for particular competences varies between the administrative levels. Again, the competences required of a municipal employee may differ from those required of an employee at the national level.

Second, our results show that all analyzed articles are empirical studies, whereas conceptual and theoretical approaches are missing completely. It is noteworthy that only few articles refer explicitly to conceptual works, e.g. O'Leary et al. (2012) and McQuiston and Manoharan (2017). Instead, most articles directly introduce their method, e.g. Hunnius et al. (2015) and Yuryeva et al. (2015), rather than reviewing theoretical approaches related to the development of competences for the public sector, e.g. Michelucci et al. (2016). The focus of current research on empirical studies leads to the production of practically relevant knowledge but contributes

to a lesser degree to the scientific body of knowledge. McQuiston and Manoharan (2017, p. 174) point out: "As a *pracademic* field, public administration is based on the integration of academic concepts with its practical applications, as its boundary and scope are increasingly expanded in an ever-complex world". However, the exclusive emphasis on empirical studies revealed by means of the literature review raises doubts if scholars in the field of competence research actually "[...] strive to maintain this balance" (McQuiston and Manoharan, 2017, p. 174) between practice and academia. Accordingly, we find that only very few of the articles include references to another paper of our sample, although all articles deal with the development of e-government competences. This finding highlights a need for a better linkage of existing research. This fact is all the more astonishing as most of the papers are published in related outlets such as the proceedings of the *Hawaii International Conference on System Sciences* (Janowski et al., 2012; Hunnius et al., 2015; Hunnius and Schuppan, 2013; Leitner, 2006; Schuppan, 2014), *Public Administration* (Brans and Hondeghem, 2005; Williams, 2002),*Public Administration Review* (O'Leary et al., 2012)*International Review of Administrative Sciences* (Awortwi, 2010), *International Journal of Public Sector Management* (Noordegraaf, 2000; Virtanen, 2000) or the *International Journal of E-Government Research* (Marzullo and Souza, 2009). Thus, we propose to better link existing research on e-government competences and to conduct more conceptual research to establish a common theoretical understanding.

Third, the review shows that number of specific competences is very high. The proposed framework of competences for the public sector should, thus, be refined and validated – theoretically and empirically. As outlined above, the analyzed articles do not provide any information on whether the identified competences are task-specific or should be trained in general. Thus, the question remains to what degree employees in different departments should be educated in every category. To the best of our knowledge, only one study exists, which was implemented for the German IT planning council, that takes into consideration that competences may be task-specific and that the distribution of competences may depend on the specific job profile of an employee (Becker et al., 2016). The authors distinguish the development of competences with regard to two aspects: First, public administration staff may need different competences according to their task or role. Second, the employees needing the same competences may not need them to the same degree. The depth of the competence acquaintance ranges from designing (highest level) over usage to knowledge (lowest level) and is based on the well-known taxonomy of educational

objectives by Bloom et al. (1956). In accordance with this study, we propose to not only categorize competences that are needed in digital public administrations overall but to differentiate the competences on two levels. On the *horizontal level*, competences are distinguished in relation to tasks within the public administration. For example, leaders of public agencies may need more business skills than does a case worker who may need more personal skills. Not every task may require every competence listed in the framework (see Table 8.2). On the *vertical level*, competences are distinguished according to the degree to which they have to be appropriated by the employees, i.e. although employees may need the same competence, e.g. competences in enterprise architecture, one may only need to know what this term comprises, whereas another employee may need to design such systems.

Fourth, the literature review revealed that business skills are far more often required than technical or other competences. Although the ubiquitous digitalization is reality, research seemingly puts less emphasis on the training and recruitment of technical competences. Moreover, it is noticeable that public administration-specific competences are less often required as compared to business skills. The analyzed articles are less context-specific as one might expect. About half of the identified competences were not domain or task-specific but more related to the employee's personality (e.g. soft skills, character traits etc.). Thus, we conclude that competences independent from the tasks are equally important for the public administration as are task-related competences. In relation to the overall competence framework, this leads us to the assumption that instead of looking for specialists, public administrations rather seek all-round talents. Given that researchers have recognized the necessity of the interplay between ICT and institutional settings as success factors for e-government implementation, e.g. Cordella (2013), further research is needed that sheds light onto the specific competences public administrations need to successfully implement e-government, i.e. the framework proposed here needs to be validated. It also offers an estimation with regard to whether weighting of the competences as revealed by the literature review adequately addresses the challenges public administrations have to face in the digital age. Regarding the development of research on competences over time, it seems that the topic was of special interest in the beginning of the e-government area. 7 articles were published between 2000 and 2014. From 2005 to 2009, research on competences declined to 6 articles. It was not before the year 2010 that e-government competences received more attention

with 17 articles published until 2014, which seems to go on, because since 2015 until today we could identify 12 articles.

8.6 Conclusion and Outlook

This study set out to identify the competences public sector employees need from a research perspective. To answer the research question, we conducted a structured literature review on competences in the public sector literature. Our review shows that to date only few studies exist that are concerned with competences in the public sector. Within these studies, we identified two overarching categories, competences and personality traits that could be further split up into 8 and 4 sub-categories respectively. We set up a research agenda to list all future research directions that can be derived from this study. It shows that besides the need for functional or task-related competences like organizational or management skills, there is also an increased need for soft skills and personality traits. Task independent competences seem to be equally important for the public domain as are functional competences, thus requiring public servants to be all-rounders rather than specialists in one specific area. Having said this, future research should also consider examining the respective competence depth more critically, since not every employee is required to embody one specific competence in the same way. Given the limited amount of studies identified in total and the finding that those are primarily of empirical nature, more research on this topic is needed in general and especially with regard to theoretical contributions that provide a solid basis as a commonly agreeable set for further research in this area to build on. After all, a diversified look into interdisciplinary competences, required by public servants working in a digital environment today, only picked up real speed in terms of scientific contributions by the year 2010. Thus, this topic has gained considerably in importance and more contributions are to be expected. The main limitation of this study is the choice of database that naturally fails to provide a complete picture of competence research in e-government. Thus, further research should look into other databases to round out and verify these results. Due to the pace of changes, induced by technology, competences also might undergo much more frequent changes than it was the case before. This is why more and particularly constant research is required to monitor these developments to competently address possibly new challenges.

9 Towards Efficient E-Government: Identifying Important Competences for E-Government in European Public Administrations

Fact sheet of publication P4

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Abstract. *In an attempt to enhance efficiency, public administrations around the world and in particular in Europe are increasingly relying on information technology (IT) to improve their performance and service delivery. This growing use of IT results in a changed set of competences demanded from civil servants. In order to find out the concrete competences that are required for successful implementation of e-government initiatives and that, consequently, need to be included in the education of future professionals, a European-wide survey was conducted (n=697). This paper reports on the first results of this study, revealing that there is a strong need for professionals with socio-technical, organizational and managerial competences.*

9.1 Introduction

The ever-increasing demands public administrations must fulfil concerning social, economic and political challenges, have raised the pressure to respond appropriately to this environment. Efficiency in terms of the joint creation of public value beyond national borders is therefore at the heart of European political debates and "requires holistic responses, which in turn call for the transformation of public administrations" (European Commission, 2014b). In this respect, IT and technological innovation can serve as primary drivers since they provide effective and complexity-diminishing tools to deal with the plethora of requirements. They can contribute significantly to the amelioration of the performance and efficiency of the public sector and improve the service delivery (Sabbagh et al., 2012). Under the umbrella term *electronic government* (e-government), IT and technological innovations that allow public administrations to collaborate more efficiently with all stakeholders are summarized. The stakeholders include private actors, citizens and other organizations. Efficient collaboration makes it possible for public administrations to address diverse and constantly increasing needs of stakeholders. According to European Commission (2006), e-government means "the use of information and communication technologies in public administrations combined with organizational changes and new skills" with the objective to "improve public services, democratic processes and public policies" (European Commission, 2006).

E-Government initiatives, however, highly depend on the employees' expertise and qualification in this area (Janowski et al., 2012). To fully leverage the potential of e-government, it is important to have a workforce with the right competences to perform the necessary tasks. The term *competence* can be defined as a combination

of work-related knowledge, skills and abilities held by an individual (Nordhaug, 1993). It has to be ensured that civil servants are trained to be able to deal with new technologies and, thus, to guarantee customer satisfaction and efficient service delivery (Reding, 2005). Studies show that a high number of e-government projects have failed (Heeks, 2003), which emphasizes that it is not sufficient to have the technology available; expertise and commitment of qualified professionals are crucial. IT has to be designed and adjusted to the respective context in which it is applied and it needs the right professionals, who are capable of exploiting the new potentials of IT as far as possible (Grönlund, 2002). E-government is not only about new techniques; it is much more about the people implementing it who need to have the right competences (Hunnius and Schuppan, 2013).

Due to the lack of a comprehensive overview, what competences are required by public administrations for a successful implementation of e-government initiatives at all levels, a European-wide survey was set up with the aim to provide such an overview. Awareness about the demanded competences is of value for both educators to improve existing curricula and training programs and (future) professionals who would like to enter or advance in the e-government field. The survey was conducted between January and February 2016 and resulted in 697 usable responses from participants in 34 countries. This paper is focused on the presentation of the survey results and their implications for the development of e-government education in Europe.

The remainder of this paper is structured as follows. In the next section we review related literature and introduce the e-government competence framework applied in the study. Then, we describe the study method, followed by the presentation of results and their discussion, highlighting constraints and limitations. In the concluding section, we provide a short summary of the work done, together with the areas for future research.

9.2 Research Background

One way of increasing efficiency of public administrations is to have the right employees in the right positions doing the right things and to train them accordingly. Therefore, it is of utmost importance to define the competences that are necessary for

a successful e-government education in the European context. However, research on education of e-government in order to identify these competences has been neglected for a long time: for instance, e-government education was not identified among future research topics within the roadmapping for the eGovRTD2020 project (Wimmer et al., 2008) and it remains under-researched (Scholl, 2013).

Identification of the right competences for e-government has started to attract increasing attention among scholars. A first attempt by Janowski et al. (2012) identified a first set of competences and structured an academic debate around developing an e-government curriculum (Janowski et al., 2013). Apart of this e-government specific approach, a more generic approach was developed on the EU level. The European e-competence framework (e-CF) was established in 2014 as a means for describing the skills and knowledge requirements of IT professionals (European Committee for Standardization, 2019). The framework is supported by the European Commission and forms part of the EU strategy for e-skills in the 21st century. The e-CF was developed with the objective of offering a one-stop shop for needed competences in an IT environment and provide decision support concerning competency requirements and their implications for training, career development and so on. Yet, this framework provides a rather generic reference system, given that it is focused on IT professions in general, and does not take into consideration the peculiarities of different domains. On the one hand, this framework makes a valuable orientation in terms of classifying different types of competences; but on the other hand, its suitability for the e-government domain is limited.

In search for a suitable framework, we decided to orient ourselves closely around the study by Hunnius et al. (2015) for the purpose of designing our questionnaire. In light of the lack of profound examination and classification of e-government competences in the academic field (Hunnius and Schuppan, 2013), this study is especially valuable, because it offers a comprehensive framework compared, for example, to the e-CF framework, because it is comprised of five different categories of e-government competences, namely technical, socio-technical, organizational, managerial and political-administrative. The dimension of *technical* competences encompasses all IT-related skills like the fundamentals, strategy and design of Information Systems. *Socio-technical* competences refer to all the skills that are at the interface of technical system and human beings and involve both of them. Examples for such competences include framework requirements on the impact of IT/e-government. *Organizational* competences concern the organizational integra-

tion of IT/e-government, organizational structures, process management etc. The next category of *managerial* competences deals with business and management skills in the context of IT/e-government, such as project, change and financial management. The fifth category of *political-administrative* competences addresses all skills that deal with the environment that IT/e-government is embedded in, such as legal conditions and policies. These five categories represent the multi-faceted composition of e-government and its requisites, beyond purely focusing on IT knowledge as in earlier publications.

9.3 Research Method

In order to gain an understanding of the competences demanded by public administrations in Europe, an online survey was conducted among the representatives of public administrations and other organizations working in close cooperation with public administrations (target respondents). The framework by Hunnius et al. (2015), presented in the previous section, acted as a basis for the questionnaire development. On top of that, it was decided to include in the survey several additional questions about the organization location, type, number of residents in the area of responsibility, number of employees and number of implemented e-government projects.

Once the agreement on the final set of questions had been reached by the authors, the survey was pre-tested by five experienced researchers, incorporating their feedback to the questionnaire. As a result, for each of the five categories of e-government competences, namely technical, socio-technical, organizational, managerial and political-administrative, questions about the importance of three to five exemplary competences in each category were asked about (Table 9.1a). All included exemplary competences were derived from the study by Hunnius et al. (2015), who identified them based on extant academic literature in the field. The competence importance was measured using a 5-point Likert scale, with response options ranging from "unimportant" to "very important".

In case a specific competence was perceived important by a respondent (was marked as "important" or "very important"), two additional questions were asked. First, it was valuable to understand whether enough professionals in the organization

or on the job market offer this qualification (Table 9.1b). Second, the respondents were asked, whether employees in the organization have been or will be sent for an additional training to obtain this competence (Table 9.1c). Both additional questions were measured using a 5-point Likert scale, with response options ranging from "strongly disagree" to "strongly agree".

The final version of the questionnaire was translated from English to German, French, Estonian, Spanish and Dutch. Thus, the survey was made understandable to target respondents in most European countries who do not necessarily speak English. The survey was then implemented using the LimeSurvey platform[9] in all six languages and tested by ten researchers, making final adjustments. Once the online survey was launched in January 2016, a link to it was sent per email to more than 12,000 target respondents, asking them to distribute the link further to relevant personal contacts. The link to the survey was active for six weeks and during this time 2,155 responses were received in total. However, only 697 of them were complete, meaning that all mandatory questions were responded to. We decided to focus only on complete cases in further analysis, which was done using the SPSS Statistics software package. The results of data analysis are presented and discussed in the following sections.

9.4 Results

Of the 697 completed questionnaires, about 84% of the responses came from Germany, due to the direct access of the authors to the target respondents in this country. In addition to Germany (n=587), Belgium (n=44) and Estonia (n=19), respondents from the following countries participated in the survey: Austria, Azerbaijan, Bosnia and Herzegovina, Brazil, Bulgaria, Chile, Croatia, Finland, Georgia, Hungary, Italy, Kazakhstan, Kosovo, Latvia, Lithuania, Macedonia, Montenegro, Netherlands, Norway, Philippines, Moldova, Romania, Russia, Switzerland, Serbia, Spain, Thailand, Turkey, Ukraine, United Kingdom and Uzbekistan.

More than 90% of the responses came from the representatives of public administrations, out of which 38.2% came from public bodies serving fewer than 50,000 residents. Related to that, most organizations turned out to have less than 500

[9] www.limeseurvey.com

employees. Moreover, we asked for a general experience with e-government and e-government projects. In total 69.9% of the respondents implemented five or fewer e-government (or e-government-related) projects. Therefore, it can be stated that at the participating organizations the overall experience with e-government and e-government implementation was on a quite low level.

As the main goal of the survey was to identify the competences sought by public administrations in Europe, the majority of questions were focused on the identification of these demanded competences. In general, the proposed competences in the chosen categories from the framework by Hunnius et al. (2015) seem to be relevant. Only three competences were marked by less than 40% of the respondents as "important" or "very important" (*expertise in Information Systems design*, *Information Systems competences* and *expertise in politics of e-government*). On the other side, *IT competences, business/public management competences, project management competences* and *expertise in administrative workflows* were pointed out by more than 70% of the respondents as "important" or "very important", and there are further competences considered as important by more than 60% of the respondents (*process management competences*, *expertise in legal framework* and *expertise in public policy*). It is quite interesting that besides rather basic IT and administrative workflow competences the managerial aspects were mentioned most often. It seems that there is a special need for leadership competences. This is also flanked by the answers in the open-ended responses, where mostly managerial, but also social competences were mentioned (e.g. communication competences).

Table 9.1: Relative Importance of E-Government Competences in Practice and, for the E-government Competences Marked as Important, the Level of Perceived Supply and Qualification

Competence Category	Competences	(a)	(b)	(c)
Technical	IT competences	72.2%	46.3%	66.8%
	Expertise in Information Systems design	33.6%	56.8%	59.4%
	Information Systems competences	26.7%	45.2%	50.0%
Socio-technical	Expertise in e-government impact	45.1%	60.5%	51.3%
	Expertise in technology and e-government adoption	44.6%	57.9%	47.3%

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Competence Category	Competences	(a)	(b)	(c)
Organisational	Expertise in politics of e-government	39.5%	59.6%	44.7%
	Expertise in e-government structures	45.9%	52.2%	57.2%
	Expertise in organisational design	52.9%	39.0%	60.8%
Managerial	Process management competences	60.0%	40.2%	57.3%
	Business/Public management competences	71.6%	29.5%	57.3%
	Project Management competences	70.4%	33.8%	59.1%
	Financial management competences	51.8%	23.6%	58.2%
	Performance management competences	40.6%	40.6%	42.8%
	Change management competences	54.4%	48.8%	47.0%
Political-administrative	E-policy competences	46.1%	46.7%	42.4%
	Expertise in legal framework	65.1%	22.7%	55.3%
	Expertise in administrative workflows	74.2%	27.3%	56.1%
	Expertise in public policy	60.6%	18.5%	56.9%

(a) Relative importance of e-government competences in practice | (b) For e-government competences market as important: share of the respondents who stated that there are *not* enough professionals in the organisation/on the job market who offer competences | (c) For e-government competences marked as important: share of the respondents who stated that employees in the organisation have been/are planned to be sent for an additional training to obtain competences

Besides the general importance of single competences, it is also valuable to understand, to what extent the employees working at European public administrations are equipped with these competences. To address that, for each competence marked as important for e-government, we asked whether, from the respondent point of view, there were *not enough* employees in their own organization or on the job market skilled with this competence (see Table 9.1 (b)). It is surprising that only five out of the 18 investigated competences were mentioned with a share of more 50% saying there are not enough people in the sector. These competences include *expertise in Information Systems design*, *expertise in e-government impact*, *expertise in technology and e-government adoption*, *expertise in politics of e-government* and *expertise in e-government structures*. It is interesting that all socio-technical competences were considered as not sufficiently supplied by more than 50% of the respondents. Furthermore, it is striking that purely technical competences were not demanded, but strategic/managerial aspects seemed to be of importance instead. It is noteworthy that interdisciplinary aspects are especially missing in the skillsets of people already working in the field.

As a next step, we intended to find out if, besides an awareness of missing competences, appropriate actions were undertaken to address existing gaps (e.g., by additional trainings). For each competence marked as important, we asked, whether there were plans for employees to be sent for trainings to obtain this competence or whether they had already attended such a training, see Table 9.1 (c). It is surprising that only six out of 18 competences received less than 50% of the responses, indicating that two-thirds of the employees were either planned or had already been sent to trainings to acquire the competences. However, it has to be taken into account that here rather basic competences like *IT*, *Process- and Project Management* were rated with the highest shares of 60% and more. There are two possible explanations for these results: (1) there is more training offering on the market for the rather basic competences and that is why it is easier to send employees to attend such a training, and (2) seeing it from a maturity perspective, the *basic* competences are the first ones to acquire, leaving the other competences to be developed and taught at a later stage.

9.5 Discussion

From the results above, we could draw three important conclusions for modern public administrations: First, the survey confirms the initial idea that public sector organizations are in need of *specific* competences to be able to adopt and implement e-government projects and e-government-based service delivery in a sustainable way. This is a crucial issue, because, on the one hand, public administrations worldwide are well aware of the importance of IT and digital evolutions for their future development. On the other hand, they still seem to lack the necessary competences to achieve this. Is that because it is difficult to find professionals with certain profiles? Or is it because public administrations lack the resources to attract the professionals who possess specific competences? Or is it because there is a lack of specific education capable of addressing the necessary diversity of competences in a coherent way? If the last explanation is the case, it would mean that there is an important gap in higher education in this domain, and that the higher education sector carries an important and urgent responsibility to develop those competences.

Second, though the difference is not that large, it seems that there is more need for organizational and managerial competences in the domain of e-government than

for technical competences. This fits the idea that public administrations have for decades (1) reduced the adoption of e-government projects to technical projects and (2) have not hired managers and leaders with sufficient specific e-government related competences. Both elements are striking since public organizations have been well aware of the complexity of e-government implementation. As stated above, we can argue that public administrations will need to make a shift in their recruitment policy, if they want to be able to embrace the possibilities of e-government for a deep efficiency increase and service delivery improvement. From this perspective, it will be important to hire employees who possess all the necessary competences – technical, managerial, as well as socio-technical and political-administrative.

Third, as can be derived from the first two elements of discussion, it is no wonder that the majority of organizations have limited experience with e-government projects in general. There might even be a vicious circle that a lack of competences within an organization to adopt and implement e-government projects will be an important inhibiting factor for the implementation of e-government projects. And, logically, a lack of experience in e-government projects will create a lack of internal competences in this domain and prevent building required internal capacities. Using external know-how would be difficult in times of financial austerity (Kickert et al., 2015). This means that there might be only one possibility to break this circle: if public sector organizations would like to benefit from the potential advantages of digital evolution, they will have to make e-government a foundation for future service delivery. This is a major shift, since e-government should become more than a means, but the future of innovative public administrations, which will have to invest in acquisition and development of interdisciplinary competences to achieve this.

9.6 Conclusion

Academic studies report that the increased need for efficiency gains drives many e-government projects. Hasty e-government implementations, combined with a lack of IT understanding and IT skills in the public sector, lead to the failure of many such projects. At the same time, there is still a lack of discussion of the competences missing in the field.

We conducted a web-based survey with almost 700 respondents from European stakeholders hiring university graduates to work in e-government projects. Despite our recognized bias on Germany, the study shows a need not only in IT competences but also in a more holistic approach that integrates perspectives on several disciplines. Our results indicate that a thorough understanding of public service delivery and information and communication technologies is required, combined with knowledge of organizational processes and political contexts entangled with managerial competences. The results show evidence that there is a need for interdisciplinary learning which can only be addressed when considered early on in designing new curricula targeted at future e-government professionals. New e-government curricula should also address the problem of appearance of silos in public administrations. The solution need to be complemented with national initiatives such as the laudable study of e-government competences by the German IT *Planungsrat* (Planning Council) (Becker et al., 2016). The survey results confirm that looking at e-government projects as only technical projects and understanding e-government just as a technical issue does not represent the core of e-government. Holistic, interdisciplinary concepts and skillsets are necessary to overcome existing problems.

Further directions of our research will focus on the following aspects: (1) We will analyze the need for social competences for future e-government professionals. Results show that social competences in the fields of leadership and communication are crucial to manage the digital transformation of the public sector domain. (2) European and international e-government curricula and job descriptions for e-government professionals need to be developed, because the lack of respective competences is not a just national phenomenon. The EU common values, guidelines and norms require that civil servants working in this field understand the transnational aspects of implementing an efficient and effective e-government architecture.

10 Governments' Need for Digitization Skills: Understanding and Shaping Vocational Training in the Public Sector

Fact sheet of publication P5

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Abstract. *This article describes how while confronted with digitization, governments need to equip their employees with skills for dealing with the upcoming technologies. To date, however, there has been no thorough analysis of which skills governments actually require and how these skills are addressed by (vocational) training. Therefore, the aim of this article is to understand both governments' needs and the scope of currently offered training as well as identifying the existing gaps by conducting qualitative interviews with employees from HR departments in governments. An understanding of what skills are actually required in public bodies and how they can be classified will be outlined. Furthermore, the challenges and benefits of governments' decision to offer vocational training are investigated, pointing out gaps that need further investigation. Based on this, implications for theory and practice for the digitization future and vocational trainings in government are derived.*

10.1 Introduction

Digitization in the form of using smartphones, laptops and other digital devices for the execution of all kinds of tasks via the Internet like online shopping, banking or just information gathering, has not only become an integral part of people's private everyday life, but has also entered business life deeply. On the one hand, organizations are actively shaping Information Technology (IT) systems by integrating new technologies into their business models and by restructuring their internal processes. On the other hand, with their fast-changing features, new technologies challenge organizations' competencies and require them to dynamically adapt to this changing environment (Kim et al., 2011). Public administrations are no exception in this respect. Quite the contrary: Since the emergence of electronic government (e-government), public administrations are flooded by the appearance of and need to use new technologies, which has the potential to serve as primary innovator in terms of completely changing the way public administrations interact with their stakeholders: It even "becomes a vehicle for societal improvement" (Córdoba-Pachón, 2015, p. 9). At the same time this bears severe implications for the ways of how the work is done and organized, necessitating organizational adjustments (Anthopoulos and Reddick, 2015; Gascó, 2003).

However, only because government employees might be accustomed to using new technologies in their spare time, this does not mean that they are automatically pre-

pared to use the partially very specialized, not self-explanatory IT that comes into play when looking at the daily work of public administrations nowadays. Public servants find themselves in a completely new situation, having to deal with electronic procedures, which do not only change the work processes but also demand different approaches due to the use of IT. Thus, it does not suffice to have the latest technologies in place. One of the most decisive success factors of e-government implementation and projects is the public servants' education in this area to equip them with the demanded competencies in order to meet their customers' expectations (Janowski et al., 2012).

According to Dada (2006, p. 5), there is a profound "lack of skills and training which are required to effectively use an e-government system that is available to government officials and citizens". A possible remedy to this problem should therefore be a targeted training "in order to be prepared for the future" (Niehaves, 2010, p. 8). Such training should address the variety of needs for dealing with IT in different departments and job positions and provide the employees with the required e-government competencies. Different programs exist such as full study programs, postgraduate studies or vocational training. Whereas IT-related study programs covering several months or years are relevant only to a limited number of specialized employees, vocational training is an adequate option for the majority of the government workforce for several reasons. First, neither all employees have the time to follow a full program nor can all public entities afford to send employees on extensive study programs. In times of scarce public budgets and enforced austerity (Kickert et al., 2015), there is a need for offering vocational trainings for government employees to stay up-to-date. Second, shorter trainings, offered on a regular basis that provide the most important and latest inputs might also be preferred in consideration of the fact that IT is fast-changing and asks for periodic updates. Finally, the training has to address the needs of different target groups. Thus, short-term vocational training lends itself to an appropriate teaching format.

In order to teach government employees the relevant IT skills, the specific needs of governments and the offered vocational trainings need to be aligned. Due to the specific characteristics of governmental work and organization, vocational training methods applied to the private sector cannot be transferred one on one to the public administration domain. Instead, effective training has to take into account the specific needs of the public sector and especially of government employees who are affected by digitization. However, both practice as well as research have failed to

consider governments' specific needs when designing vocational training. Therefore, the questions guiding this study are:

- *RQ 1. Which needs for vocational training arise due to the increasing digitization in public administrations?*
- *RQ 2. Which kinds of trainings do currently exist and how do they suffice the identified needs?*
- *RQ 3. Which gaps exist between the needs and the offer of vocational training? How can these gaps be closed?*

For answering these questions, qualitative interviews with employees in German municipalities in charge of vocational training were conducted to capture the perspective of those who have to implement these digitization efforts: public administrations themselves, which has – to the best of the authors' knowledge – up to now been an unconsidered point of view. This study synthesizes the status quo and, therefore, serves as a starting point for more theory-driven and more normative research in the future. The results suggest that digitization is an emerging topic for public administrations with many individual initiatives taking place. There is no consensus as to whether public administrations and their employees are sufficiently equipped for this challenge. Although, the interviewees reported a general satisfaction with trainings teaching how to use a specific program, the results suggest that especially comprehensive and strategic IT skills would be valuable.

10.2 Background

The pervasiveness of IT is more present than ever before. This new level of interconnectedness is oftentimes referred to as *digitization*, equaling "the mass adoption of connected digital technologies and applications by consumers, enterprises, and governments." (Sabbagh et al., 2012, p. 121), and leads to unprecedented opportunities for economic growth. Especially in the public sector, struggling with financial bottlenecks, the use of IT offers a large set of benefits that has also been acknowledged by policy makers such as the European Commission (European Commission, 2016c, p. 2), who states that it "supports administrative processes, improves the quality of the services and increases internal public sector efficiency. Digital public services reduce the administrative burden on businesses and citizens by making

their interactions with public administrations faster and efficient, more convenient and transparent, and less costly." However, this undoubted potential concerning new business opportunities, substantial cost savings and efficiency increases has to be well prepared to prevent it from becoming another failed e-government initiative (Dada, 2006; Heeks, 2003; Müller and Skau, 2015). The increased use of IT will only achieve a profound institutional change which in turn is a necessary prerequisite for the successful implementation of e-government projects "when they give rise to the adjustment of the whole set of technological, managerial, and political variables affected by ICTs implementation" (Gascó, 2003, p. 13).

The implementation of IT in public administrations and thus the underlying processes differ between government organizations. In order to set the necessary preconditions for a successful e-government implementation in Germany, the federal government passed the e-government act (EGovG), which entered into force as from August, 1st 2013 (Federal German Government, 2013). By means of this act, public services should become simpler, more efficient and user-friendlier (European Commission, 2015). Yet, it is not only the public authorities as entities that need to be prepared for this technologically induced changes, but rather the employees who need to deal with the new systems and procedures, e-government is bringing about, on a daily basis. Skills and experience with IT – both at work and in private life – heavily influence people's use of IT at the workplace (Thompson et al., 1994). Research streams such as the IT adoption literature emphasize previous skills and knowledge as an important antecedent to IT usage behavior, see Venkatesh et al. (2003). However, there are several studies that acknowledge the lack of such specific skills for the implementation of e-government: Reviewing the literature in this field exhibits that there are studies that accentuate the need for more training and personnel specialized in IT (Kim et al., 2011) like a survey amongst 500 employees of public authorities in the United Arab Emirates (UAE) which revealed that lacking IT skills is among the three most challenging factors impeding successful e-government adoption (Al-Jenaibi, 2015). According to this study, the more the employees are demanded by IT skills and the cost of e-government, the more the feeling arises that their organization would be more challenged when adopting e-government. This effect can be ascribed to the fact that there is not enough expertise and training for the purpose of e-government (Basu, 2004; Dada, 2006). Especially elder employees are heavily challenged by new IT. It is particularly the public workforce that is oftentimes composed of employees with an advanced age. U.S. state governments,

for example, have older employees than any other sector and the mean workforce age has risen from (already) 40 years in 1980 to 45.5 years in the period 2005 – 2007, with a share of only one tenth of the employees being younger than 30 years (Lewis and Cho, 2010).

There are also studies that cater for a more holistic consideration of e-government skills, namely encompassing more than just "technical" skills (Hunnius et al., 2015; Hunnius and Schuppan, 2013; Janowski et al., 2012; Leitner, 2006) that are a prerequisite for e-government to be successful. According to Hunnius et al. (2015) and Ogonek et al. (2016), who did a literature review and a survey, e-government competencies need to be interdisciplinary exhibiting a mix of technical, socio-technical, organizational, managerial and political-administrative competencies. The term competence refers to the combination of an individual's work-related knowledge, skills and abilities (Nordhaug, 1993). Both research teams found that there is not sufficient expertise in the currently offered training programs and that new curricula are needed to equip public servants with the skills e-government demands for.

In close connection to the needed employee capacities and skills are the organization's predisposition and existing facilities to create the necessary prerequisites for their employees to be able to implement the exigencies e-government is imposing on them. The organization's IT capacity are an important prerequisite for the successful implementation of e-government (Moon and Norris, 2005). Thus, there is a need for more strategic planning and alignment, management, communication and a clear vision for the role and use of IT to successfully implement e-government (Caffrey and McDonagh, 2015; Leitner, 2006). Setting the mandatory organizational preconditions with top managers who "work to empower the Organisation and HR staff units as well as invest more in managerial education of administrative personnel" are regarded as inevitable in that respect (Bof and Previtali, 2007, p. 8).

Apart from pointing to that need, research has mainly neglected the field of training in public administrations. Janowski et al. (2012) are one of the few who have considered training for digitization skills from an academic perspective and who have developed a theoretical framework for classifying e-government (EGOV) education. They distinguish the dimensions "learners" ("Who should receive EGOV education?"), "roles" ("Why should they receive EGOV education?"), "competencies" ("What EGOV competencies should they receive?"), "programs" ("How should EGOV competencies be built?"), "schools" ("Where should EGOV education be

carried out?") and "prerequisites" ("When should EGOV education be delivered?") (Janowski et al., 2012, p. 2273). Furthermore, Chandavimol et al. (2013) have identified obstacles to training programs, which mainly are insufficiently time allocated to the training, and Carte et al. (2011) acknowledge a positive effect on IT skills as well as an improved computer self-efficacy after attending a training. However, up to now, no thorough understanding of public administrations' needs for vocational training on digitization skills and the mechanisms for offering such trainings or the employees' perception exist.

10.3 Research Method

Since the topic of (vocational) training in governments has not yet been analyzed thoroughly from a scientific perspective, a qualitative approach to this topic seems most adequate. Qualitative research is especially appropriate in areas where only few prior research has been conducted because it can give insights into new situations (Recker, 2013). Within qualitative research, interviews are the most common form of data collection (Myers and Newman, 2007) and they are also the method of choice in this study.

To get insights into the status quo of current trainings offered for digitization skills and the employees' satisfaction as well as how these trainings are organized and what possible educational gaps can be identified, seven interviews were conducted with the help of a semi-structured interview guideline. The guideline was based on the related work presented in the previous section and comprised the following topics: How does digitization affect the work in public administrations in general? Which new requirements and needs for skills are induced by digitization? Which kind of trainings are offered to teach these skills? Which impacts do the trainings have? Which obstacles exist when organizing the trainings?

For being able to draw common conclusions from the results, the interview partners were selected from municipalities within one federal German state, North-Rhine-Westphalia, which is the most populated federal state, located in the Western part of the country. In Germany, municipalities are classified into seven size classes according to their inhabitants (Krems, 2015). To avoid biases based on the size of the municipalities, the seven interviewed municipalities cover these seven size classes.

The number of inhabitants range from less than 10,000 to more than one million, the size of the interviewed public bodies from about 60 to 6,500 employees.

The interviewees were responsible for vocational training in their administration or were at least familiar with the structure and organization of the trainings. In most cases they were from the human resources department (if such a department existed) or from the IT department. The number of people responsible for vocational training ranges from less than one full-time position to twelve employees who, however, are not exclusively concerned with this topic. Whereas six interviewees work in the core municipality, one interviewee works in the IT service provider of the municipality, which used to belong to the municipality and has only recently been converted into an organization of its own. The interviews took place in the interviewees' offices. The first two interviews were conducted by both researchers together to make sure that the following interviews, which were operated by one researcher each, were conducted in a similar way. They lasted between 19 and 65 minutes with an average duration of 40 minutes. The interviews were audiotaped and afterwards transcribed.

Finally, the interviews were analyzed using qualitative content analysis, which is a common analysis method in the social science (Recker, 2013) and helps to identify the latent and the manifest content within a material. In order to identify this content, the material, in the present case the interview transcripts, were coded with the help of categories (Krippendorff, 2004). These categories can either be defined deductively prior to the analysis based on the related work, or they can emerge and be adjusted inductively during the coding of the text. In many cases, a mixed approach is recommended (Elo and Kyngäs, 2008). In the present study, the coding categories were derived based on the literature used for the interview guideline. These categories were tested on the seven interview transcripts, refined and extended. Afterwards, the interviews were coded in-depth by both researchers with the help of the online coding tool QCA Map[10], which is based on the qualitative content analysis by Mayring (2000) and allows to compare the coding of two coders. The coding results were discussed and analyzed jointly leading to the concepts, presented in the following section.

[10] www.qcamap.org

10.4 Results

In this section, the analysis results focusing on research questions 1 and 2 will be presented. Research question 3 concerning possible remedies to closing these gaps will be presented and discussed in the subsequent section. The findings are derived from the coding results. Cited statements by the interviewees are presented in quotation marks.

Needs for vocational training arising due to the increasing digitization in public administrations

Digitization initiatives in public administrations. Digitization has arrived in public administrations more or less intensively. Recently introduced technologies range from single specialized procedures and applications such as digital graveyard organizers or refugee management to supporting infrastructures like digital post inboxes, invoice scanning or electronic filing systems. Mobile devices as well as remote access tokens enable teleworking and facilitate accessing relevant documents independent of time and place. Further digitization projects, which the interviewed administrations plan to address in the near future, include the introduction of document management systems, electronic forms for citizens as well as electronic signatures to be able to accept electronically submitted applications. When asked for digitization and its effects, the interviewees mostly associated it with Microsoft Office applications such as Word, Excel or Access as well as the Internet. Rather than by changed processes, digitization is observed by new hardware or software as well as by new ergonomic furniture. Whereas digitization is sometimes viewed as daily routine that *"we cannot do without anymore"*, other interviewees mentioned a lacking comprehensive IT concept. Especially from an outside perspective, public administrations are viewed as reluctant adopters of digitization and particularly for small municipalities, digitization is quite new. These digitization initiatives are initiated by different stakeholders – be it the department head, a single employee or external parties such as software providers or politics.

Benefits of digitization. The interviewees regard digitization as a necessity which brings various benefits for the work in public administrations. On the one hand, tasks can be carried out more efficiently, which is shown by time and cost savings, less workload, a reduction in paper and fewer required personnel. On the other hand, digitization makes work more effective by offering new functionality such as

a data history or ubiquitous availability of information. In addition to this rational perspective, working with new IT system is simply regarded as *"fun"*.

Challenges of digitization on an organizational level. However, due to digitization, public administrations are confronted with tremendous challenges both on an organizational level as well as on the employees' individual level. On an organizational level, public administrations are faced with the need to *strategically plan and embed IT* into the organizational structure. This is oftentimes hindered by a lack of a comprehensive digitization strategy and insufficient resources allocated to digitization projects. Rather than saving costs in the long run by reengineering processes, short-term labor costs have been cut. Public administrations have not yet yielded the full potential of digitization. In many cases, department leaders are not IT savvy themselves and therefore do not live up to a role model. What is more, even employees who are responsible for IT often do not have an IT background. Public administrations face the challenges of having to "*clarify the legal uncertainty*" that is induced by the unprecedented use of IT. Many interviewees stated, for example, that it is not clear which requirements digital formats need to fulfil in order to be legally binding. Furthermore, the issues of data protection and privacy become increasingly important as employees start to use private IT infrastructures for their daily work. Some interviewed administrations have already started to define departmental notes on the use of IT but are planning to further extend these instructions. Public administrations need to cope with or *reduce increased system complexity*, which is, on the one hand, created by digital processes and the administration of these processes becoming very complex and user-unfriendly and, on the other hand, by currently existing parallel work both on paper as well as digitally. In addition, public administrations have to *deal with their dependency on IT*. In the interviews it became apparent that there is a fear of losing social competencies due to extensive use of technology as well as the danger of not being able to work in case of a system failure or blackout. Finally, since the success of digitization initiatives in public administrations is heavily dependent on the employees working with the systems, public administrations face the challenge of having to *give the employees an understanding of digitization*. The most severe obstacle, though, seems to be the employees' resisting attitude who can hardly be forced to deal with digitization. Digitization often does not respect the employees' needs and fears, which mainly arise due to missing knowledge.

Skills required by digitization on the employees' individual level. An important prerequisite that all interviewees agreed on are the employees' *IT skills*. These skills

go beyond the mere use of single programs but include a basic understanding and "feeling" of IT, which can only be obtained by an intensive use of IT. In addition to the technical skills, employees need to be familiar with the government procedures and filing plans. There was a consensus that even more important than specific IT skills are the *soft and (self) management skills* that go along with digitization. Among the mentioned skills are time management, dealing with increased stress and information overload, higher concentration, solution orientation, work structure or digital communication skills. Closely related are the requirements to *be open towards innovations and learning*. Employees are expected to be open-minded and willing to qualify. They should not take the as-is situation for granted but be open for process improvements. Many interviewees wished for more "*courage in using IT*", which tackles various dimensions. Employees seem to be afraid of making mistakes when dealing with new programs with IT bugs creating even greater fear. Furthermore, some interviewees identified a fear of being monitored and controlled by others, a general fear of change or the fear of becoming needless.

Sufficiency of employees' skills. The interviews draw a quite diverse picture of whether the employees are sufficiently skilled for the ever increasing digitization of the public sector. Whereas one interviewee was heavily convinced that especially IT skills were lacking, the remaining interviewees did not regard this as a problem. This goes hand in hand with a heterogeneous understanding of whether employees are equipped with the required organizational skills. No clear picture was either drawn on the effect of age. Whereas younger employees are assumed to be less afraid of using IT and show more enthusiasm, some interviewees stated that elder employees as well were eager to keep up with IT. A more important factor for digital skills seems to be the employees' use of IT in their private life.

Kinds of trainings currently existing and how they suffice the identified needs

Current training offer. All interviewees acknowledged the importance of trainings. In case of lacking competencies trainings should and are being offered. However, according to the gathered responses, the number of IT trainings is far less than the offer of other "organizational" trainings or trainings related to a specific field. According to one interviewee "*most trainings, about 90% are juridical ones*". Further offered trainings concern soft skills, such as self-, time- and stress management. Looking at the offer public administrations provide in the field of IT, those trainings cover very basic "everyday" IT tools like Microsoft Office, Windows and alike. This is due to

the fact that trainings for specialized procedures and programs are offered by the program developers themselves or by external institutes. Furthermore, there are diverse training needs according to the area of responsibility, which is why most of the trainings on specialized procedures are organized decentralized, i.e. every department decides independently on the kinds of trainings it considers to be relevant according to its needs and the available budget. This, at the same time, is one inhibition to the implementation of training needs, i.e. the implementation of trainings that are needed. If the yearly budget for trainings has been spent already, as reported by two interviewees, further trainings sometimes have to be postponed. The general duration of trainings is one day on average, ranging from 2-hour trainings, also being done via telephone to up to two days.

Policy on training participation. It was reported by all interviewees that, in general, employees are free to attend the offered trainings, as long as they fit the respective employee's field of work. Nobody is obliged to attend a training, everybody may choose them according to her needs, but three interviewees reported that sometimes a training can also be induced as "*binding recommendation*" by a department head, if it is felt necessary for the respective employee. Even though there is a rich offer of different trainings, the employees themselves have to become proactive in applying for and attending such a training. From the interviews, it became apparent that there is the expectation on the side of the department heads that the employees have an intrinsic will to attend a training and that they feel and utter the need of receiving more input.

Organization of trainings. Since the training needs of different departments are so diverse, there are a lot of different training providers that the administrations can choose from. Oftentimes these are professionals from external training facilities or IT providers the employees go to in order to attend a training, but there are also the options of in-house trainings, either taught by invited experts or by key users within the public administration. In general, e-learning assumes a rather inferior role: Only two interviewees reported that e-learning was offered at all and also emphasized that there was little interest among employees in using it. In all entities, the employees are being offered the possibilities of suggesting trainings which they deem important. One interviewee reported that this option, however, is made little use of.

Alternatives to formal trainings. All interviewees mentioned the possibility to be taught by colleagues who have expertise in this field instead of attending a regular training. This kind of training is especially used, if there are currently no trainings offered, but there is an urgent need for someone, e.g. a new employee, to be trained. "*If there is the need for one or a small number of employees to be trained instantly, we invite trainers to realize such a training on short notice or have the respective colleagues ready to do that.*" If a training is provided externally, it is also common that not all concerned employees attend this training, but only one or two, who in turn then have to pass their knowledge on to the other colleagues. All respondents reported that "multipliers" are frequently used for the implementation of trainings in public administrations, i.e. one or two employees attend the training and pass their knowledge on. Sometimes it is also just "*learning by doing*", since the professional handling is a matter of regular and frequent use.

Satisfaction with training offer. When it comes to the satisfaction and/or problems with regards to training, there seem to be few issues, despite of registered attendants not showing up. "*The non-attendance rate is lower than 10%.*" Besides this, other issues in connection with trainings are seen in the fact that trainers or topics are not according to expectations or long waiting times because trainings sometimes are only offered, if a sufficient number of participants is reached, which makes it difficult for the employees to plan it on a longer-term period. It is also reported that issues arise due to time constraints: "*The colleagues [especially the ones attending customers] just do not have the time to attend trainings.*" The trainings are generally well received by the employees, even though there might be sometimes topics that do not attract a lot of interest. Many employees appreciate the possibility and take part in those courses; in general, they seem to benefit not only from the content-wise input they get but also from the interdisciplinary exchange with colleagues from other administrations and departments. The effects of those trainings are not properly measured by the administrations: The attendants are only asked (if at all) to fill in a feedback form after attending the training, which makes it impossible to judge the effectiveness of the offer: "*There used to be a feedback form, but now we do not do that anymore.*" Only one interviewee reported about having implemented a survey about the offer of trainings, lastly in 2011. However, the interviewees state to perceive a greater employee satisfaction and self-confidence, after having attended a training.

Training needs for digitization. When asked about missing trainings in the context of digitization, the interviewees generally answered that there was nothing that was not taught anywhere either in the organization or somewhere externally. All interviewees reported that there were no specific training courses lacking, but they uttered that department heads, i.e. public managers, should also receive trainings in order to understand the necessity and issues arising around digitization, since they are the ones that need to pass it on to the employees. Furthermore, training should awaken the desire, interest and fun in digitization, reducing the prevalent fear of many employees concerning the impact and demand digitization is bringing along.

10.5 Discussion

Although digitization has become an integral part of work in public administrations, the single areas of application mostly remain unconnected and a comprehensive digitization strategy is often missing. For a smooth process of digitization without any fears and concerns on the side of the employees, a thorough understanding of digitization – going beyond the mere use of Word and Excel – should be created. In that respect, it is especially the department head's duty to better introduce the topic of digitization to their employees. Therefore, it is crucial that public managers themselves hold a broad understanding of IT and its impacts. They are the ones who (should) have a better overview of all the processes and can easily see where the implementation of IT is useful. Similar to what the interviews in this study revealed, previous work has identified a lacking management support of IT as one of the most severe obstacles to a comprehensive proliferation of IT in public administrations (Leitner, 2006; Rochet et al., 2012). Managers tend to regard digitization as purely technical issue, thus neglecting its organizational dimension. To a certain extent this is due to the fact that high job positions in administrations and even project leaders in IT projects are occupied by personnel without a profound understanding of IT. Dawes (2004, p. 1) points out five skills that public managers should acquire including "strategic thinking and evaluation, system-oriented analytical skills, information stewardship, technical concepts, and complex project management skills." Only with this kind of understanding and a high level of communication, they can explain the necessity and especially the advantages that this change brings along

and guide their employees through this endeavor. Otherwise the employees might be annoyed or scared by the newly implemented programs and there is the risk that they might shrink from adapting to them and have a negative attitude towards the (use of) IT in general.

It turned out that in none of the interviewed public administrations, there is a comprehensive digitization strategy in force. This might be due to the fact that the authors possibly did not interview the right target group, but since it was not known to the HR departments and judging from what has been outlined in the course of the interviews, this does not seem to be the case. Furthermore, this finding is in line with the academic body of knowledge which also states that education for public administrations needs to stress the topics of information strategy and management content to make sure that IT will be embedded in government organization (e.g. Dawes, 2004). For digitization to be successful, though, it requires rules of procedures in order to ensure the correct and identical fulfilment of such processes. To give an example: One interviewee reported that they all had to use electronic signatures in e-mails, but there was a variety of them, since the employees were not given any requirements. This emphasizes the fact that the transfer from offline to online procedures is not necessarily better, if this is not thoroughly thought through and planned before being implemented. Literature, too, acknowledges the problem of simply digitizing analog processes without prior re-engineering. In addition, system users are rarely involved in IT development projects and human needs remain unconsidered. However, since they need to comply with detailed legal regulations, IT systems are more complex in public administrations (Rochet et al., 2012). Therefore, the establishment of regulations on how to deal with IT, especially when teleworking, could comfort the employees in terms of creating legal certainty and avoiding data protection issues. In a similar vein, a contingency plan should be in place for employees to know how to act in case of blackouts or system shutdowns. Data protection and security is yet another topic that should receive more attention, because the interviews showed that the handling of sensitive data could still be improved and cared for more extensively.

This is why the realization of training efforts becomes more important than ever before to deal professionally with IT, not only with regards to creating a new awareness and consciousness of digitization but also to reduce the fears many employees still seem to have: On the one hand, employees are afraid of not being able to use IT correctly or that they could be personally punished because of legal failures. On the

other hand, employees fear that with the increased use of IT, the work load and pressure will rise and they can be controlled more easily. In this case, training can help better informing the employees, making them more acknowledgeable. The effects of training have been positively evaluated by literature. Carte et al. (2011) found, for example, that after having participated in a training, the employees were more strongly aware of IT, had improved their IT skills and exhibited a higher computer self-efficacy. As mentioned by the interviewees, being able to deal with IT is not the only required skill induced by digitization. Janowski et al. (2012), too, suggest that skills such as teamwork, self-organization, analysis of one's work, self-reflection as well as process redesign should be part of trainings as well. Furthermore, they propose – among others – workshops and courses taught by professional institutions, competence centers, consulting companies as well as by in-house staff. These recommendations are mostly applied by the public administrations as the interviews revealed.

In addition to classical training on IT skills, both the interviews as well as literature have identified further promising formats such as knowledge spreading by so-called "multipliers". Department heads should carefully select the employees serving as multipliers: Employees who are very open towards IT are predestined to transfer knowledge to less open colleagues. In contrast modestly open employees should serve as brokers who recognize the need for IT as well as the colleagues' personal needs while staying focused on the task (Carte et al., 2011). Furthermore, as mentioned by the interviewees, trainings on digitization account for only 10% of the offered training. In order to nevertheless teach IT skills, rather than being the content of a course, IT tools could be used as *means* for teaching other content (Carte et al., 2011). In doing so, IT experience is trained 'on the fly'. This also addresses the wish expressed by the interviewees to not only teach the employees how to use specific IT programs but to equip them with a general understanding of IT. In that respect, e-learning has a lot of potential, if being adequately supported and lived up by the management (Rosenberg, 2001). Especially, Massive Open Online Courses (MOOCs) could represent a powerful tool to upskill a large number of public employees across different physical locations simultaneously (Daradoumis et al., 2013). According to the interviewees, however, this option is currently barely offered at all. Only two interviewees reported about existing e-learning offers, which, however, are rarely used by the employees. Again, a clear strategy and the commitment by managers serving as living examples is needed to leverage the full potential of e-

learning measures. In addition, the training content should be applied and repeated regularly to avoid forgetting the knowledge. Therefore, creating communities of practice can help to jointly memorize the acquired skills (Chandavimol et al., 2013). In general, the effectiveness of trainings as pointed out by the interviewees is only rarely evaluated. Rather than surveying the effect, public administrations content themselves with the vague impression of employees' increased satisfaction. In order to actually measure the effectiveness of a specific training, the efficiency of using IT systems – not the employee herself – should be evaluated before and afterwards.

Here, the department or organization head is also in demand to communicate a lot and to make sure that the employees' fears do not come true. To underline the importance of trainings, they should also be integrated into the appraisal interviews of the employees and controlled for better to first ensure that employees stay up-to-date and second to give them the feeling that their efforts are being recognized and valued. Currently, taking part in vocational trainings is voluntary in most cases and driven by the employees' intrinsic motivation. In order to increase the participation, employees should be incentivized and rewarded (Chandavimol et al., 2013). Another task for the department head and the personnel development staff is to guarantee sufficient free time to take part in trainings (Chandavimol et al., 2013). As indicated by the interviewees, time and budget restrictions are the most severe obstacles to further trainings. Summing up, the training and qualification of all employees should start as early as possible in the digitization process and take place regularly to avoid all possibly arising issues.

Even though, in the course of this study, it did not turn out unambiguously whether there is a skill difference between younger and elder employees, this is often being referred to as an issue, owing to the general demographic trend of Westerly countries, which exhibits a shrinkage of Europe by 2050 and a development of the over-65s as fastest growing group by 2025 (PricewaterhouseCoopers, 2015). Therefore, it still might bear consequences for a successful implementation of e-government services, since "it is harder for the elderly to adapt necessary skills because they have problems to understand complex new processes" (Niehaves et al., 2009, p. 3). However, training efforts should target *all* employees. One interviewee suggested that reverse mentoring could be a means to realize trainings on a more personal and direct level, where the more-skilled ones (especially the younger employees) in one area teach the less-skilled ones (typically the elder employees). Since digitization is already

well-established in the private sector, it might also be a good idea to learn from and adapt their approaches.

Next to training, new employee profiles with more IT background are needed in public administrations, because, according to two interviewees, the IT administrators in charge sometimes do not have an IT background themselves. This reflects the situation in many public organizations where IT project leaders are actually non-technical civil servants who have developed IT skills on their own (Rochet et al., 2012). Furthermore, a better and deeper cooperation between different IT centers could be helpful to reduce redundant work and create synergy effects.

10.6 Conclusion

Since digitization has become omnipresent, also the public sector has to meet the challenge to transfer great parts of the hitherto offline procedures to online ones. Government employees are to a large extent concerned with (sensitive) customer information, oftentimes in the form of documents. Although digitization will not change the information- and document-centered work, it certainly changes the way of handling and processing this information. Two reasons are guiding this transformation: a great efficiency potential in terms of time- and cost savings and an improved customer service delivery that better meets all stakeholders' expectations. It was the aim of this study to find out which skills governments require for this transformation and if those skills have already been addressed by vocational training, offered on the part of public administrations. This was done in order to, first, get an understanding of the governmental perspective and their needs and, second, identify the gaps that currently exist (status quo identification).

A set of implications for practice and theory can be derived from this: With regards to practice, it became obvious that digitization, even though already having arrived in the German town halls, still is considered a great challenge. By means of qualitative interviews, it was found that digitization should be more than just the mere transfer from offline to online. It has to be well-planned and coordinated in advance, involving the employees as early as possible to prevent resistance and resentment and to take the latent fears of the employees existing around this topic. Communication and training are the most indispensable means in that respect to

successfully guide this process. This, however, can only be achieved, if there is a sufficient number of IT knowledgeable employees, primarily in higher positions, who have an overview of the digitization process as a whole and are able to estimate the resulting needs and implications, which they then can purposefully pass on to their subordinates. Public entities should involve *all* employees as early as possible in the process of digitization to have a smooth transition from offline to online and their full commitment, since the success of digitization highly depends on the ones executing it.

This study has also brought up considerable implications for research, primarily in view of the factors influencing the course of a public body's digitization: Further research should therefore focus on the factors that influence the use and efficiency of IT, i.e. required skills (technical and mainly non-technical) as well as the existence of role models like the IT savvy of department or administration heads. Even though in this study, there were no particular differences to be perceived between different employees, e.g. due to the difference in age as oftentimes being referred to in the literature, personal characteristics might still play a role in this context. Instead of concentrating on the employees' age, the personal IT usage in the private lives seems a good predictor of employees' IT usage at work, as well as their personal attitude towards innovations that also have a positive influence on the IT savvy of employees. Another possible stream of research being derived from this study is into the main inhibitors to using IT like a person's resistance and fear regarding different dimensions like the fear of doing things legally wrong, damaging IT or being substituted by it. It has to be investigated on how this lacking self-confidence could be positively influenced by means of trainings. Future research should also look into existing theories in this area and analyze those theory in terms of their validity and possible need for adjustment and/or extension.

Having said all this, it is crucial to find out what the special characteristics of public administrations are, since all these hitherto named factors are quite general in nature and could equally hold for the private sector. A comparison between the characteristics of government employees and those in the private sector will possibly shed more light on that and further define the specific research directions that need to be taken. Furthermore, cross-state or even cross-country comparison should allow to evaluate the generalizability of the findings. Whereas the comparability between different German states might be likely given due to the joint federal structure, one needs to be very careful when transferring the results to other countries. Despite the fact

that the public sector in other countries could benefit from the insights, this aspect is gaining in importance because cross-border trade has constantly increased, creating a strong need for cross-country government services. These harmonized services, in turn, call for an international perspective on employee training because equal IT skills are needed in various countries. Therefore, future research should also focus on examining the situation on different federal levels and, even more importantly, on an international or global scale to shed light on the possible generalizability of this study.

A possible limitation in this context might stem from the subjective perception of the interviewees. They themselves might not be able to recognize the full dimension of the training needs of their employees either, which could make it difficult for them to evaluate objectively on their employees' training deficits.

Finally, on an individual level, it seems promising to have a closer look at the employees' professional background and their job-related IT experiences in order to derive tailored training recommendations. The question on how organizations can and maybe even need to restructure themselves in order to make use of digitization to its full potential was out of scope of this particular study but should certainly be examined in future research.

To conclude, this study depicted the status quo in the context of public administrations' digitization needs and therefore can only serve as a starting point. It pointed to gaps leading to implications for theory and practice. The public sector has undoubtedly started its endeavor to digitization, but still has to overcome various obstacles on that way. Although being perceived as a great challenge, this particular situation also offers a tremendous potential that is yet to be fully exploited, as has been shown in this study.

11 Different But Still The Same? How Public And Private Sector Organisations Deal with New Digital Competences

Fact sheet of publication P6

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Abstract. *One of the greatest challenges that digitalisation brings along for the public sector is the need to equip their employees with digital competences. Since private sector companies are often assumed more progressive in exploiting digital media, it seems worthwhile for the public sector to understand how the need for digital competences is addressed by the private sector. However, the public sector needs to be careful before transferring solutions from the private sector one-on-one as both sectors exhibit various differences. Our aim in this study is therefore, to analyse which digital competences are needed by employees in both sectors and how the employees are equipped with these competences. In doing so, we have conducted 17 interviews in German public and private sector organisations. Our results exhibit only marginal differences between public and private sector organisations. Furthermore, we find that rather than being able to handle IT, the most important competences in the digital era are soft skills such as time and self-management as well as to understand the impact of digitalisation in general. In the private sector, analytical skills are furthermore important for developing new business opportunities. In order to equip employees with the required competences, training plays an important role in both sectors. Based on our results, we enhance an existing framework of digital competences by adding the dimension impact awareness in order to provide for the required ability to evaluate the impact of digitalisation on processes and activities outside of the digital world.*

11.1 Introduction

One of the greatest challenges that digitalisation brings along for the public sector is the need to equip their employees with digital competences (European Commission, 2016a). Digital competences refer to the technological, cognitive and social knowledge, skills, and attitudes in order to apply ICT for investigating and solving problems and developing further knowledge (Vieru et al., 2015). Thus, it is imperative for public sector organisations to understand which digital competences their employees need and how they can best acquire these competences. However, while studies have analysed singular aspects of digital competences such as technical skills (e.g. Kaiser, 2004) up to now, research has not yet presented a comprehensive empirical analysis of the required digital competences in the public sector.

Since private sector companies are often assumed more progressive in exploiting digital media (Halvorsen et al., 2005; Sethibe et al., 2007), it seems worthwhile for the

public sector to understand how the need for digital competences is addressed by the private sector. Rather than developing own concepts and solutions, the public sector has repeatedly adopted solutions developed by the private sector (e.g. Bozeman and Bretschneider, 1986; Cordella and Iannacci, 2010; Dufner et al., 2002). However, the public sector needs to be careful before transferring solutions from the private sector one-on-one as both sectors exhibit various differences. Bozeman's famous model of publicness (e.g. Boyne, 2002), for example, contains the three dimensions ownership, funding and control as distinguishing features. First, while owners of public sector organisations are all members of a political community, the owners of a private sector organisation are entrepreneurs or shareholders. Second, funding opportunities in the private sector are mainly the customers' fee whereas for public sector organisations, the most important funding source is taxation. Finally, while public sector organisations are controlled by political forces, the controlling mechanism for private organisations is the market. These differences and their implications can make it difficult for the public sector to adopt solutions from the private sector. Hence, before implementing external practices, it is first of all imperative to identify similarities and differences between governments and companies in this area.

Although a variety of research comparing the public and the private sector exists, studies that analyse how public and private sector organisations differ in dealing with digital competences are missing. In order to close this gap, our aim in this study is to answer the following research questions

1. *Which digital competences are needed in public and private sector organisations and in how far do the employees have these competences?*
2. *How do both sectors equip their employees with the required digital competences?*

We argue that our study is important because it is the first to provide a comprehensive perception of the competences that the public sector needs in the digital era. Furthermore, we conduct an unprecedented cross-sector analysis of digital competences and show that the private sector struggles with similar problems as the public sector. Finally, we demonstrate that rather than differentiating between public and private sector organisations in general, it makes more sense to consider further characteristics when categorising organisations according to their level of digital competences.

In order to answer our questions, we conducted seven semi-structured interviews with managers responsible for HR in public administrations and ten interviews with managers from private sector companies, which we analysed using content analysis. We classified our results according to the digital competence framework by Vieru et al. (2015) and further extended it.

The remainder of this paper is organised as follows: In the next section, we present related work on digital competences in public and private organisations. Afterwards, we introduce our interview and analysis method, and subsequently present and discuss our results and answer our research questions. We finish the article by pointing out directions for future research.

11.2 Background

Digitalisation is not new, but remains a fuzzy concept. Technology fundamentally transforms processes of all kinds, and the application of IT in business contexts has ever since led to organisational changes and receives continuing attention because its invasiveness on people's work is increasing (Robey et al., 2013). The abundance of existing terms that describe those organisational changes caused by IT such as digitisation (e.g. Coreynen et al., 2017), e-transformation (e.g. Scott, 2007), and digital transformation (e.g. Berman, 2012; Chanias, 2017) underlines its blurred perception. For the purpose of this paper, we examine the impact of technology integration as a whole and therefore follow the definition by Legner, who introduces digitalisation as "[...] the manifold sociotechnical phenomena and processes of adopting and using these technologies in broader individual, organizational, and societal contexts." (Legner et al., 2017, p. 301)

In any business context, digitalisation needs to be thoroughly prepared in order to exploit the large potentials promised by an increasing use of IT. Especially in the public sector, oftentimes coping with financial hardship (Kickert et al., 2015), digital services can be a means to increasing efficiency, effectiveness, and transparency (European Commission, 2016c). Besides introducing new and changing existing systems, also "the adjustment of the whole set of technological, managerial, and political variables affected by ICTs implementation" (Gascó, 2003, p. 13) need to be

considered. This development causes an increasing demand shifting from lower-skilled to high-skilled employees (e.g. Arvanitis and Loukis, 2015; Brynjolfsson and Saunders, 2010). However, IT can only be supportive in nature, if the preconditions within the organisation are set (Kraemer and King, 2006; Scholl, 2005). Thus, it should be managers' primary task to provide the organisational preconditions and to "work to empower the organisation and HR staff units as well as invest more in managerial education of administrative personnel" (Bof and Previtali, 2007, p. 8). Miller et al. (2006) and Shah et al. (2017) claim that employees' knowledge and skills are among the decisive workplace factors determining the employees' readiness for change.

Therefore, new digital competences are needed. Whereas earlier literature has mainly emphasised IT skills (Kaiser, 2004; Kim et al., 2011), a growing number of studies take a more holistic view, thus acknowledging the importance of a variety of skills beyond the "technical" ones (Brynjolfsson and Saunders, 2010; Cordella and Tempini, 2015; Hunnius et al., 2015; Hunnius and Schuppan, 2013; Janowski et al., 2012; Leitner, 2006). In order to acknowledge the diversified skill set needed in times of digitalisation, we use the definition by Vieru et al. (2015, p. 4683) who define an individual's *digital competences* as the "[...] individual capacity to use and combine one's knowledge (i.e. know-what), skill (i.e. know-how), and attitude (i.e. know-why) associated with three related competence areas, technological, cognitive and social, to use new or existing ICT to analyze, select and critically evaluate information in order to investigate and solve work-related problems and develop a collaborative knowledge base while engaging in organizational practices within a specific organizational context." This definition offers a framework of digital competence that encompasses three learning domains knowledge (know-what), skills (know-how) and attitude (know-why) as well as three competence areas: technological competence, i.e. the selection of suitable IT and its flexible handling, cognitive competence, i.e. the access to, organisation and evaluation of the information embedded in data, and social competence, i.e. dealing with IT in an ethical and confident manner as well as making use of the collaborative forms of interaction enabled by IT (Vieru et al., 2015).

There is no comprehensive empirical analysis of the required digital competences in either one of the two sectors. While some studies deal with the implications of digitalisation on the workforce, they generally rather focus on parts of this phenomenon, not taking a holistic perspective. Neither have there been cross-sectoral comparison

to the best of our knowledge, which analyse the need for digital competences in the public and the private sector.

11.3 Research Method

Since scientific literature focusing on digital competences hardly exists (Murawski and Bick, 2017) neither in the public nor in the private sector, we deemed a qualitative approach in terms of interviews most adequate, given that qualitative research is especially appropriate in fields with limited prior research (Recker, 2013). A summary of our approach is shown in Figure 11.1.

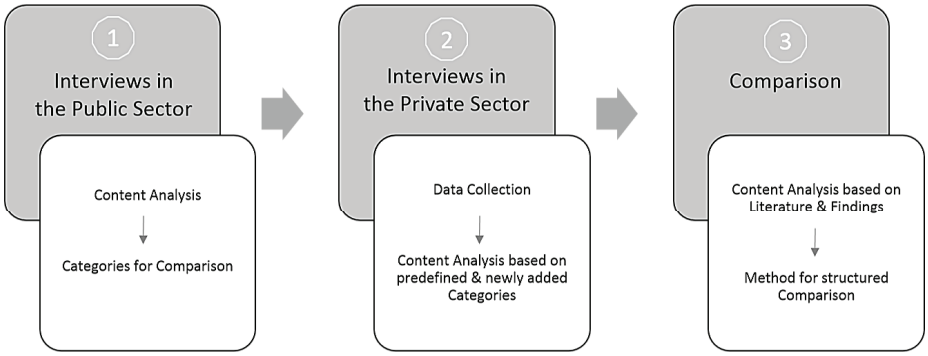

Figure 11.1: Research Approach

We started with interviews in public sector organisations to get insights into the required digital competences, the status quo of these competences among the employees, and the actions for equipping employees with the required competences. In total, we conducted seven interviews with the help of a semi-structured interview guideline. Table 11.1 shows the sections of this guideline and the related objectives. For our interviews in private sector organisations (step 2), we slightly adjusted the interview guidelines due to the insights from the first round of interviews as well as newly gathered literature and conducted ten interviews.

All interviewees were responsible for the organisation and rollout of trainings, or at least familiar with the structure. Most of the interviewees were from the human resources department, one from the IT department (public) and two from the corporate strategy department (private). An overview of all context data can be found in Table 11.1.

Table 11.1: Sections of the Interview Guideline and Objectives

Section	Objectives
Impact of digitalisation on work and new required competences	Understanding the influence of digitalisation on the employees' work and their required skills and competences
Employees' current competences	Understanding the current status of employees' competences
Actions for acquiring employee competences	Understanding the actions taken in order to equip the employees with competences

After the first two interviews in the public sector, which were done by both researchers to make sure they followed the same lines and did not include major flaws, the remaining interviews were mainly conducted by one researcher. All interviews were audiotaped and transcribed using a reconstructive transcription technique (Brinkmann, 2013) that primarily focuses on the content of the interview and neglects dialects and breaks.

Table 11.2: Interview Context Data

	Public sector	Private sector
# interviews	7	10
Responsibility/ Size of organisation	Municipal public administrations in North Rhine-Westphalia covering all seven different German size classes (in terms of inhabitants)*	Nationally operating SME (1), internationally operating medium and large organisation (9)
Interviewees	HR manager (6), IT manager (1)	HR manager (6), CEO (2), CIO (1), executive director (1)
Industries	Public administration	Agriculture construction, manufacturing, communications, wholesale trade, finance, services
Period of interviews	Summer 2016	Spring 2017
Average duration interviews	40 minutes	35 minutes

*https://www.kgst.de/groessenklassen (in German)

Subsequently, the interviews were analysed using content analysis, which is a common approach in social sciences (Recker, 2013). In doing so, the interview transcripts were coded with the help of categories (Krippendorff, 2004). Most of the categories were derived deductively based on literature. We also added two categories in the

second interview round (private) inductively while coding the interviews. Subsequently, all interviews were coded in-depth by both researchers with the help of the online coding tool QCA Map[11], which is based on the qualitative content analysis by Mayring (2000). Finally, we discussed the results and jointly analysed the content.

In a third step, we categorised our results on the required digital competences according to the framework by Vieru et al. (2015), which we extended by a fourth dimension, impact awareness, which is further detailed in the next sections. Finally, we contrasted our findings with relevant literature and identified differences and similarities between the public and private sector.

11.4 Results

We first present our results on the digital competences that our interviewees from public and private sector organisations regarded as important as well as the degree to which employees currently meet the competence requirements. Afterwards, we elaborate on how both sectors equip their employees with the required digital competences. Our findings are backed by interview quotes from both, private sector interviewees (pr) and public sector interviewees (pu).

Required and existing digital competences in public and private sector organisations

We categorised the required and existing digital competences according to the above described framework provided by Vieru et al. (2015). Our interviews revealed the need for all three digital competence areas, i.e. technological, cognitive, and social, in both sectors – although to a varying degree. In addition, a further dimension of competences was frequently mentioned that concerned the ability to evaluate the impact of digitalisation on processes and activities outside of the digital world, which we call *impact awareness*.

Technological competences

Although the interviewees in both sectors acknowledge IT aptitude as the basic competence needed by the employees today, this is, however, not seen as the most important one. Much more vital are soft skills such as time and self-management,

[11] www.qcamap.org/

flexibility, openness towards innovations, and courage in using IT. "More important than IT competences is if people have the ability and willingness to learn, are open to new experiences and have cognitive skills." (pr) "A general openness to innovation and self-management becomes increasingly important." (pu) In both sectors, digitalisation goes along with further challenges including increased system complexity, which requires additional competences. "The complexity of many (IT) programmes is such that the employees need to be ready and willing to be trained, because otherwise they will not be able to work in many areas anymore." (pu) "The most important thing for me is the change process in people's mind sets. People are willing to think new and are up to accepting changes." (pr) Interviewees from both sectors mentioned employees' fears as barrier of increasing digitalisation. Especially in the public sector, it is the fear of unknown situations. "Public sector employees are known for their general fear, and they would rather wait, then to be the first movers." (pu) "There is a fear of new technologies, which to a lesser extent is a question of adjustment than more of flexibility and a mental problem that many colleagues have." (pu)

Cognitive competences

Unlike public sector organisations, which do not need to explore new business models, private sector organisations need to make sense of the abundance of digital data and use them in their interest. "Besides automation, less paper use and process optimisation, digitalisation primarily means new business models and this is where most people have difficulties with." (pr) The intelligent use and evaluation of data also enables new business models. "Only thanks to consumers' increased use of smartphones and tablets and the digital developments throughout the last six years, we were able to start our business and grow." (pr) Especially private sector organisations see the need for higher-skilled employees and look for analytical competences and expertise in databased work, which goes hand in hand with the above-mentioned search for new business opportunities (see also impact awareness).

Social competences

For public sector organisations, another challenge refers to legal uncertainties in dealing with digital documents. "Sometimes, you have to do legal assessments yourself. Can this e-mail be taken as an official document? This needs to be decided on a case to case basis." (pu) "There are just not enough starting points, to adapt the

processes in a meaningful way to the digitalisation requirements. Moreover, there are legal hurdles that exist despite all the technical advancements." (pu)

Impact awareness

Many interviewees raised a further dimension of competences, which we summarised as impact awareness. It refers to the ability to evaluate the impact of digitalisation on processes and activities outside of the digital world. Especially among managers in both sectors the awareness of digitalisation and its impacts are crucial since they are seen as role models and provide the basis for a digital-friendly organisation culture. In some cases, managers seem unable and unwilling, to appropriately communicate and support digitalisation initiatives. Some deny their employees the possibility to attend digitalisation-specific trainings. "There are really managers who complain that their employee is gone for two days without having talked to him before. [...] If the superior does not create the framing conditions that the employee can apply the newly learnt behaviour patterns, that is strictly for the birds." (pr) In addition, it is important to understand both the positive and negative consequences of digitalisation since otherwise rumours emerge. "[The managers] are the ones most afraid of losing status, importance and function." (pu) For private sector employees, this fear seems more clearly linked to possible losses due to automation. "There is a great fear that robots take away the jobs of people and this especially, if we as a company, decide to develop a new technology. Then we just do not need three to four only fairly trained employees, but machines or robots doing this instead." (pr) In addition, employees are afraid of being monitored and controlled. "There is always the fear, [with increasing IT] more monitoring and more control will be possible." (pu) Furthermore, employees fear to become dependent on IT and thus lose 'offline' skills. Especially in the private sector, the ability to understand how the benefits of digitalisation can be exploited to enhance business opportunities and which dangers are linked to this endeavour is important. "What we need in our team are creative minds, who think about business opportunities independently of IT." (pr) Finally, the impact of digitalisation on the organisational structure needs to be understood. "[Digitalisation] is only a tool, if at all, it is a process linked to a transformation we are going through. It is a mistake, many – also in our industry make – to think that just by digitising they will become automatically successful. Digitalisation needs to be understood as complete transformation of your business." (pr)

Existence of required competences

No clear picture exists as to whether employees possess the required competences. The interviewees from the public sector more often regard the current competences as rather sufficient ("I would say that all of the employees have the needed competences." (pu)) whereas the interviewees from the private sector acknowledge a competence gap. "Well, few have the competences. The reason for the gap is that they have never been taught." (pr). Management is seen as a primary inhibitor. Both representatives from public sector organisations and – especially large, traditional – private companies report that managers are often not IT-savvy themselves and thus do not live up to a role model. "There is a lack, especially on higher levels of the organisation. It is not only the "simple" workers, but especially the managers who do not know themselves how to (electronically) invite ten employees simultaneously." (pu) Another interviewee added that even if the managers are generally very open towards it, "they don't get the approach, how to make it work." (pr). Employees from organisations in the public sector and, again, especially large private organisations seem to lack a comprehensive understanding of digitalisation that goes beyond the use of single IT tools. In contrast, in younger and smaller private sector organisations, neither employees nor managers seem overburdened by digitalisation.

How to equip employees with the required digital competences

Both sectors acknowledge the importance of continuous competence education by means of trainings. In the public sector as well large organisations in the private sector, traditional offline trainings take the lead, whereas younger and smaller private sector organisations tend to rely more on direct feedback and on-the-job training. Especially larger companies increasingly plan to offer e-learning and blended learning courses. In the public sector, in contrast, e-learning is seldom a topic.

With regard to content, 90% of the trainings in the public sector cover juridical topics, followed by trainings on specific programmes and procedures, soft skill-related trainings concerning self-, time- and stress-management, and training on basic IT tools, such as Microsoft Office. In the private sector, especially the larger companies offer a variety of trainings on "offline" competences. Like the public sector, they offer hardly any trainings on digitalisation, but a range of soft skills (e.g. change management) or methodological courses (e.g. prototyping, design thinking, and agile management). Yet, training alternatives become more important in both

sectors such as informal trainings with and by colleagues. In the public sector, for example, multipliers who have followed a traditional training are in charge of teaching their peers on the job.

Problems in the competence equipment arise, if trainings are not taken seriously. Especially private sector organisations plan to evaluate trainings more strictly in order to avoid wasting money. "I am fascinated, we spend incredible amounts of money on training and we do not measure the results." (pr)

11.5 Discussion

Based on the above described results, we now answer our two research questions. Furthermore, we explicate our implications for theory and practice.

1. Which digital competences are needed in public and private sector organisations and in how far do the employees have these competences?

In both sectors, a general IT aptitude is seen as a prerequisite for being able to work in today's interconnected business world. More important in both sectors, however, is to acquire soft skills such as time and self-management. In addition, especially private companies call for analytical skills to analyse the bulk of data arising through digitalisation. These findings are in line with the digital competence framework by Vieru et al. (2015). Besides, employees need to have a general awareness of digitalisation and its consequences, i.e. they need to be able to evaluate the impact of digitalisation on processes and activities outside the digital world. This so-called impact awareness is important since otherwise, possible fears, which are not necessarily fact-grounded, such as being monitored and losing a function, or eventually the job might arise. In addition, it also comprises, for example, the understanding that digitalisation goes hand in hand with a need to adjust the organisational structure.

No clear answer can be given whether employees generally have the required digital competences. Whereas public sector organisations and large organisations in the private sector at least acknowledge their employees' lack of a profound and comprehensive understanding of digitalisation, employees of smaller and younger private sector organisations are generally digitalisation-savvy.

2. How do both sectors equip their employees with the required digital competences?

Training plays an important role as a major means for equipping employees with the required digital competences in both sectors – in the private sector at least for large organisations. This is in line with Harel and Tzafrir (2001, p. 346) who found that in general, the "[...] nature of the environment determines the amount of investment in training and the level of employee participation, irrespective of the sector in which the organization operates." Yet, the formats and ways are different and gradually change. Private sector organisations increasingly us IT as a medium for training their employees (e.g. virtual reality glasses, e-learning courses) whereas public sector organisations stick to traditional ways of teaching. Younger and smaller private sector companies rather refrain from traditional training but rely on training on the job and the employees' intrinsic motivation to stay up to date with new digital trends.

To a certain extent, our findings contradict existing literature, which assumes that private sector organisations are far more advanced in the use of IT than public sector organisations (Sethibe et al., 2007). This seems mainly true for younger and smaller companies, which have a deeper understanding of digitalisation since digital technologies are often the basis for their business models. Especially large, traditional private sector organisations appear similar to their public counterparts in their slow adoption to the digital world and both see the need for a more comprehensive understanding of digitalisation.

Our results provide value to theory and practice in various ways. As to theory, our study contributes to the existing body of knowledge by extending the digital competence framework by Vieru et al. (2015) with the new dimension impact awareness, which describes the ability to evaluate the impact of digitalisation on offline processes and activities. In contrast to some studies comparing the public and the private sector, our results suggest that private sector organisations cannot be regarded as homogeneous entity. Rather than discovering differences between the public and the private sector in their entirety, we could identify differences between public sector organisations and large private sector organisations on the one side and small, younger companies on the other side. Thus, many factors play a role in the status of digital competences in an organisation and the differentiation between public and private should only be one constituent element. Strikingly, the majority of literature regards private sector as the norm and compares the "deviating" pub-

lic sector to it, suggesting that the public sector can learn from the private sector. However, we could not verify this imbalance in our results. For practitioners, our results suggest to acknowledge the importance of digital competences, to offer soft skills and out-of-the-box trainings – not just mere IT courses, to encourage employees to learn digital competences, adjust the company structure to the digitalisation environment, and prepare managers to become role models in the digital world. Furthermore, since equipping employees with the needed digital competences is a task for organisations across all sectors, we suggest to create platforms for exchanging best-practice experiences and for jointly developing training strategies. Furthermore, the required competences should be taught early on. Thus, school education should prepare pupils for the soft-skill 'competences' such as flexibility, curiosity, and problem solving.

11.6 Conclusion

In our study, we have conducted 17 interviews with public and private sector organisations in order to identify the need for digital competences, to understand in how far employees have these competences, and to figure out the actions that are taken in order to equip employees with those competences. Our study shows that requirements for employees are indeed changing due to digitalisation. However, the required competences in the digital age are not purely technical but also cover soft skills such as time-management and understanding the impact of digitalisation on the offline world. Our findings indicate that especially young and small private organisations differ from public ones. There is not much of a difference between public organisations and big, traditional private sector organisations.

Our study exhibits several limitations, too. Our interviewees might not be IT-savvy themselves and therefore provide a limited evaluation. Furthermore, we conducted only 17 interviews, which are limited to the German context, thus being another bias to our findings. Therefore, future research in this field should consider different contexts and also involve employees as interviewees. In addition, our study showed that many factors play a role concerning the status of digital competences in an organisation, which have not yet been analysed. Subsequent studies should pay attention to these influencing factors. Finally, future research should also enquire about the ideal digital competence mix.

12 Can we Learn from Down Under How to Rise Up in E-Government?

Fact sheet of publication P7

Title	*Can we Learn from Down Under How to Rise Up in E-Government? – A Comparative Analysis of the Public Sector Competences in the German and Australian Higher Education System*
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Abstract. *Australia has been voted world's second in the last two United Nations e-government surveys 2014 and 2016, despite the acknowledged difficulties that arise in terms of implementation because of its federal structure. Germany, having a similar federal structure, in contrast, only ranks 15th. The study at hand aims at eliciting, if this development can be ascribed to the higher public administration and e-government education landscape. By means of a content analysis, we examined 126 higher education study programmes with a link to the public sector in Australia and compared them to a similar study in Germany from the year 2015. Results show that there are indeed differences with respect to the delivered contents and the respective competences in Australia that might contribute to the different e-government development in the two countries: Higher levels of socio-technical courses and a more contextualised programme delivery in general are two of the main findings.*

12.1 Introduction

The modernisation of public administrations worldwide is in full swing. Coming from a mere vision of policy makers around the globe "to improve public services, democratic processes" (European Commission, 2006), it is turning bit by bit into reality. Induced and enabled by "[...] the use of information and communication technologies [...] combined with organizational changes and new skills" (European Commission, 2006), this modernisation process, known under the term electronic government (e-government) has started its success story. The European Commission ascribes great potential to this concept. In their e-government action plan 2016-2020 (European Commission, 2016c, p. 2), e-government is said to not only contribute to a more efficient and effective service delivery by the reduction of administrative burdens throughout the European Union (EU), but also to be able to "[...] unlock further economic and social benefits for society as a whole."

A recent benchmark study, however, reveals that, even though in general public services are increasingly available in the EU with an online availability of 81% and an online usability of 83%, not all European countries are developing equally Carter et al., 2016; European Commission, 2016b; Gilbert et al., 2004. According to (World Bank, 2016, p. 23) "[...] policy makers face a race between technology and education, and the winners will be those who encourage skill upgrading so that all can benefit from digital opportunities." This statement turns into a postulate amongst decision

makers worldwide, given the growing realisation, that digitalisation is not just a temporary phenomenon, but a revolutionary intrusion that has already started and will keep on sustainably changing the world.

Yet, similar to some other European countries, especially Germany (DE) is still falling short of expectations (Akkaya et al., 2013; Goings et al., 2003). Albeit ranging among the top performers (number five out of 138 countries) in the Global Competitiveness Index (World Economic Forum, 2016), Germany has problems improving its performance with regard to digitalisation due to the still stagnant adoption of e-government. This keeps it from leveraging the benefits, e-government can offer, despite a high broadband penetration and the existence of digital skills (Akkaya et al., 2011; Akkaya et al., 2013; European Commission, 2016b).

One possible cause for this situation could lie in the federal structure of Germany, where "[...] eGovernment policies have to be implemented largely through coordination mechanisms between national, regional and local public authorities rather than simply being forced top-down by national authorities." (European Commission, 2016b, p. 66) Besides those coordination efforts, the federal structure especially in Germany is said to bring along a mass of different IT systems that need to become integrated and interoperable, "[...] which is probably unique in the world" (Kubicek and Wind, 2004). Globally seen, though, it is Australia (AUS) with its federal system that is among the world-leading countries in e-government and keeps ranking second, in 2016 behind the United Kingdom (UK) and in 2014 behind the Republic of Korea (KOR) according to the E-Government Development Index. Germany, in contrast, is currently only at position 15 (United Nations, 2014; United Nations, 2016). We chose Australia due to its similarity to Germany in terms of the political structure with a federal system and an equally independently operating educational system.

Many reasons could contribute to this diverging development. Next to political, economic, legal or cultural influences, the education in this particular area might also be a reason that accounts for this difference: "Successful digital transformation does not come from implementing new technologies but from transforming an organisation to take advantage of the possibilities that new technologies provide. Besides leading the change, this also requires that all people in an organisation – leadership, IT professionals, employees in other divisions – obtain the skills to embrace technology." (European Commission, 2016b, pp. 76 sq.) Thus, an adequate prepara-

tion of the ones responsible for the implementation of e-government, i.e. the public servants who are increasingly exposed to Information Technology (IT), is therefore crucial, because its success is highly dependent on the employees' skills and expertise (Estevez and Janowski, 2013; Hunnius and Schuppan, 2013). Especially the *socio-technical* competences, which gain in importance in this regard, should take a centre stage. Yet, they have been identified as still under-represented in public sector higher education curricula (Hunnius et al., 2015). Hence, it seems to be promising to have a look at the higher education system in a better-ranked country with a similar political structure like Australia to potentially learn from this approach. A transfer of the possibly identified best practices to the higher education system in Germany might result in improved competences of the public servants and lead to a more purposeful e-government in Germany in the end.

Against this backdrop, the research questions, we want to answer in this paper, are:

1. *What competences are taught in the Australian public sector higher education and how do they differ from Germany?*
2. *To what extent can Germany learn from this approach, given its current higher education landscape in the public sector?*

As a basis for comparison, we replicated the study by Hunnius et al. (2015), who examine the German higher education system in the area of e-government and set up a competence framework with necessary skills and knowledge.

The remainder of this paper is structured as follows: In the next section, we refer to related work in this context. In Section 12.3, we describe the research methodology, followed by a presentation of the results in Section 12.4. In Section 12.5, we discuss our findings and conclude the study in Section 12.6 with a short summary of the work done, also highlighting limitations as well as illustrating starting points for future research.

12.2 Related Work

The study by Hunnius et al. (2015), which serves as primary reference point, analyses 91 Bachelor- and Master study programmes of 55 German universities in the

Table 12.1: Competence Categories by Hunnius et al. (2015)

Category	Exemplarily assigned knowledge, skills, competences
technical	information technology skills; IS design competence, information systems
socio-technical	e-government impact; technology and e-government adoption; politics of e-government;
organisational	e-government structures; organisational design; process management
managerial	Business skills; project management, financial management, performance management; change management
political-administrative	e-policy competences; legal framework, administrative workflows; public policy

field of public administration and e-government. They first identify e-government as well as IT-related contents, classify their importance within the programmes and analyse the five thematic competence categories within the programmes (see Table 12.1). Those categories were previously derived by means of a literature review. In this context, a competence can be defined as a combination of work-related knowledge, skills and abilities held by an individual (Nordhaug, 1993).

Their findings reveal that most of the study programmes cover topics from all five thematic competence categories, whereas programmes that have a high number of courses in one topical direction, typically exhibit a lower number of courses in another category. Some study programmes either do not at all or only barely touch the *socio-technical* dimension. One of their main findings is that "[...] social scientific topics are mostly taught apart from technical topics so that questions and potentials of IT remain underappreciated" (Hunnius et al., 2015, p. 2119). Although all thematic topics are covered to some extent, a general understanding of the importance of the technical aspects, their application and influence on the public sector context is missing, which is what the *socio-technical* category focusses on. A general classification of socio-technical knowledge is the following: Technologically-induced changes in organisations require a "[...] continuing recognition of the interaction that is taking place between technical, economic, organisational and social factors when systems are being designed and, afterwards, when they are being used by groups that need the data they can provide." (Mumford, 2000a, pp. 132 sq.) public servants, who work at the interface between customer demands, public processes and laws as well as technical requirements are increasingly in need of this compe-

tence category, since "[...] although technology and organizational structures may change in industry, the rights and needs of all employees must always be given a high priority" (Mumford, 2000b, p. 45).

By classifying the competences, which stem from very different disciplines, Hunnius et al. (2015) put emphasis on the interdisciplinary environment, public servants need to be prepared for. Such a discipline-spanning set of competences can be crucial, since "e-Government projects might fail when neglecting their multidisciplinary, complex and unstructured reality." (Puron-Cid, 2013, p. 46)

The identification and classification of competences as critical success factor in any organisational context has been extensively studied in academia. There are studies identifying necessary competences for specific professions, such as the study of Gorbacheva et al. (2016), that classifies twelve competence categories for professionals in the field of Business Process Management. Similarly, Mumford (2000a) identify leadership competences for successful project managers. Other studies, such as Kim et al. (2011), Kim and Lee (2006), and Tijdens and Steijn (2005) recognise the impact of IT on the organisation and the employees' performance and acknowledge the need for more IT competences. Those studies, however, either focus purely on IT competences or target specific professions, which is why they are not suitable here, due to the public servant's diverse field of activity.

Competences in and for e-government and a focus on the education as basis for a sound public service delivery, though, have only recently gained in importance and still are not among the primary research interests (Ogonek, 2017; Scholl, 2013; Scholl, 2014; Wimmer et al., 2008). There are few attempts that endeavoured to structure e-government education (e.g. Janowski et al. (2012) and Janowski et al. (2013)). A similar situation repeats itself in practice. The topic seems to be of minor importance for the operational business of the public sector, since 'education' and 'skills' do not appear at all in the European Commission e-government action plan 2016-2020 (European Commission, 2016c).

Due to the absence of guiding frameworks and best practices, the analysis of curricula and module handbooks seems to be a valid approach to find out more about the offered and required competences for e-government scholars. A considerable number of studies follow this approach in order to elicit the offered courses with the ultimate aim of subsequently revealing the delivered competences.

In their study, Davis et al. (2003), for example, compare e-business programmes to analyse how these programmes are performing and which gaps can be revealed with regard to the industry demand and needs. They use a content analysis of business school websites to identify the offered programmes. In a similar vein, Estevez and Janowski (2013) take a closer look at the international education landscape to investigate the degree to which programmes build the relevant competences for the formation of a Government Chief Information Officer. For this purpose, they analyse online databases and websites of existing programmes and universities around the world. In another study, Breytenbach and De Villiers (2015) use Information Systems (IS) education concepts and course structures to develop a framework to counteract the IS skills deficiency in South Africa.

12.3 Method

12.3.1 Data Collection

In order to identify the relevant competences in the area of public administration, we first did an open online search to find suitable study programmes in the public sector in Australia. Then, we examined the publicly available module handbooks from the respective university websites, where we always took the latest version, if more than one were available. We based our search on three main websites. The first website, www.australianuniversities.com.au, includes an overview with undergraduate and postgraduate study courses in the field of (public) administration. We also searched the Australian study portals www.bachelorsportal.eu and www.mastersportal.eu, using the search terms “public administration”, “public management” and “e-government”. Lastly, we also had a look at the university webpages, identified through the website search, to see if there were relevant study programmes that had not been captured by the previous search. This analysis, conducted in February and March 2017, yielded 126 study programmes in total with different degrees including Bachelor (B) and Master programmes (M), as well as diplomas (D) and certificates (C), offered by 31 universities spread across Australia (see Table 12.2).

12.3.2 Data Cleansing

Once the data collection with the basic information containing the study programme's name and degree as well as a short content description was completed, and the learning outcomes as well as an overview of all the courses were extracted, we cleansed the data. This was necessary, because several hits turned out to be less suitable for the analysis. First of all, we decided to only include full study programmes culminating in a Bachelor's or Master's degree, thus omitting all those that offer diplomas or certificates in order to safeguard the comparability with the study of Hunnius et al. (2015), where those degrees only played a minor role. This eliminated 37 study programmes. Then, we also had a closer look at the contents of the programmes by studying the detailed course descriptions and the expected learning outcomes. We eliminated two more programmes, because of the limited information on the complete programme. In those two cases, only the majors were exemplified. Furthermore, we wanted to have a picture of the current education landscape in this area and therefore focussed on courses that were available and offered at the time of the search, thus excluding all those that were currently unavailable.

Another 52 study programmes were left out because our analysis aimed at identifying study programmes that are closely related to the administrative work in a public body. Almost all those programmes targeted the health sector like the Master of Health Services Management offered by Monash University, exhibiting a rather medical focus, tailored to the special needs of the health care sector. This cleansing in the end led to a final set of 35 study programmes from 15 universities, all coming from the social sciences with a broad range of specialisations, such as economics, management, business, politics or policy. Those programmes are highlighted in grey in Table 12.2.

Table 12.2: Analysed University Programmes

Analysed University Programmes

Study Programmes	Total	B	M	D	C
Curtin College	1	0	0	1	0
University of Canberra (UC)	10	4	3	0	3
Flinders University (FU)	20	2	7	3	8

Continued on next page

Analysed University Programmes					
Australian Catholic University	4	0	2	1	1
Griffith University (GU)	3	0	2	0	1
Monash University (MonU)	3	0	2	0	1
Australian National University (ANU)	13	2	11	0	0
University of Sydney (US)	5	1	2	1	1
University of Newcastle	1	0	1	0	0
University of Tasmania (UT)	1	0	1	0	0
University of Wollongong	2	1	0	0	1
La Trobe University	3	0	2	0	1
Murdoch University (MuU)	6	1	3	2	0
University of Melbourne (UM)	5	0	4	0	1
University of Western Australia (UWA)	4	0	4	0	0
University of New South Wales (NSWU)	7	2	4	0	1
University of South Australia	1	0	1	0	0
University of Technology Sydney	4	0	2	1	1
Queensland University of Technology	3	0	0	0	3
Charles Darwin University (CDU)	1	0	1	0	0
University of Adelaide	2	0	2	0	0
Curtain University of Technology	2	0	2	0	0
Deakin University (DU)	4	3	1	0	0
Western Sydney University	1	0	1	0	0
Bond University	1	0	1	0	0
Carnegie Mellon University Australia (CMU)	3	0	3	0	0
University of Queensland (UQ)	3	3	1	0	0
Charles Sturt University	7	1	1	1	4
Swinburne University of Technology	1	1	0	0	0
University of Southern Queensland	4	4	0	0	0
Southern Cross University	1	1	0	0	0
Total (all programmes)	**126**	**25**	**64**	**10**	**27**

12.3.3 Analysis of the Study Programmes

Traditionally, in the social science research, the analysis of unstructured data in the form of textual documents had to be done manually. The coding therefore was very costly and time-consuming as well as prone to limitations and biases due to large data sets, amongst others things (Quinn et al., 2010).

Computer-supported qualitative data analysis software such as NVivo or QCA map can support this coding process, for example by enabling the direct comparison of coded data. We estimated NVivo as suitable software to analyse the 35 study programmes and based our analysis on the qualitative content analysis by Myers and Newman (2007). Then, we deductively categorised the documents in order to analyse them quantitatively afterwards. As earlier described, for this purpose, we used the publicly available online module handbooks of the study programmes and extracted the information given on the course contents as well as the course specific learning outcomes. The predefined elements that constituted the deductive categories were grounded in the categorisation of e-government knowledge, skills and competences, i.e. *technical, socio-technical, organisational, managerial* and *political-administrative* competences, developed by Hunnius et al. (2015), see Table 12.1. We followed their general classification scheme and only slightly extended the comprehension of one category in consideration of the material at hand. This adjustment concerns the *socio-technical* dimension. Since there were hardly any mentions of the term "e-government", we defined the *socio-technical* competence category as relating to the application of technology in a given administrative context. Courses that target those competences are, e.g., "New models for governance and strategy, innovation, decentralization" (ANU) or "Leading Innovation" (UM).

Next to the obligatory programme courses, we also included all study electives, whereof always a certain number was mandatory to be chosen. Two universities form an exception in this regard: The University of Sydney (US) and the University of Melbourne (UM) offer a large number of university-wide electives, constituting a total of 110 and 87 electives respectively, out of which a maximum of three (US) or five (UM) were to be selected. Since those courses were very wide-reaching and not necessarily related to the public sector, we only included the mandatory courses in the case of the US and, in the case of the UM, we opted for selecting the electives that were exhibited in the example study plan on the study programme's website.

Given the fact that one course oftentimes does not only cover a single competence, due to the context in which it is delivered, we decided to allow the repeated classification of one course into different competence categories. This is also the reason why the number of appearing competences is a lot higher than the number of actual courses. The courses were only classified into one or more competence categories, if either the course title, the course description or the learning outcomes (explicitly) referred to the competence category. We discussed the validity and feasibility of

this overall approach of classification in a small group of e-government researchers before its implementation.

12.4 Results

12.4.1 General Results

We analysed a total of 515 courses belonging to the 35 study programs, out of which six are programmes culminating in a Bachelor's degree and 29 in a Master's degree. Four programmes are executive programmes, thus targeted at the education of public servants already working in the public sector: The executive Master of Public Administration. The majority of courses is related to the *political-administrative* competence category with an absolute number of 378 (40%), followed by the *managerial* competence category with 349 courses (36%) (Figure 12.1). The course number of a programme ranks between six courses in the case of the Master of Public Policy (UT) and 59 courses (including a broad choice of electives) in the Master of Public Policy or the Master of Public Policy in Economic Policy, both offered by ANU.

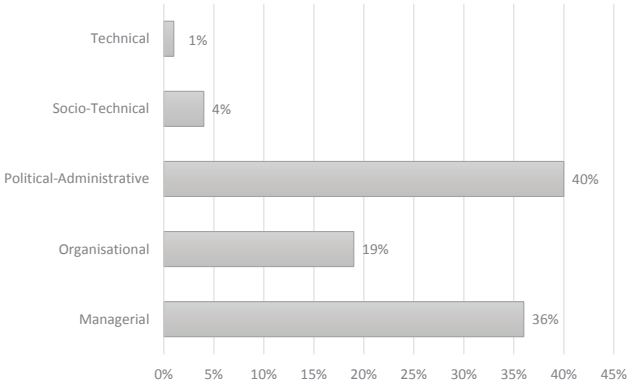
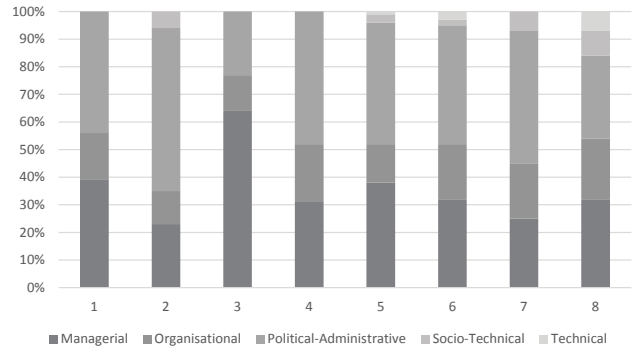


Figure 12.1: Distribution of Competences among All Offered Courses

The average number of courses within a programme is around 27.5 courses. 19% of the courses target *organisational* competences, thus ranking third most often. Surprisingly, the *technical* competence category scores lowest with only 1% (13 in absolute numbers) of the courses that explicitly deal with the use or application of IT skills and Information Systems. Even the *socio-technical* courses with 4% (40 in absolute numbers) surpass them. Concerning the competence distribution within the single



1: (FU) B: Government and Public Management | 2: (DU) B: Politics and Policy Studies |
3: (UQ) M: Economics and Public Policy | 4: (US) M: Public Administration |
5: (ANU) M: Public Policy in Dev. Policy | 6: (MuU) M: Public Policy and Management |
7: (DU) M: Politics and Policy | 8: (UC) B: Public Administration

Figure 12.2: Distribution of Competences in Selected Study Programmes

programmes, it becomes obvious that in most of the 35 programmes all competence categories are represented by some kind of course(s).

Exceptions with only four competence categories, lacking the *technical* competence category, are the Bachelor of Politics and Policy Studies (DU), the Master of Politics and Policy (DU), the Master of Public Administration (FU), the Master of Public Policy and Governance (NSWU), the Masters of Public Policy and Management (MonU, UM) and the Master of Public Policy (CDU). Seven further programmes only include three of the competence categories and completely neglect the *technical* and *socio-technical* competence categories. Those programmes are the Bachelor of Government and Public Management (FU), the Master of Economics and Public Policy (UQ), the Master of Public Administration (International) (UT), the Masters of Public Administration (GU, UM, US) and the Master of Public Policy (UT). Figure 12.2 exhibits a selection of eight different programmes to illustrate the heterogeneity in their composition concerning the different competence categories.

12.4.2 Comparison with the Study by Hunnius et al. (2015)

At first sight, there does not seem to be a big difference between delivered competences in the higher education landscape concerning e-government and public administration in Germany and Australia. Only a more thorough analysis reveals the nuanced peculiarities, which we outline in the following:

Hunnius et al. (2015) categorise the different competences on a one to four scale from not to strongly manifested. To safeguard the comparability between the two studies, we summed up the first study's levels three and four ("existent" and "strong"), since we only classified the categories as being existent or not. This is also the reason why the percentages of the German scores appear higher than the Australian scores (see Table 12.3).

Table 12.3: Results of the Comparison

Category	DE%	AUS%
managerial	69	36
organisational	67	19
political-administrative	84	40
socio-technical	27	4
technical	13	1

As a result, it turns out that all of the competence categories are represented within the study programmes with courses targeting *political-administrative* competences as strongest thematic focus, followed by courses targeting *managerial* competences and then courses targeting *organisational* competences. *Socio-technical* and *technical* competences are the competences at the rear end in both countries. A difference to Germany is that "[...] social scientific topics are mostly taught apart from technical topics, so that questions and potentials of IT remain underappreciated" (Hunnius et al., 2015, p. 2119). We cannot confirm this statement here, since among the 35 programmes, only seven do not offer any *socio-technical* courses: The Bachelor of Government and Public Management (FU), The Master of Economics and Public Policy (UQ), both Master programmes offered by UT, and the Master of Public Administration, offered by GU, UM and US. Strikingly though, out of the 13 courses, classified as *technical*, eleven were also tagged as *socio-technical*, which leaves only two that exclusively focus on the technical body without considering its application environment. Even though this number still is to be considered quite low, its integration seems to be more profound and on a broader basis. Furthermore, (Hunnius et al., 2015) mainly find a low degree of interrelation between the different thematic foci and hence also a minor integration of the targeted competences. This outcome cannot be confirmed in the Australian case, either: The majority of courses offered tap more than one competence category – only 21% percent of the *managerial* courses,

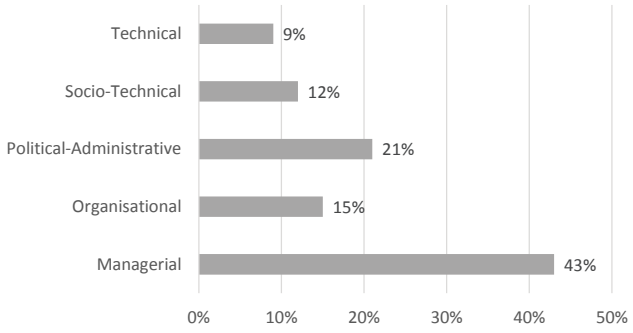


Figure 12.3: Distribution of Competences in the Master of Science in Public Policy and Management (CMU)

1% of the *organisational* courses, 27% of the *political-administrative* courses and 0,1% of the *technical* courses are classified as belonging exclusively to one single category. Beyond that, *socio-technical* courses are not at all to be found as only belonging to this category. 33% of all courses target the *managerial* and *political* dimension and 27% target *managerial* and *organisational* competences and equally 27% can be assigned to *organisational* and *political-administrative* courses, respectively. 13% of the courses include *managerial, organisational* and *political-administrative* contents and 2% even target four categories, i.e. all categories except of the *technical* category. What we could confirm, though, is that *technical* courses remain largely disconnected from political-administrative topics: Out of all offered *technical* courses, only two also address *political-administrative* issues.

A promising example of a study programme in this regard is the Master of Science in Public Policy and Management (Digital Transformation and Analytics), offered by CMU, since it offers a more interdisciplinary approach, combining all the different competences in a more balanced manner, as can be seen in Figure 12.3. First, all competence categories are represented by a decent number of respective courses. Second, the programme offers a course, particularly addressing the issues faced by public administrations due to the rising degree of digital processes and a changing work environment, namely *Digital Transformation*. The course's goal is "[...] to integrate technological and managerial aspects of information technology."

Another good example of a course that bridges the gap between different competence categories, belonging to all Master programmes offered by ANU, is the course *Comparative Public Sector Management*. It offers a broad introduction into the public administration context including the historic development as well as current and

future topics like reforms in the public sector and their impact(s) on governance and networks, community engagement and e-government.

12.4.3 Further Findings

Another very interesting finding is the existence of an inner and outer Australian border-spanning executive master programme: The Executive Master of Public Administration, offered by the Australia and New Zealand School of Government (ANZSOG). A network of 15 Australian and New Zealand universities offers this programme, with its distinctive feature lying within the eight offered core courses that are taught at every member university:

- Delivering Public Value
- Managing Public Sector Organisations
- Government in a Market Economy
- Designing Public Policies and Programs
- Decision-making Under Uncertainty
- Governing by the Rules
- Leading Public Sector Change
- Work-based Project

This two-year programme is designed: "[...] to equip high-performing public sector managers with the fresh ideas, skills and expertise they need to deliver value to the communities they serve" (Australia and New Zealand School of Government, 2017). Besides those eight core courses, every university offers its own electives, whereof one must be chosen in the area of public sector financial management. Looking at the competence structure of this programme, it offers a mix of mainly *managerial*, *organisational* and *political-administrative* courses, enlarged by fewer *socio-technical* and one *technical* course, thus following approximately the same distribution as the other programmes.

In this programme, also the mandatory work-based project arose our attention, where students get the chance to apply their knowledge in a practical real-world setting. This is also something, we found in many of the 35 analysed programmes. Eight of the 15 institutions providing these programmes explicitly offered internships or work placements, whereof five included them as mandatory courses and three as electives.

Lastly, we found that the term "e-government" did not at all appear in any programme title of all analysed programmes, nor did it appear as course name. If mentioned at all, it appeared within the course descriptions or the learning outcomes, sometimes not mentioning the name either, but rather describing the concept.

12.5 Discussion

Summing these results up, we can say that structurally there are hardly any differences between the German and Australian higher education system concerning the public sector. The courses offered mainly target the same five competence categories.

However, there are some differences that are more subtle in nature. Besides the higher availability of courses that explicitly target *socio-technical* competences, the courses seem to be more interrelated and more contextualised. Contents are barely taught independently, but are put into the context of the peculiar situation of public administrations, addressing the institutional landscape as well as the particular surrounding conditions that shape the structure and functioning of public bodies. In doing so, they address a single topic from a set of possible perspectives, not limited to a one-sided, e.g. legal perspective.

Furthermore, practical experience in real-world public settings as well as a broad choice of thematic foci seem to be of higher significance in Australia than in Germany. If in Germany the conclusion drawn from this analysis is that "[...] the public administration has no clear image about what kind of educated staff they need in the context of e-government" (Hunnius et al., 2015, p. 2121), it seems that the picture in Australia is clearer: The competences need an interdisciplinary perspective on the issues the public sector is facing now. The courses offered in this sphere seem to be better aligned to this demand.

It is also striking that the term e-government does not seem to bear great importance for the categorisation of study programmes or courses, since it is hardly used, which might have different reasons. Either the concept is not broadly known under this name, despite its usage on governmental websites, or it is more important to describe its contents to make it more feasible for the outside world.

Generally, it has to be taken into consideration that we only had a limited look at the higher education landscape in the public sector in Australia. We did not consider other education paths, that surely equally exist, like an apprenticeship system, which might take the same or a completely different approach. A deeper analysis of the education system in Australia as such would also help to shed light on this matter: Is the education organised in a way that students are equipped with competences like problem-solving and the consideration of different perspectives right from the start? Is there a greater importance attached to practical or applied knowledge?

Moreover, the burdens of implementing such programmes in a federal system might not be equally high in the two countries. The results show that a joint executive master programme like ANZSOG that also integrates practitioner's knowledge is not only possible beyond the autonomously operating states and territories. It is also enabled beyond country borders, providing for a more synchronised content- and competence delivery and creating a joint knowledge basis. A higher degree of knowledge sharing and exchange possibly enhances best practice sharing, learning and signifies a better understanding and service delivery. "Sharing knowledge and information is also an important factor [...] to improve the quality of services to the public, government agencies need to share their most effective knowledge-sharing practices by collaborating, both internally, within agencies, and externally, with agencies of similar functions." (Kim and Lee, 2006, p. 370)

12.6 Conclusion and Outlook

Summary. In this study, we compared the Australian and German higher education landscape in the public sector to find out more about the similarities and especially the differences of the offered competences in the two federal countries. In doing so, we wanted to examine whether Australia's prescribed success in e-government can be ascribed to a difference in their higher education system. By means of a content analysis, we could identify a number of differences. Those differences are not fundamental in nature, but still offer some insights and best practices that might lead to a better e-government development in the end. We found out that the Australian system certainly also has some shortcomings, as there are study programmes that ignore the *socio-technical* and/or *technical* perspective altogether. Yet, there are also some programmes as well as special courses that exhibit better-integrated contents,

which also contextualise the perspectives that need to be addressed in the public sector. Especially the *socio-technical* perspective is better and more broadly covered, which is important, because "[...] organizational objectives are best met not by the optimization of the technical system and the adaptation of a social system, but by the joint optimization of technical and the social aspects" (Cherns, 1976, p. 786). Overall, there seems to be a better understanding of what mix of competences is needed to be able to successfully navigate through the diverse and multidisciplinary public sector environment.

The ANZSOG programme that bridges national and international educational gaps is another element that signifies a better higher education in this sector by means of a collaborative approach, conveying identical contents across borders. This could serve as a role model for Germany for the sake of a better e-government education that meets the demands and requirements, leading to an improved public service delivery.

Limitations. This study is, of course, not without limitations. First, we only had a look at the educational landscape for a very short time during the search of programmes in spring 2017 and therefore only integrated those programmes and courses that were available at that time. Additionally, we concentrated on selected websites, which might have led to an incomplete list of study programmes. Then, we focussed on examining the higher education programmes, neglecting the education that might exist beyond or in parallel. Furthermore, we did not consider possible developments that might have taken place in the German system since the study by Hunnius et al. (2015). Newer study programmes that might exist now are not incorporated. Lastly, the assignment of the courses to specific competence categories might have been biased or incorrect due to the limited information given on the websites.

Nevertheless, this study offers some considerable implications for research and for practice: Institutions offering e-government education of any kind should rethink the course structure and check the availability of *socio-technical* as well as interrelated courses that reflect the situation and issues of today's public administrations, thus being closer to their reality. New courses and study programmes need to be thought of and developed that better integrate the different multidisciplinary perspectives that come into play in the public administration everyday life. Some of the Australian study programmes could serve as role model in this regard. With the

help of more international comparative studies, a classification scheme for necessary competences in the e-government domain can be developed.

For research, due to the fast changing environment technical innovations cause, a constant analysis of the prerequisites and needed competences to early identify new developments should be pursued. This study is only a first step to investigate what the public sector education sphere looks like and to identify best practices.

Outlook. Future research should broaden the perspective and examine other kinds of educational paths as well as other countries that score high in e-government, too. A comparison with countries like e.g. the UK or the Republic of Korea could help to receive more insights into the international constitution of e-government education and identify further best practices. Furthermore, also the German higher education system should be monitored continuously to see in how far the education is changing over time.

Another option is to take a more nuanced look at the faculties to understand why programmes are designed the way they are and possibly give recommendations towards a suitable composition of courses. Moreover, it would be insightful to monitor the development of programmes over time to derive the degree of importance of the higher education in the public sector (in terms of study programme numbers and the number of graduates actually working in public bodies afterwards) as well as to learn about how they evolve content wise.

We wanted to learn about the different structures in the two countries and inspire fellow scholars to do research in an area that opens for several further areas of investigation like the demand perspective of higher education programmes, addressing questions, such as: Why do international students consider studying in a country that is completely different to their home country's structures? This perspective was outside the scope of this study.

By comparing the educational systems, we aimed at answering the two initially posed research questions. Concerning question 1, we found out that the higher education in Germany and Australia are structurally congruent, offering (almost) the same types of courses and in doing so, addressing nearly the same contents. Differences only become visible when investigating the composition of courses and their way of delivery from a closer angle. Concerning research question 2, we can

conclude that Germany can learn about the way on how competences can be delivered in a more contextualised manner, integrating the different perspectives, public servants are confronted with. A mixture of disciplines such as politics, law, management and technology, as shown by the different mandated competences, is needed. Australia offers a number of programmes with courses that seem closer to the reality of public administrations nowadays and therefore better prepare (future) public servants for their work in a changing environment. Those are valuable insights that can help to improve the education in the public sector and ultimately lead to a better and more effective public service delivery that is at the heart of the e-government vision.

13 Let's Play… eGovernment! — A Simulation Game for Competence Development among Public Administration Students

Fact sheet of publication P8

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Abstract. *The rollout of e-government is in full swing worldwide, because of governments' realization of its possible efficiency and effectiveness gains. The introduction of service accounts, as exemplary initiation of the European eID strategy in Germany, is one of the e-government projects that keeps the German public sector busy. Owing to the federal structure of Germany, the nationwide implementation poses an extraordinary challenge. With this, it forms a good example for the complexity of e-government projects in federal states. (Future) public servants need to have a full understanding of the interdisciplinary environment, they will need to operate in.*

13.1 Introduction

In an attempt to increase the public service delivery, public administrations worldwide are eager to adopt electronic government (e-government) because of its huge ascribed potential in terms of cost savings and efficiency gains (Afonso et al., 2010; Greiling, 2006; Kalb et al., 2012).

That is the reason why policy makers everywhere put huge efforts in pushing it as priority on the political agendas and defining strategies and standards for simplifying its introduction and implementation within and beyond national borders. An example for such a strategy is the European Commission's Digital Single Market Strategy, with the digital transformation of governments being one of its success factors (European Commission, 2016a). Within this strategy, the e-government action plan 2016-2020 is a policy that shall guarantee a smooth cooperation on the European level, which can be seen as joint efforts between all member states to increase the level of e-government. Herein, core principles are defined that should be taken into consideration when designing new services. One of those principles to reduce administrative burdens across borders being the *once only* principle, which has that data – in compliance with the respective laws and framework conditions – need to be collected only once and are stored and shared for future purposes. Another principle is *digital by default*, stating that all public bodies' preferred type of communication should be the digital one, while also keeping other channels in place. Both of these principles are enabled and made secure across Europe by means of technological key enablers such as the Electronic Identification (eID), enforced by the eIDAS regulation (European Commission, 2017b; European Commission, 2017a). Comparing the scores on the eID availability, countries like Denmark (score 100),

Malta (score 94) and Estonia (score 76) are outperforming Germany (score 68) (European Commission, 2017b).

The implementation of the eID strategy with a focus on the service accounts is one of the core projects of the German IT planning council – the central federal body for advancing cooperation on information technology – since the dissemination and use of electronic identities by citizens and legal persons plays a key role for the national e-government strategy (Federal Ministry of the Interior, 2018).

A service account enables citizens and businesses to digitally manage and exchange their affairs with the respective public institution. Despite its strategic purpose, Germany is still facing issues in advancing with the implementation of service accounts. According to Accenture (2015), only 25% of the German citizens currently uses some kind of digital channel for administrative purposes, due to the limited availability of data and documents in a digital format, an equally limited adoption of eID means and the lacking interoperability of existing service accounts.

E-government, as it is treated by overarching political executive institutions such as the EU, can be broadly referred to as "[…] the use of information and communication technologies in public administrations combined with organizational changes and new skills." (European Commission, 2006) Hence, we are focusing on the provision of e-services to different stakeholders and not on governance aspects. This is a mandatory prerequisite in order to make use of the whole array of benefits, it is able to provide, even beyond national borders.

Yet, it seems that especially the adequate competence provision is a considerable challenge for public sector institutions (European Commission, 2016a), while it constitutes a decisive factor, since "[s]uccessful digital transformation does not come from implementing new technologies but from transforming an organisation to take advantage of the possibilities that new technologies provide. […] this also requires that all people in an organisation – leadership, IT professionals, employees in other divisions – obtain the skills to embrace technology." (European Commission, 2016b, pp. 76 sq.) For this reason, it is indispensable to introduce future public servants as early as possible and as close to reality as possible to the peculiarities of their working environment.

Given that the introduction of service accounts is an enduring and very complex project that involves many different stakeholders on all different political levels

in Germany, to understand the mechanisms, dependencies and challenges of all players involved can be very difficult for an outsider. Especially when laying the grounds for a basic comprehension of e-government procedures, it is hard to understand these complex structures that oftentimes are disconnected from the students' experience. "Even when the relevance of international affairs to everyday life is recognized intellectually, it is difficult to give the student a sense of how it feels to be a decision-maker at the national and international level." (McIntosh, 2001, p. 269)

This is the reason why we developed a simulation game to mimic the introduction of service accounts and let the players get an impression of the complexity inherent to this process in a federal state like Germany. This game should serve as tool for competence delivery in the field of e-government. In terms of its current design, it primarily aims at shaping an understanding of the German federal structure, its laws and regulations as well as reasonable decision-making, communication and negotiation.

A simulation game, sometimes also called serious game to avoid the impression of fun being the primary source for its use (Westera et al., 2008), puts human participants into a fictitious setting in that they have to act according to a role description and a set of rules, emulating a certain aspect of real life. For this game, a group of 16 international Master students with a specialization in the public sector was the test group in which each student incorporated a different role. With regard to peculiarities of the German administrative system, the simulation game was accompanied by a mandatory lecture to provide the students with substantial information on the initial scenario. During and after its completion, we evaluated the use of the game for the development of students' e-government competences.

This paper is structured as follows: First, we draw on advantages as well as possible drawbacks of using simulation games for higher education and elaborate on the competences needed by public servants in a digital public sector. In the next Section 13.2, we describe the structure of the simulation game, i.e. the roles, responsibilities and general course of action. In Section 13.4, we present different evaluating elements, discuss the potential implications of simulation games and draw conclusions.

13.2 Related Work

Simulation games and game-based learning have become more and more popular in higher education in recent years (Adobor and Daneshfar, 2006; Lean et al., 2006; Mayer et al., 2013). This can be mainly ascribed to two reasons. First, they offer the possibility to mimic real life scenarios in a risk-free environment and therefore are ideally suited for learning and practice settings and second, they have an entertainment factor that increases the students' motivation by engaging them in an interesting and exciting case (Fletcher and Tobias, 2006; Salas et al., 2009; Westera et al., 2008). It can help to increase the students' understanding of new phenomena and situations (Fletcher and Tobias, 2006). According to Schank (2005), it is indispensable for learning to happen to become active and not only to listen to what is taught, since this does not necessarily lead to the intended results.

However, the development of a simulation game also comes with a price, i.e. the time and resources needed to sufficiently prepare such a complex game, involving a multitude of different players. Lean et al. (2006), for example, conducted a survey within a UK higher education institution and identified the limited time available for teaching development as well as limited technical and administrative support for the use of new methods as main barriers to its use. This is also backed by McIntosh (2001) and Schank (2005), who argue that the development and actual implementation of a simulation game is costly in terms of time and resource allocation. This might also be a reason why the scientific literature on the use of simulation games for e-government is scarce. Klievink and Janssen (2010), for example, developed a simulation game for public service delivery, fostering collaborative development in e-government. Aisopos et al. (2012) created a fully virtual simulation game to support policy makers and involve citizens in the policy making process.

At the same time, simulation games are particularly suitable to "[...] address the changing competences needed in the information age: self-regulation, information skills, networked co-operation, problem solving strategies and critical thinking." (Westera et al., 2008, p. 420) This is backed by Mayer et al. (2013) who see a huge potential in gaming with regards to the use technological projects and for learning and training, as well as for policy makers.

As elaborated before, it is especially the targeted competence provision that falls short of expectations in the design of e-government curricula and does not meet the

Table 13.1: Competence Categories by Hunnius et al. (2015)

Category	Exemplarily assigned knowledge, skills, competences
technical	information technology skills; IS design competence, information systems
socio-technical	e-government impact; technology and egovernment adoption; politics of egovernment
organizational	e-government structures; organizational design; process management
managerial	Business skills; project management, financial management, performance management; change management
political-administrative	e-policy competences; legal framework, administrative workflows; public policy

actual demands (Hunnius et al., 2015; Ogonek and Becker, 2018; Ogonek et al., 2016). Furthermore, "[...] in many cases, the inclusion of innovation in HRM policies and practices does not often extend beyond a passing reference and does not expand in detail the specific skills and capabilities needed." (OECD, 2017, p. 4)

Scientific literature on competence needs in e-government, however, is limited. Coming from a mere call for more IT skills of the public workforce (Kaiser, 2004; Kim et al., 2011; Tijdens and Steijn, 2005), the limited scientific debate has developed since then into the direction of acknowledging the need for a broader skillset that better fits the diverse working environment of public servants today (Hunnius and Schuppan, 2013; Janowski et al., 2013; Janowski et al., 2013).

A promising approach to structure e-government education by gathering and deriving competence categories from scientific literature has been made by Hunnius et al. (2015). Table 13.1 summarizes their identified competence categories: technical, socio-technical, organisational, managerial and political-administrative competences, exemplifying different characteristics.

Technical skills are all those skills that concern the mere computing and programming skills that are the prerequisite for the existence of e-government. Socio-technical competences refer to skills at the interface between human beings and technology. They are needed to shape an understanding and equal consideration of both of them, in order to make use of the full benefits. Organizational competences consist of knowledge of the organizational environment in which e-government operates, whereas managerial competences can be considered as rather traditional business

skills, needed to lead and control a company. Finally, political-administrative competences include the knowledge about and understanding of the political and legal landscape e-government is embedded in.

Besides those primarily task- and job-specific "hard" skills public servants need to have, a study among European public administration professionals revealed that even though all of those competence categories are relevant to a certain degree, there is also a strong need for a diverse set of soft skills. Those include skills like communication, negotiation, team and persuasion as well as decision making skills amongst others (Ogonek et al., 2016).

13.3 The Simulation Game

13.3.1 Development of the Game

The overall aim of this simulation game is to equip students with competences that cannot be taught through rather classic formats of instruction, such as cooperation, strategy development, and decision making. The design of the game also allows the students to gain a deeper understanding of decision-making processes in (e-)government projects in a federal system. Owing to this objective, the simulation game does not focus on technological aspects but more on political questions as well as on managerial and organizational impacts of the digitalization.

The development of the game is mainly based on the authors' knowledge, experience and results gained in a variety of e-government-related research projects. The game primarily targets the competence provision of public administration students. Competences that currently are insufficiently addressed with common study programs are covered with the simulation game (Hunnius et al., 2015; Ogonek et al., 2016) as is depicted in Table 13.2. Research on public administration employees and the implementation of IT projects revealed various issues such as resistance to IT-related projects (Gil-García and Pardo, 2005), and legal issues (Distel, 2016; Gil-García and Pardo, 2005). These and other important issues are addressed with the simulation game as well.

13.3.2 Design & Starting Scenario

The simulation game is situated in Germany and as an overall scenario, the introduction of service accounts was deemed appropriate for two reasons. First, it offers interaction possibilities for a variety of stakeholders operating in the German e-government landscape. Second, this scenario can be considered a realistic setting as it is actually part of the German digitalization agenda (German Federal Government, 2017). Due to Germany's federal structure, stakeholders at all federal levels as well as non-governmental organizations have to be included for a successful and extensive implementation and nationwide coverage of service accounts. Thus, various roles with different, sometimes opposing opinions are integrated in the simulation game. As Klievink and Janssen (2010, p. 4) point out, a simulation game is an "[...] abstraction of reality and should capture the main complexities that need to be addressed when developing e-government." Anchored in the conception and initiation phase of the service account project, we cover political questions as well as managerial and organizational impacts the administration of an IT project faces, such as organizational resistance, changing political balances of power, and economic pressures. We intentionally decided to not consider purely technical issues in this simulation game, as they are just one of the decisive factors. "[P]rojects need to develop and use 'hybrid' professionals, who understand both perspectives. We might even call them 'tribrids' because they combine three aspects: understanding the technology *and* the business of government *and* the role of information in government." (Heeks, 2003, p. 11) Furthermore, the technology perspective will be dealt with in detail during the students' semester focus on information systems. The game is designed to take place over a period of three months and is accompanied by an introductory lecture to e-government and the administrative system in Germany but may as well stand alone. In this case, due to the heterogeneity (EU and non-EU students, from federal and centralist countries) and internationality of the student group, however, we deemed a general introduction to the German structure important. The game consists of a set of (mandatory) sessions during which all players meet and exchange important information. These sessions are accompanied by informal and non-obligatory sessions, during which the players can meet and discuss. The core of the game, though, are five events. Each event has a fundamentally changing influence on the initial scenario. Certain tasks come along with those events where the players have to react in accordance with their roles' overall

aims. They also have to prepare certain actions that address issues raised through the events.

The simulation game is accompanied by three reflections the students have to write at the beginning of the game (expectations), during the game (mid-term) and after the completion of the game (final). Those reflections are not only a helpful instrument to monitor the game but also to evaluate the educational impact. The evaluations facilitate the improvement process during the game and help to change the course where needed, as depicted in Figure 13.1.

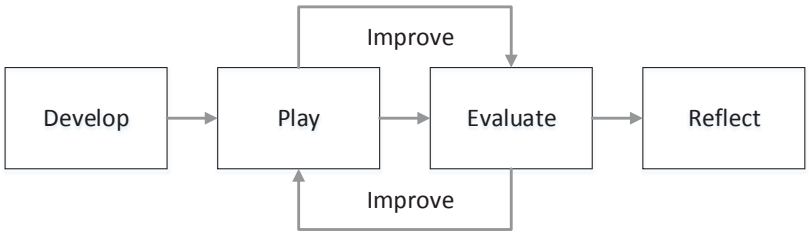

Figure 13.1: Game Development and Implementation Phases

Although the starting scenario as depicted above as well as the included roles are based on the situation in Germany, the simulation game is designed flexibly and in a way that enables the adaptation to other nations or contexts. The number of players can be reduced or increased, roles can be assigned to more than one player and events can be altered. It is supported by a Moodle platform, where all necessary information is published and shared between lecturers and players. Moreover, the students can use the internal messaging functions to interact with each other in private sessions.

13.3.3 The Roles

In total, we included 16 roles for this game, situated at different federal levels. The *Federal Government of Germany* was included as the party enacting laws and specifying the general direction of digitalization efforts for the whole country. Although the Federal Government is the highest administrative unit, laws such as the eGovernment law are only effective for the federal agencies (Federal German Government, 2013). Each state has to pass own laws to direct its course of action and the course for local government agencies. Hence, *two states, North Rhine-Westphalia (NRW) and Saxony*, were included as roles. The former was chosen as it is the most populous

state in Germany and Saxony, because of its role as a frontrunner in terms of digitalization. Whereas Saxony invests resources in digital projects, NRW has to face many challenges that require most of the available public budget, such as poverty and unemployment. On the local government level, *two municipalities* are included, *Bautzen and Dresden*, two cities that are both located in Saxony. While Dresden is a big rich city with an important history that attracts millions of international visitors each year, a renowned university and flourishing economy, mainly tourism, Bautzen is a small city in the orbit of Dresden and is considerably less wealthy. Both cities, however, are directly affected by decisions made on the state level.

As political players, we included two parties, a liberal and a right-wing populist party. We made this decision, owing to a European-wide observable, political trend that populist parties gain more and more popularity and, thus, political importance (Gest et al., 2017). While the *liberal party* in our setting supports digitalization efforts, the *right-wing party* opposes digitalization in general. This notion of proponents and opponents of digitalization prevails in all roles with a varying intensity and is a realistic imprint of the current political situation in Germany.

As potential users of service accounts, we included *two fictive businesses* in the scenario. One business is a large IT company that is eager to realize any contact with administrations as efficient as possible and is, therefore, a great supporter of service accounts. The second business, though being internationally successful, is a long-established local mustard manufacturing company and as such, feels more obligated to the region and its inhabitants than to the greater goal of digitalization.

The IT company is represented by *a lobbyist association* for telecommunication businesses in Germany that exerts influence on the government in IT-related decisions. As second lobbyist, we included *an association representing the interests of German cities and municipalities*. As such, they are not opponents of digitalization per se but see the reasons for many of their members struggling with the costly implementation and therefore repeatedly point to the financial and economic constraints especially smaller cities in Germany face.

Commonly, the municipalities, cities and states in Germany have municipal IT providers, who advise administrations, and implement and operate municipal IT infrastructure. The game includes *two municipal IT providers*, who are entrusted with the procurement and operation of e-services. Naturally, both roles are in favor of sophisticated and sustainable digitalization efforts, but they are as well aware of

the financial and economic burdens for the municipalities that come along with the digitalization.

Closely related to the IT providers are the software producers, *two companies specialized in the development of office and enterprise solutions*. They are competitors in the fight for contracts with public administrations. One of the software producers is rather small with a limited client base, trying to offer customized solutions for their customers. The other software producer is close to becoming the market leader and thus, is a proponent of offering standardized solutions that are easy to implement and maintain, not putting too much effort in serving the single customer's wishes and needs.

Finally, the game includes a *journalist*. This role has a different mindset than all the other roles, observing the events, stakeholders and their actions. The journalist is not determined to take a position but is free to shape her role in any way she wishes and to influence the course of the game with either neutral, positive or negative coverage of the events.

The creation of the roles was greatly oriented on existing stakeholders in e-government projects in Germany, although not every interest group could be included. Citizens, for example, who are only seldom integrated in the initiation phase of e-government projects were not considered. Although all stakeholders are oriented towards existing entities, the roles are exaggerated at times to highlight the prevailing dependencies, constraints, and scopes of action.

Every student is assigned to one of the above sketched roles and receives basic information on the role and her personal goals. While the students are asked to play their roles as realistic as possible, they are free to make decisions not anticipated by the instructors. Moreover, they are free to interact with each other, form alliances, and to share or withhold important information. All roles as well as relationships are depicted in Figure 13.2. The green connections show roles with a similar mindset or similar strategic goals, red connections indicate (possibly) conflicting interests.

13.3.4 Events & Associated Tasks

Five events shape the simulation game that may act either as episodes, i.e. they stand alone and have no consequences for further events, or as milestones in the course

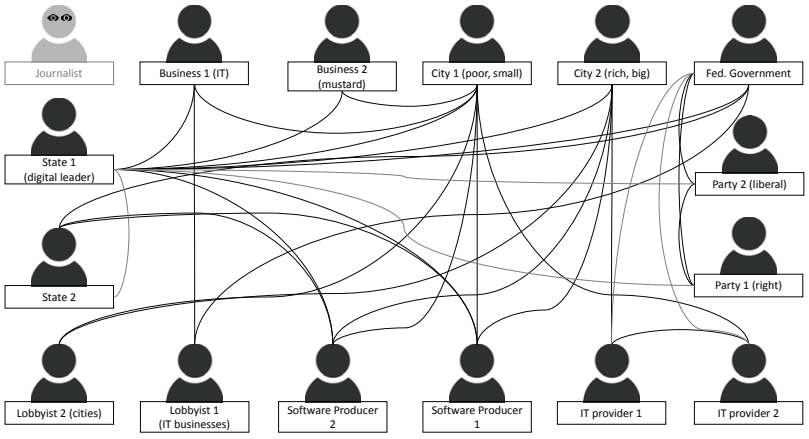

Figure 13.2: Game Roles and Relationships

of the game, i.e. each event changes the scenario and influences the subsequent events.

The *first and introductory event* in this simulation game is a conference on the topic of "digital transformation of public administrations". The neutral journalist has to give a key note on the status quo of service accounts in Germany, all other players have to give a short overview of who they are and what their positioning is with regard to the comprehensive implementation of service accounts in Germany. One of the lecturers acts as moderator. This event mainly serves to give all players a condensed overview of the actors and to establish first insights on who potential collaborators in this game could be.

The *second event* is a *data leakage* detected at the Federal Ministry of the Interior by which sensitive personal data of citizens and businesses were accessible for non-authorized third parties for several hours. This event is an incident that puts emphasis on security and technical aspects that have to be considered when implementing service accounts.

Opponents of the project are encouraged in their view by this event, while the supporters' efforts are set back. This event mainly touches upon a, on the one hand, technical and, on the other hand, affective dimension of e-government projects and is constructed to reinforce existing opinions and positions. IT security and privacy matters are a major consideration and constitute a prominent concern in the implementation of e-government (business, citizens and administrations) that

have to be adequately addressed and provided for by the implementing institution (Carter and Bélanger, 2005; Ebrahim and Irani, 2005).

The *third event* is the *bankruptcy* of Bautzen. The city is so highly in debt that necessary investments cannot be arranged and cost-intensive projects such as the service account introduction are cancelled. In fact, German cities cannot declare bankruptcy strictly speaking. They are obliged to have a balanced budget and in case municipalities cannot balance their budget, they come under control of higher administrations and have to develop a concept to consolidate their budget (see for example: Municipal Code for North Rhine-Westphalia (North Rhine-Westfalia, 2018)). As a lot of cities and municipalities in Germany are struggling financially and some of them are actually in the situation to be under a higher administrations' financial surveillance, this event represents a real threat to the successful implementation of e-government projects. This event is accompanied by a TV talk show during which some of the players have to advocate their positions and engage in discussions with the audience. The players not participating in the show act as audience and are asked to pose (critical) questions and engage in discussions.

The *fourth event* is a political event. The right-wing populist party wins the latest *state elections* in Saxony and declares a governmental program in which digitalization is to be abandoned. In recent years, European and other western countries have faced a considerable swing to the right that entails "[...] policies that seek to turn back the clock and reestablish eras of more homogenous demography, rigid hierarchy, and protectionist economics." (Gest et al., 2017, p. 2) Although these parties are not necessarily digitalization adversaries, they are commonly elected by citizens who are afraid of change in general. Digitalization is considered to fundamentally change the society. In this case, the populist seems to be the most probable one to oppose digitalization efforts. Again, we used exaggeration as a stylistic element to stress important aspects. This event requires the students to react to changes in the political agenda of a nation, state or municipality, to position their roles in a changed power structure and to newly negotiate their positions and alliances.

The *fifth and last event* forms the official closure of the simulation game. Here, all players are invited to participate in a Digital Summit where they present their vision for the future of the service accounts in Germany, taking into account the past events and recent developments. This requires the students to reflect upon what has happened so far and try to think strategically, but realistically about the future.

The players should design a poster that sketches their ideas and present them to a bigger audience.

13.4 Educational Approach and Competences Addressed

By means of the different elements and the scenario in which the students are put, we intend to create a learning environment that is as close to the e-government reality in Germany as possible in order to shape the competences, public servants should ideally master. We oriented ourselves on the competence categories by Hunnius et al. (2015), leaving out the technical competence category, as was mentioned before and instead adding soft skills to the mix of needed competences, as identified by Banerjee et al. (2015) and Leitner (2006). Table 13.2 comprises the different elements of the game and the respective competences addressed by those elements.

Table 13.2: Intended Competence Coverage by the Simulation Game

Competences	Soft Skills	Socio-technical	Organizational	Managerial	Political-administrative
Elements of the game					
Scenario in general	●	●	●	●	●
Interaction with other players	●		◐	●	◐
Presentations	●				
Information gathering for events	●	◐	●		●
Event 1 (conference)	●	◐	◐	●	●
Event 2 (data leakage)	●	●		●	●
Event 3 (bankruptcy)	●			●	●
Event 4 (elections)	●				●
Event 5 (digital summit)	●	●		◐	●

Fully colored circles indicate a total coverage of the competence, semi-colored circles indicate that the competence is partly covered, though not representing the main focus of the event.

As can be seen, the simulation game covers all of the indicated competences, while the focus clearly lies on the coverage of soft skills and political-administrative skills. The latter is because we designed the game in a way that primarily should facilitate the understanding of the complex decision making structures that are inherent to a federal system as well as the political environment that encourages/hinders the implementation of nation-wide e-government. Soft skills are increasingly in demand for people working in public institutions, especially when being hired for the advancement and implementation of e-government, since they act as mediators between the different kinds of employees, communicating and negotiating between the technical and organizational interests of the stakeholders involved. In order to do this, they also need socio-technical competences, i.e. understanding and respecting both sides of an information system, the users as well as the system itself (Cherns, 1976).

13.5 Reflections & Evaluation

13.5.1 Aim of Reflections & Evaluation

In order to judge on the success of the simulation game in terms of its competence delivery and overall satisfaction of the students, it is complemented by three reflections and a final survey via the Moodle platform, used throughout the game. Simulation games are successful if they succeed in completely involving the players and transferring them to the simulated world (Lean et al., 2006; Salas et al., 2009).

The game starts with an introductory session in which the setting is explained and roles are assigned. After this session, the students shortly articulate their expectations regarding the game and its educational impact in a short essay. After the completion of the first event, the students again evaluate on how the game met those expectations and on what they (dis)liked so far. At the end of the simulation game, the students hand in a final reflection (after all five events are completed). Only then, they are able to fully reflect the game.

The reflections serve a twofold goal. First, the students have to reflect on the game and its educational impact. Thereby, they can connect teaching contents from the lecture with the simulation game, lessons learned can thus be strengthened. Second,

it enables the instructors to monitor the games' process and to intervene, if necessary (see Figure 13.1).

In addition to these three reflections, the simulation game is evaluated through a survey. Since it is designed as a tool to enhance the students' competences, it is important to monitor in how far each of the competence categories (see Table 13.1) is actually addressed from a student's perspective.

13.5.2 Results of the Reflections

By the time of the manuscript's submission, two out of three reflections were written by the students and could be evaluated. The issues raised in these reflections are discussed according to their topic. In general, the reflections were very constructive but show quite heterogeneous expectations and experiences. In total, we identified four areas for improvement.

Background Information. Some of the reflections revealed a lack of information from the students' perspective with regard to the game and its outcome. They wished for more information on the rules that guide the players' (inter)actions as well as mechanisms to sanction improper or unrealistic behavior. One student wrote that "I think some more guidance and hand-holding would be beneficial, especially at the beginning stages of the game so that everyone is comfortable with the concept." Therefore, we decided to give more input for the following events, detailing possible actions for the role players.

As the students had diverse backgrounds, for some it was hard to find enough and relevant information on their roles and their scope of action as a lot of information is only available in German. Moreover, there were students among the group with no background in public administration and with no experience with federal systems. Relating to this, one student raised the issue of the game's dependency on profound research and information gathering. We addressed this issue by compiling important information and translating it to English where necessary. Thereby, we were also able to better guide the direction of the game by providing relevant information to the students.

Transfer of Knowledge. One major component of the game is the transfer of knowledge through an innovative teaching method. While most of the students appreciate

this 'experiment' as an intriguing and attractive approach, they also raised concerns about the actual output. On the one hand, students expected to learn about difficulties related to the implementation of e-government solutions in general and the German case in particular. They also expected to learn about legal, political and socio-economic aspects of the e-government landscape in Germany and Europe. On the other hand, some students criticized that especially the international perspective is missing in the game. Therefore, they raised doubts about the generalizability of the game for other contexts within Europe. As a consequence for future iterations, we decided to provide more information on the general scenario, the game's scope and learning outcomes.

Soft Skills and Social Skills. Nearly all students expected to enhance their soft and social skills and as the reflections reveal, those expectations were met. One student stated "To start with what I like about the game, it is observable that most of us are improving presentation skills since we have to present in front of the audience." Among the skills students were able to improve are communication and negotiation skills, leadership skills, presentation skills as well as skills in decision making. In how far other skills or competences were trained through the game is evaluated through a short survey (see Section 13.5.3).

Format. The students also gave feedback on more formal aspects of the game, which is also the major area for improvement. So far, all events are accompanied by some form of written evaluation from the students' part, i.e. press releases and presentations they have to prepare. While the game also includes a talk show, a conference and discussion rounds, the game could profit from periodic and more informal meetings during which the players can discuss their plans and actions and form alliances. For future iterations of the game, these discussion rounds will be incorporated, while the written assignments will be reduced.

13.5.3 Results of the Survey Evaluation

We conducted a short survey to evaluate in how far the competences (see Section 13.4) were actually addressed by the game. While the students' reflection were not explicitly geared towards this aspect, the survey solely focusses on the development of competences.

Table 13.3: Exemplary Questions for the Evaluation of Trained Competences

Category	Exemplarily assigned knowledge, skills, competences
technical	- not addressed with the game -
socio-technical (soctec)	The simulation game helped me to understand the change processes induced by increased technology use.
organizational (orga)	The simulation game helped me to understand the interdependencies between the different organizational stakeholders involved.
managerial (man)	The simulation game helped me to understand IT management processes.
political-administrative (polad)	The simulation game helped me to understand the influence of political will on e-government projects.
Soft Skills (soft)	The simulation game helped me to improve critical thinking skills.

For each group of competences (see Table 13.1), four to six questions were developed, measuring the extent to which the competence group was trained through the game. Table 13.3 gives an overview of exemplary questions for each group. The statements were rated on 5-point scale, ranging from "1 – completely disagree" to "5 – completely agree". We received 14 responses. Descriptive statistics are shown in Table 13.4.

Students agreed with having ameliorated their competences in three categories (socio-technical, organizational and political-administrative competences). Surprisingly, the students rated soft skills less positively than the reflections suggested. This may be due to the fact that the survey was run during the game. Thus, the students were not able to fully evaluate the game as some of them pointed out in open comments at the end of the questionnaire. On the other hand, this evaluation demonstrates that the transfer of managerial competences and soft skills should be improved during the next run of the game. In general, the reflections and the short survey show that the first run of the game was a success, but they also reveal areas for improvement. At this point it should be re-emphasized that the game has to be adapted for each group, their prior knowledge and carefully monitored during the conduct.

Table 13.4: Evaluation – Descriptive Statistics

	soctec	**orga**	**man**	**polad**	**soft**
Mean	3,15	3,29	2,46	3,23	2,85
Median	3	3,33	2	3,2	2,6
Min	1,25	1,16	1,5	1,2	1
Max	5	4,5	4	5	4,4
SD	1,27	0,91	1,07	1,23	1,15

13.6 Discussion

We developed this simulation game with a twofold goal. First, the simulation game served to create an understanding for the complexity of decision-making processes in e-government in a federal system such as Germany for international students who are not familiar with these structures. We chose the introduction of service accounts, which on the one hand it is highly topical with regard to the status of e-government in Germany and on the other hand, involves a variety of different stakeholders on all political layers and thus, represents a reflection of Germany's reality. Second, it served as a tool for competence development, where the competence provision was incorporated by the different existing roles and the tasks – evoked by the five events that change the course of action – the players had to fulfil and act according to their role's orientation.

A simulation game can help to gain first-hand insights into situations that are not known to the individual and thus, offer an environment that is ideally suited to practice what is needed later on in corporate contexts (Salas et al., 2009). Incorporating a simulation game in e-government education thus could support a competence provision that is close to the public servants' needs and offers an integrated perspective on the interdisciplinary nature of competences , instead of offering isolated approaches that do not suffice to close those gaps (Hunnius et al., 2015; Ogonek and Becker, 2018). It has to be emphasized, though, that, as the evaluation shows, employing a simulation game in the education is not a self-fulfilling prophecy and does not guarantee a more targeted provision of the necessary competences. It very much depends on different variables. First, the construction of a scenario needs to be as close and as relevant to the learner's reality as possible. Then, the learners need to take the game serious and obey to the rules that are in place to make it a success.

Despite those constraints, the use of a simulation game can help to illustrate realistic situations that are normally not known or not that easy accessible to a learner without any practical experience. Thus, this game could be used as a valuable template that can and needs to be adapted according to the competence provision aimed at and to the target group. While groups with a similar educational background that have had previous experience in this domain do not need a lot of extra information, we made the experience that heterogeneous groups that are further away from the topic in question, need more guidance and introduction.

13.7 Conclusion & Outlook

In this paper, we introduced a simulation game as a means to transfer knowledge and train competences of public administration students with an innovative and practice-oriented teaching method. The evaluation of the test run shows that the students appreciate this form of learning and were able to actually improve their competences. However, the evaluation also revealed areas for improvement such as the restructuring of written assignments and interactive parts within the game. Our findings are based on a small sample and may thus not be generalizable. The game has to be repeated several times before valid conclusions can be drawn. Furthermore, it might be advisable to introduce more objective measures since the students themselves might not have been able to fully and objectively judge on their knowledge gain.

In general, simulation games are a tool that should be increasingly used in higher education programs in e-government, as being disclosed by the evaluation, in order to introduce future public servants to the interdisciplinary environment, they will be employed in. It is crucial for practitioners to understand the importance of the specific context in which they are working to be able to bridge the existing gaps and, in the end, to create a better e-government reality.

There is a call for more research on innovative teaching methods in general and on higher education teaching as well as its effects as well as implications in the field of public administrations are needed.

14 Playing Is Knowing! Using a Simulation Game to Impart Competences to Public Servants

Fact sheet of publication P9

Title	*Playing Is Knowing! Using a Simulation Game to Impart Competences to Public Servants*
Authors	Nadine Ogonek Bettina Distel Jörg Becker
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Abstract. *The statewide introduction of service accounts is about to be happening: However its implementation is strongly opposed by the city of Poormine and advocated for by Innovalley. Can this situation come to a good end for all involved stakeholders? We talked to Selma and Louis, two citizens of Poormine about their views and fears on the matter...*
This headline shows under which pressure the public sector currently is and why it is crucial to develop the public servants' competences to cope with digitalization. The challenge is not only digitization itself but to prepare the public workforce for these changes. Gamification is viewed as a suitable means to convey required competences for digitalization in a targeted and realistic, yet playful manner. This article addresses these challenges by designing an e-government simulation game for higher education as well as for public sector practitioners. The game is designed to address a set of soft skills and socio-technical competences that public servants need in order to understand and implement e-government projects beyond mere technical issues.

14.1 Introduction

14.1.1 The Rise of Gamification

Gamification as "the use of game design elements in non-game contexts" (Deterding et al., 2011, p. 9) has rapidly gained in popularity throughout the last 20 years. Initially labelled as a pure marketing trick to reward customers, it has become an established tool for policy makers and businesses to increase motivation and commitment and has led to a gamification of the society (Korn Ferry Institute, 2013; The Independent, 2014). Since its appearance, it has been implemented in a variety of areas and sectors, from health care to media. Even local supermarkets try to attract us with earning points when shopping there.

14.1.2 Gamification Approaches for Imparting Competences

Educational institutions similarly focus more and more on gamified approaches in teaching to successfully get contents across (Adobor and Daneshfar, 2006; Lean et al., 2006). Management games are amongst the most common forms. Gunther et al.

(2010), for example, designed a management game in higher education for teaching technology management. Petter et al. (2018) used an online gaming to expand the digital workforce talent pool. This can be mainly ascribed to two reasons. First, gamified approaches offer the possibility to mimic real life scenarios in a risk-free environment and therefore are suited for learning and practice settings and second, they have an entertainment factor that increases the learners' motivation by engaging them in an interesting and exciting case (Fletcher and Tobias, 2006; Salas et al., 2009; Westera et al., 2008). Gamification can help to increase the learner's understanding of new phenomena and situations (Fletcher and Tobias, 2006). For learning to happen, it is indispensable that learners themselves become active and not only listen to what is said, since this does not necessarily lead to the intended results (Schank, 2005). According to Gartner's Hype Cycle for Education 2016, gamification will be mainstream in educational settings within the next 2 to 5 years Gartner (2016). In higher education, for example, simulation games – a specific form of game-based learning – in general have become more and more popular in recent years. Simulation games are particularly suitable to "[...] address the changing competences needed in the information age: self-regulation, information skills, networked cooperation, problem solving strategies and critical thinking" (Westera et al., 2008, p. 420). Yet, the development and implementation of a simulation game can be very complex in terms of time and needed resources (Petter et al., 2018).

14.1.3 Gamification Approaches for Imparting E-Government Competences

This might be a reason for why the use of simulation games in the context of e-government is scarce. Yet, there are examples that demonstrate that developing a gamified approach to learning can be very well worth the efforts. Public servants operate in a highly diversified environment that is also becoming more and more digitalized where an interdisciplinary set of competences is required. Besides task-related expertise in areas such as management, technical skills, public policies or law (Hunnius et al., 2015), soft skills are in high demand. According to Mark Nation, the competent use of soft skills in today's public sector is one of the most important factors (Careers in Government, 2019). There needs to be a diversified skillset that enables public servants to act confident in a complex field involving a multitude of different stakeholders internally and externally. Gartner (2014) identified twelve

competences that are critical in a digital work environment. Distel et al. (2019) identified important competences for the public sector, listing 6 professional competence categories, among which are soft skills, and 3 personality traits. Specifically developed for the public sector and grounded in scientific literature, we use this typology as a starting point for the simulation game and address each specific competence throughout the simulation game. Table 14.1 lists the addressed competence categories and specific competences as proposed by Distel et al. (2019).

Table 14.1: Needed Competences by Public Servants in a Digital Public Sector

Competence Type	**Competences**
Social Skills	leadership – conflict management/negotiation – (cross-cultural/unit, oral & written) communication – mediation – assertiveness – influencing – relationship
Personality Traits	tolerance – continuous learning – creativity – commitment – tenacity & perseverance – flexibility
Analytical Personality	critical thinking – analytical thinking – strategic & innovative thinking – decision making – problem solving – abstraction
Self-Management	self-organization – self-control – self-awareness – self-confidence – self-reflection

14.2 A Simulation Game for Public Sector Students and Practitioners

14.2.1 Game Design and Implementation

In order to address the need for a broader set of soft and socio-technical skills in the public sector, a simulation game can help to equip its players – either public administration students or public servants – with competences that cannot easily be taught through rather traditional formats of instruction such as lectures. Competences trained in this simulation game include forms of cooperation, decision making, and strategy development. As with every game, also a simulation game follows a certain logic, which can be referred to as the game structure. This structure is comprised of three basic sections: initialization, the game loop and termination (Wikidot, 2019). Following such a structure ensures a smooth set up, run and sound

closure of the game, regardless of the type of game envisioned. This particular simulation game was designed in the context of public administration education and addresses challenges related to the implementation of e-government projects in a federal system. Since there is also a need for public servants to be trained on these competences, a variation of the game adapted for the use in governmental institutions, such as public administrations, will be presented, too.

Initialization

When wishing to design a simulation or any other type of game, the first thing to do is to set up the whole scenario. First, the game needs one or several clear objectives to be achieved with its implementation. Designers need to ask themselves: What are the (major) takeaways, they want their participants to have? Those can be very different, such a game can, for example, serve to improve the teamwork by switching roles and creating a mutual understanding.

Depending on the objective(s), the actual planning needs to be done. This includes the design of the variables, which will shape the game's character and determine the course of action. For this game, we came up with a set of variables that also need to be taken into consideration in general when designing a game: the *duration* of the game and the *time* that can/must be invested into the game by the players. In the case of the simulation game for PS (public sector) students and practitioners, those variables include the necessary *roles* for all players, a *realistic overall scenario* they are put into and some basic *instructions* to get them started. A scenario should ideally contain conflicting interests, either in the form of the scenario itself that lends itself to discussion and/or by the careful choice of roles that embody those conflicting interests. Furthermore, one or more *events* are needed that bring the players together for a specific purpose. Here, a sufficient portion of *context information* needs to be provided, depending on the composition and knowledge of the players (de Freitas and Oliver, 2006; Fumarola et al., 2012).

In this paper, we will sketch a possible scenario for the higher education (HESG) and for the practitioner version of the game (PSSG) that will give an idea about a possible outline of such a game. It should not go unmentioned that such a game always needs to be adapted to the specific target group as well as their needs. There is no one-fits-all solution.

Game Loop

Once the set-up has been done, the game can start. A moderator needs to invite the players to the event(s) and is there to introduce the players into the current setting and is also there to intervene, if discussions do not kick-off or, on the contrary, get out of hand, because players identify too much with their role and become too emotional.

This simulation game is situated in a federally organized state and as an overall scenario for both versions of the game, the introduction of service accounts within one state is chosen. This scenario was deemed appropriate due to two reasons. First, it offers interaction possibilities for a variety of stakeholders operating in a decentralized e-government landscape. Second, this scenario can be considered a realistic setting as service accounts become increasingly popular and are currently being introduced in many Western countries. Due to a federal structure, stakeholders at all federal levels as well as non-governmental organizations have to be included for a successful and extensive implementation and statewide coverage of service accounts. Thus, various roles with different and sometimes opposing opinions are integrated in the simulation game. Anchored in the conception and initiation phase of the service account project, we cover political questions as well as managerial and organizational impacts the administration of an IT project faces, such as organizational resistance, changing political balances of power, and economic pressures. The starting scenario is the same for the HESG and the PSSG. The game is designed to take place over a period of several weeks, but can also be shortened or adapted to a few half-day episodes if necessary. It consists of a set of (mandatory) sessions during which all players meet and exchange important information. These sessions are accompanied by informal and non-obligatory sessions, during which the players can meet and discuss. The core of the game, though, are the events. Each event can have a fundamentally changing influence on the initial scenario. Certain tasks come along with those events where the players have to react in accordance with their roles' overall aims. They also have to prepare certain actions that address issues raised through the events. While most of the meetings take place in person, some of the tasks require the use of digital media, wherefore the supportive use of an electronic platform, e.g. a Moodle or the administration's intranet, is highly recommended.

Termination

Every simulation game should be properly terminated in order to give all players the chance to reach consensus or find a solution for the problems that arose during the game. Besides the termination of the game itself, this closure gives the participants a chance to reflect on their own progress during the run of the game. This *debriefing* constitutes a paramount element of every simulation game, since experiences made have had an effect on the learners that has to be reflected to facilitate learning (Lederman, 1992).

This simulation game is terminated with a final event – a Digital Summit. At the summit, the players present their visions for the future of service accounts (see following sections). Moreover, the student players are asked to participate in a short survey to evaluate their own progress during the game, while the PSSG is terminated with a discussion on the players' progress.

14.2.2 Higher Education Simulation Game (HESG)

General Procedure

If necessary, the simulation game can be accompanied by an introductory lecture to e-government and the administrative system in the respective country. At the beginning, during, and at the end of the simulation game, the students write a short reflection on their learning progress. Those reflections are not only a helpful instrument to monitor the game but also to evaluate the educational impact. The evaluations facilitate the improvement process during the game and help to change the course where needed. In the beginning, each student is assigned to one role and the first task is to get acquainted with that role, its character, aims and potential areas of activity. In the first session, the starting scenario and the basic rules are laid out. For the subsequent sessions, the students have to be prepared that any time things can happen to which they have to react adequately and in accordance with both their role and realistic, legal instruments at their role's disposal.

As the simulation game aims at training students' competences (soft skills, personality traits), at the end of the event descriptions we list the specific competences

that are being trained with the particular event. We also provide an overview of addressed competence categories for both versions of the game.

The Roles

This game features 14 roles, situated at different federal levels. The *Federal Government of the Country* was included as the party enacting laws and specifying the general direction of digitalization efforts for the whole country. Although the Federal Government is the highest administrative unit, most often laws, e.g. laws regulating the use of IT, are only effective for federal agencies. Commonly, each state has to pass own laws to direct its course of action and the course for local government agencies. Hence, two states, *State A: Techvana*, and *State B: Digitalisavvy*, were included as roles. The former is the designed as the most populous state in the country, whereas the latter acts as a frontrunner in terms of digitalization. While Digitalisavvy invests considerable resources in digital projects, Techvana has to face many challenges that require most of the available public budget, such as poverty and unemployment. On the local government level, two municipalities are included, the city of *Mount Debtward* and the city of *Virtual Springs*, two cities that are both located in Digitalisavvy. While Virtual Springs is a big rich city with an important history that attracts millions of international visitors each year, a renowned university and flourishing economy, mainly tourism, Mount Debtward is a small city in the orbit of Virtual Springs and is considerably less wealthy. Both cities, however, are directly affected by decisions made on the state level.

As political players, we included two parties,*a liberal and a right-wing populist party*. We made this decision, owing to a political trend observable in many Western countries that populist parties gain more and more popularity and, thus, political importance. While *The Liberal Party* in our setting supports digitalization efforts, *The Other Choice* opposes digitalization in general. This notion of proponents and opponents of digitalization prevails in all roles with a varying intensity and is a realistic imprint of the current political situation in many Western countries.

As potential users of service accounts, we included two fictive businesses in the scenario. One business is a *large IT company: Pear IT Solutions*, that is eager to realize any contact with administrations as efficient as possible and is, therefore, a great supporter of service accounts. The second business, though being internationally

successful, is a *long-established local mustard manufacturing company: Tiger Mustard*, and as such, feels more obligated to the region and its inhabitants than to the greater goal of digitalization.

The IT company is represented by a *lobbyist association for telecommunication businesses* in the country that exerts influence on the government in IT-related decisions. As second lobbyist, we included an *association representing the interests of the country's cities and municipalities*. As such, they are not opponents of digitalization per sé but see the reasons for many of their members struggling with the costly implementation and therefore repeatedly point to the financial and economic constraints especially smaller cities in the country face.

Furthermore, we included *software producers*, two companies *specialized in the development of office and enterprise solutions*. They are competitors in the fight for contracts with public administrations. One of the software producers, *Miracle Inc.*, is rather small with a limited client base, trying to offer customized solutions for their customers. The other software producer, *MakroSoft Ltd.*, is close to becoming the market leader and thus, is a proponent of offering standardized solutions that are easy to implement and maintain, not putting too much effort in serving the single customer's wishes and needs.

Finally, the game includes a *journalist* of the yellow press newspaper *The Moon*. This role has a different mindset than all the other roles, observing the events, stakeholders and their actions. The journalist is not determined to take a position but is free to shape her role in any way she wishes and to influence the course of the game with either neutral, positive or negative coverage of the events.

In order to reduce complexity for the students, citizens were not included as a role in this game. Instead, the game is located in an institutional level and focuses the implementation of e-government for businesses and organizations.

The Events

Five events shape the simulation game that may act either as episodes, i.e. they stand alone and have no consequences for further events, or as milestones in the course of the game, i.e. each event changes the scenario and influences the subsequent events.

The first and introductory event in this simulation game is a *conference on the topic of "digital transformation of public administrations"*. The neutral journalist has to give a key note on the status quo of service accounts in the country, all other players have to give a short overview of who they are and what their positioning is with regard to the comprehensive implementation of service accounts in the country. One of the lecturers acts as moderator. This event mainly serves to give all players a condensed overview of the actors and to establish first insights on who potential collaborators in this game could be.

Competences addressed: communication (oral & written), relationship, creativity, self-organization, self-confidence

The second event is a *data leakage detected at the Federal Ministry of the Interior* by which sensitive personal data of citizens and businesses were accessible for non-authorized third parties for several hours. This event is an incident that puts emphasis on security and technical aspects that have to be considered when implementing service accounts. Opponents of the project are encouraged in their view by this event, while the supporters' efforts are set back. This event mainly touches upon a, on the one hand, technical and, on the other hand, affective dimension of e-government projects and is constructed to reinforce existing opinions and positions. IT security and privacy matters are a major consideration and constitute a prominent concern in the implementation of e-government (business, citizens and administrations) that have to be adequately addressed and provided for by the implementing institution.

Competences addressed: conflict management/negotiation, influencing, strategic & innovative thinking

The third event is the *Bankruptcy of Mount Debtward*. The city is so highly in debt that necessary investments cannot be arranged and cost-intensive projects such as the service account introduction are cancelled. As a lot of cities and municipalities are struggling financially, this event represents a real threat to the successful implementation of e-government projects. This event is accompanied by a TV talk show during which some of the players have to advocate their positions and engage in discussions with the audience. The players not participating in the show act as audience and are asked to pose (critical) questions and engage in discussions.

Competences addressed: oral & written communication, assertiveness, strategic & innovative thinking, decision making, problem solving

The fourth event is a political event. The *right-wing party The Other Choice wins the latest state elections in Digitalisavvy* and declares a governmental program in which digitalization is to be abandoned. In recent years, many Western countries have faced a considerable swing to the right that entails "[...] policies that seek to turn back the clock and reestablish eras of more homogenous demography, rigid hierarchy, and protectionist economics." Although these parties are not necessarily digitalization adversaries, they are commonly elected by citizens who are afraid of change in general. Digitalization is considered to fundamentally change the society. In this case, the populist seems to be the most probable one to oppose digitalization efforts. Again, we used exaggeration as a stylistic element to stress important aspects. This event requires the students to react to changes in the political agenda of a nation, state or municipality, to position their roles in a changed power structure and to newly negotiate their positions and alliances.

Competences addressed: leadership, influencing, flexibility, self-control, problem solving, relationship

The fifth and last event forms the official closure of the simulation game. Here, all players are invited to participate in a *Digital Summit where they present their vision for the future of the service accounts in the country*, considering the past events and recent developments. This requires the students to reflect upon what has happened so far and try to think strategically, but realistically about the future. The players should design a poster that sketches their ideas and present them to a bigger audience.

Competences addressed: self-reflection, self-control, oral & written communication, commitment, analytical thinking, strategic & innovative thinking

Closure of the Game

The game closes with a final written reflection and a short survey in which the students are asked to assess in how far they actually trained specific competences during the game.

14.2.3 Public Sector Simulation Game (PSSG)

General Procedure

The procedure for the PSSG is similar to the students' game but takes into consideration that employees of public administrations have more experience with and knowledge of e-government. Furthermore, this version of the game consists of shorter episodes that are less time-consuming to ensure that the game is not at the expense of the employees and their daily tasks. While the students are asked to reflect on their own progress before, during, and after the game, the public sector employees will only evaluate their progress at the end of the game to ensure an appropriate workload.

Just as the students' game, the PSSG consists of several events, i.e. things that happen during the game, and sessions where the players meet in person and have to interact based on their roles and previous events. To ensure that these sessions can be prepared properly by the players, a schedule is set up before the game starts that contains each session of the game as well as the dates of events. This schedule should be adapted to each agency but we suggest as a general rule of thumb to inform the players about events 3-4 days before the according sessions take place. Specificities about the events, though, should not be included.

In the beginning, each player is assigned to one role and the first task is to get acquainted with that role, its character, aims, and potential areas of activity. The rules for the game and its general course are explained and the players are advised to act in accordance with their role and realistic, legal instruments at their disposal.

Again, we provide a short summary of the competences primarily trained with each event at the end of the event's description.

The Roles

The distribution of roles is slightly changed for the PSSG, because as opposed to the student group, public servants already have a good overview of potential interest groups, due to their experience with diverse contacts to entities close to the public sector. The number of roles (7-9) for this version of the simulation game is smaller in order to save resources (e.g. in terms of working time of employees) and, thus,

to ensure its usability for public agencies. Whereas a lecturer guides the HESG (see 14.2.2), the PSSG (see 14.2.3) needs to be led by a game master not directly involved in the game's conduct.

Similar to the student version, the simulation game for public employees contains one role for the state level. In order to accommodate for the smaller number of players, to have closer interactions and to better mimic real-life scenarios, the game takes place only in one state. Otherwise, the role is designed similar to the student game. The *State A: Techvana*, is the most populous state in the country and has to face many challenges that require most of the available public budget, such as poverty and unemployment. Consequently, digitalization is not among the political priorities of the state policies. The state now faces the challenge that – in order to remain competitive and attractive – larger and wealthier cities started to cooperate in joint digitalization projects, thereby aggravating existing structural differences between the various regions in the state. In addition, this development forces the state to react albeit other, more pressing challenges. As a result, the state parliament has decided to introduce a statewide service account and has now to balance the interests of several groups. Whereas larger cities, already introduced their own service accounts, other cities appreciate the state initiative and would like to actively participate. Again, other cities, especially smaller ones located in rather rural areas, strongly oppose the initiative for fear of additional and unacceptable costs. The state capital *Innovalley* is the digital leader among Techvana's cities and has already invested large sums into the development of a city-wide service account. With the state's decision to introduce a statewide service account, these investments are at stake, because the two systems are not compatible. Moreover, the city's IT specialists perceive a lack of technical competences on the state level and, thus, Innovalley strongly opposes the project. *Poormine*, a medium-sized city in the heart of the state welcomes the initiative but at the same time fears unacceptable costs. As a former coal-mining city, the city suffers from the structural changes of the recent years. The city is among the poorest in the country and faces pressing issues such as unemployment and constantly tight public budgets. Using a statewide service account could be beneficial but the city cannot afford the implementation.

The roles of the two businesses are also included without substantial alterations. The first business, a *large IT company: Pear IT Solutions*, acts as a supporter of the service accounts as they would enable faster and more efficient contacts with public administrations that occur on a daily-basis. The second business, *the long-established*

mustard manufacturing company: Tiger Mustard, is located in Poormine and still run as a family-business. As such, they feel obligated to support the city and the whole region economically. While they make wide use of digital technologies in their manufacturing processes, they are behind the city and try to exert political influence as one of the major employers in the region.

Oftentimes, citizens are considered to be the main beneficiaries of e-government and their perspective is commonly included in digitalization strategies for public administrations. Thus, public administration employees at all levels are confronted with citizens in their daily work and we included *citizens* as a role for this game. *Selma* is a junior consultant in a growing start up and single mother of two. She lives in an apartment in the heart of Poormine, and has to deal with public administrations on a regular basis, especially with regard to her maintenance claims and those of her children. She considers herself a digital native and would like to handle the public services electronically, but most of the time she is forced to go to the office instead. Many services she needs are not fully available digitally and for the maintenance claims she is required to hand in documents on paper anyways. Consequently, she supports the state's initiative to provide a service account.

Right across the hall of her lives an elderly man who sometimes takes care of her children. In return, she helps him now and then in his everyday life. *Louis* is a retired teacher and although he has diverse interests and owns a laptop and smartphone, he does not really catch digital technologies. For his pension entitlements, he has to deal with public administrations from time to time. Since a lot of his friends already passed away and his family lives abroad, he enjoys the trips to the city and chatting with the lady from the office. She already knows him and his case and, therefore, takes over the filling in and sending of all applications. Just recently, she told him about the planned service accounts and how the introduction of such a system would change her daily work fundamentally. The elderly man cannot stop thinking about this and now fears to lose another opportunity to get out of his apartment. But even more, he is afraid of having to fill out the applications on his own in the future and is, thus, very sceptical with regard to this initiative.

The roles of the political parties go unaltered. *The Liberal Party* wants to promote the sustainable and comprehensive digitalization of the public sector, whereas *The Other Choice* opposes such efforts. Current election campaigns of both parties address

this issue and the parties frequently interact with citizens during rallies, citizen consulting hours and through flyers and other advertising material.

In order to account for the organizational constraints in which the PSSG has to be conducted, and the overall setting in only one state, the Federal Government is excluded from this version of the game. Furthermore, one citizen and one party are designed as optional roles. In case only one citizen and one party are cast, the game master should assign the opposing roles to the players. The Liberal Party opposes the opinion of Louis, while The Other Choice opposes the opinion of Selma.

The Events

Conference. Similar to the students' version, the practitioners' game starts with a conference during which the players are asked to present their roles and positions. However, in order to better address the restrictions in terms of time and resources, the second event, the data leakage at the Federal Ministry of Interior, is integrated into the first event. Thus, during the conference, the players do not only present their roles and goals but also take positions against the background of the data leakage. The presentations should not only reflect the actors' position with regard to the implementation of service accounts in Techvana, but should also address the players' opinions and how they are affected with regard to the data leakage as well as possible strategies to prevent similar events in the future. After the presentation session, the conference concludes with a get together, during which the players have the opportunity to get to know each other and possibly already form alliances.

Competences addressed: communication (oral & written), relationship, creativity, self-organization, self-confidence

Bankruptcy of Poormine. This event is only slightly changed as compared to the students' version of the game. However, since the game takes place only in one state, the dynamic changes and increases the pressure on some of the roles: The state, for example, now has to surveil the budget of Poormine and sign off the budget plans of the city council. At the same time, the state still advocates the implementation of service accounts, which puts less wealthy cities under financial pressure. All players have to adapt their positions and strategies to the new situation and discuss matters and confront each other with their different understandings during a live debate on television. For this, the game master should take an active role to ensure that all the

different voices are raised and a lively discussion is sufficiently assisted. Since not all roles will be actively involved in this session, the remaining roles could act as audience, raising new issues and thus enriching the discussion.

Competences addressed: oral & written communication, assertiveness, strategic & innovative thinking, decision making, problem solving

Debate in the State Parliament. The citizens (one of them or both) have initiated a petition on the service accounts which is now debated in the parliament. In order to not only hear the citizens' voice but also other stakeholders' ideas or concerns, the president of the state has invited several speakers to this debate, e.g. business representatives. At the beginning, the citizens shortly introduce their petition and the debate starts with each speaker giving a short statement. The discussants should try to exert influence on the decision makers to push their own positions and force a decision in favor of these positions. The debate concludes with the parliament deciding for or against the statewide introduction of service accounts (this decision may be made by the game leader).

Digital Summit. The simulation game is closed with this last event where all players present their vision for the future of the service accounts in the country, considering the past events and recent developments. This event is included without alterations.

Competences addressed: self-reflection, self-control, oral & written communication, commitment, analytical thinking, strategic & innovative thinking

Termination of the Game

In contrast to the higher education game, this version of the simulation game does not entail written reflections. Instead, the game is closed with a discussion among the players during which they are asked to reflect on the game, internal dynamics, and the personal progress they made by participating in this simulation game.

14.3 Concluding Comments

It was our aim to explain how gamification in general and a simulation game in particular can represent a means to offer a more practice-oriented education in a domain where insights are not as easy to get as in business contexts, namely the public sector. For this, we previously identified the interdisciplinary competences that public servants nowadays need to embody to successfully master the diverse exigencies e-government poses. Prior research has identified six professional competence categories, soft skills and character traits that seem to be of vital importance in today's public sector and that are perfectly apt to be incorporated in a simulation game approach. Those soft skills as well as socio-technical skills presented the focus of the simulation game, since those are challenging to be taught in a rather traditional format such as lectures. We developed a scenario – the introduction of the service accounts in a federally organized state – as well as different roles on all federal levels and events that shaped the course of the game. This first developed version proved very successful in a run with higher education students, which is why a second version for the use in public administrations, featuring a smaller number of participants to accommodate for the public sector reality and slightly different roles, was sketched here. To encourage the development of context-appropriate PSSGs or at least support necessary alterations, we also presented some general guidelines for the development and implementation in this paper.

It should not remain unmentioned that the PSSG still needs to be tested in a real-life setting, but discussions with PS experts gave valuable feedback and encouraged this kind of training in the PS context. However, inferring from the success of the HESG and further success stories of tested simulation games, we see a lot of untapped potential in the use of such a gamification approach, especially where technological changes are concerned. Gamification offers a possibility to train skills: "where delays, the large amounts of resources at stake, and the high risk involved prohibit real-life experimentation" (Gunther et al., 2010, p. 191). Of course, the sketched scenario is not a 'one-fits-all' solution and contextual adaptations are a mandatory prerequisite for a successful implementation. Furthermore, a meticulous preparation of the game including a thoroughly thought through plot with a balanced participation of all players is as important as the 'buy-in' of all stakeholders involved. Only if all players and the game master are committed to and convinced of what they are doing, the game can be run successful. The goals can be seen as a key success factor

here that has already been referred to in literature as well. They need to be very clear, specific and especially challenging to trigger the players' motivation and thus, the overall performance (Garris et al., 2002). Finally, as the development and implementation of a simulation game means a lot of investment in terms of resources, our experience shows that it is nevertheless worth the efforts and can lead to a win-win situation for all parties involved.

References

Accenture (2015). *Digital Government: Your Digital Citizens are Ready, Willing… and Waiting*. Tech. rep. Accenture. URL: http://bit.ly/2dB8P0Q (visited on 03/20/2016).

Adobor, H. and A. Daneshfar (2006). "Management simulations: determining their effectiveness". In: *Journal of Management Development* 25.2, pp. 151–168.

Afonso, A., L. Schuknecht, and V. Tanzi (2010). "Public sector efficiency: evidence for new EU member states and emerging markets". In: *Applied Economics* 42.17, pp. 2147–2164.

Aisopos, F., M. Kardara, P. Senger, R. Klinger, A. Papaoikonomou, K. Tserpes, M. Gardner, and T. Varvarigou (2012). "E-government and policy simulation in intelligent virtual environments". In: *Proceedings of the 8th International Conference on Web Information Systems and Technologies*. Porto, pp. 129–135.

Akkaya, C., M. Obermeier, P. Wolf, and H. Krcmar (2011). "Components of Trust Influencing eGovernment Adoption in Germany". In: *Electronic Government: Proceedings of the 10th IFIP WG 8.5 International Conference (EGOV 2011)*. Ed. by M. Janssen, H. J. Scholl, M. A. Wimmer, and Y.-H. Tan. Delft, pp. 88–99.

Akkaya, C., P. Wolf, and H. Krcmar (2013). "A Comprehensive Analysis of E-Government Adoption in the German Household". In: *Proceedings of the 11th International Conference on Wirtschaftsinformatik*. Leipzig, pp. 1525–1539.

Albury, D. (2005). "Fostering Innovation in Public Services". In: *Public Money & Management* 25.1, pp. 51–56.

Ali, M. (2009). "The Impact of National Culture on eGovernment Implementation: A Comparison Case Study". In: *Proceedings of the 15th Americas Conference on Information Systems (AMCIS 2009)*. San Francisco.

Al-Jenaibi, B. N. (2015). "The New Electronic Government: Are the Federal Authorities ready to use E-Government?" In: *International Journal of Knowledge Society Research* 6.3, pp. 45–74.

Allen, I. E. and J. Seaman (2003). *Sizing the Opportunity: The Quality and Extent of Online Education in the United States, 2002 and 2003*. The Sloan Consortium.

Al-Sebie, M., Z. Irani, and T. Eldabi (2005). "Issues relating to the transaction stage of the e-government system". In: *Electronic Government: An International Journal* 2.4, pp. 446–459.

Al-Sebie, M. and Z. Irani (2005). "Technical and organisational challenges facing transactional e-government systems: an empirical study". In: *Electronic Government: An International Journal* 2.3, pp. 247–276.

Anthopoulos, L. G. and C. G. Reddick, eds. (2015). *Information and communication technologies in public administration: innovations from developed countries*. Boca Raton: CRC Press, Taylor & Francis Group.

Aquaro, V. (2018). *UN E-GOV Survey 2018 – Gearing E-Government to support Transformation towards stustainable and resilient societies*. Tech. rep. United Nations.

Arvanitis, S. and E. Loukis (2015). "Employee education, information and communication technologies, workplace organization, and trade: A comparative analysis of Greek and Swiss firms". In: *Industrial and Corporate Change* 24.6, pp. 1417–1442.

Atoev, A. and R. Duncombe (2011). "e-Citizen Capability Development". In: *Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2011)*. Tallinn: ACM Press.

Auluck, R. and R. Levin (2009). "Developing global public servants for good governance and sustainable development". In: *Winning the needed change: Saving our planet Earth*. IOS Press, pp. 48–63.

Australia and New Zealand School of Government (2017). *Executive Master of Public Administration*. URL: http://www.anzsog.edu.au (visited on 02/05/2017).

Awortwi, N. (2010). "Building new competencies for government administrators and managers in an era of public sector reforms: The case of Mozambique". In: *International Review of Administrative Sciences* 76.4, pp. 723–748.

Baker, M. (2000). "Writing a Literature Review". In: *The Marketing Review* 1.2, pp. 219–247.

Banerjee, P. K., L. C. K. Ma, and R. H. Shroff (2015). "E-governance competence : a framework". In: *Electronic Government, an International Journal* 11.3, pp. 171–184.

Barbour, R. (2007). *Doing Focus Groups*. Ed. by U. Flick. London: SAGE Publications.

Barth, M. and D. Veit (2011). "Electronic Service Delivery in the Public Sector: Understanding the Variance of Citizens' Resistance". In: *Proceedings of the 44th Hawaii International Conference on System Sciences (HICSS-44)*. Kauai: IEEE.

Bassellier, G., B. H. Reich, and I. Benbasat (2001). "Information Technology Competence of Business Managers: A Definition and Research Model". In: *Journal of Management Information Systems* 17.4, pp. 159–182.

Basu, S. (2004). "E-government and developing countries: an overview". In: *International Review of Law, Computers & Technology* 18.1, pp. 109–132.

Becker, J., J. vom Brocke, M. Heddier, and S. Seidel (2015). "In Search of Information Systems (Grand) Challenges". In: *Business & Information Systems Engineering* 57.6, pp. 377–390.

Becker, J., V. Greger, O. Heger, K. Jahn, H. Krcmar, H. Müller, B. Niehaves, N. Ogonek, M. Räckers, T. Schuppan, and R. Zepic (2016). *E-Government-Kompetenz*. Tech. rep. IT-

Planungsrat. URL: https://www.it-planungsrat.de/SharedDocs/Downloads/DE/Entscheidungen/21%7B%5C_%7DSitzung/30%7B%5C_%7DAnlage1%7B%5C_%7DE%7B%5C_%7DGovernment%7B%5C_%7DKompetenz.html (visited on 03/21/2016).

Bélanger, F. and L. Carter (2009). "The impact of the digital divide on e-government use". In: *Communications of the ACM* 52.4, pp. 4–7.

Berman, S. J. (2012). "Digital transformation: opportunities to create new business models". In: *Strategy & Leadership* 40.2, pp. 16–24.

Bernholz, C. D. and W. R. Ellis (2006). "The Missing Court of Claims Report: Is Letitia Humphreys Court of Claims Report 42?" In: *Government Information Quarterly* 23.2, pp. 309–324.

Bertot, J. C., P. T. Jaeger, and J. M. Grimes (2010). "Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies". In: *Government Information Quarterly* 27.3, pp. 264–271.

Besson, P. and F. Rowe (2012). "Strategizing information systems-enabled organizational transformation: A transdisciplinary review and new directions". In: *Journal of Strategic Information Systems* 21.2, pp. 103–124.

Bhatta, G. (2001). "Enabling the Cream to Rise to the Top". In: *Public Performance & Management Review* 25.2, pp. 194–207.

Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices*. Textbooks Collection.

Blei, D. (2012). "Probabilistic topic models". In: *Communications of the ACM* 55.4, pp. 77–84.

Bloom, B. S., M. D. Engelhart, E. J. Furst, W. H. Hill, and D. R. Krathwohl (1956). "Taxonomy of Educational Objectives: The Classification of Educational Goals". In: *Handbook I: The Cognitive Domain*. New York: David McKay.

Bode, L. (2012). "Facebooking It to the Polls: A Study in Online Social Networking and Political Behavior". In: *Journal of Information Technology & Politics* 9.4, pp. 352–369.

Boell, S. K. and D. Cecez-Kecmanovic (2014). "A Hermeneutic Approach for Conducting Literature Reviews and Literature Searches". In: *Communications of the Association for Information Systems* 34, pp. 257–286.

Boell, S. and D. Cezec-Kecmanovic (2011). "Are systematic literature reviews better, less biased and of higher quality?" In: *Proceedings of the 19th European Conference on Information Systems (ECIS 2011)*. Helsinki.

Bof, F. and P. Previtali (2007). "Organisational Pre-Conditions for e-Procurement in Governments: the Italian Experience in the Public Health Care Sector". In: *Electronic Journal of E-Government* 5.1, pp. 1–10.

Böhmann, T., P. Drews, and C. Meyer-Blankart (2015). *Digitale Exzellenz: Eine Bestandsaufnahme zur Digitalisierung deutscher Unternehmen und Behörden*. Tech. rep. Hamburg: Sopra Steria GmbH.

Boyne, G. A. (2002). "Public and Private Management: What's the Difference?" In: *Journal of Management Studies* 39.1, pp. 97–122.

Bozeman, B. and S. Bretschneider (1986). "Public Management Information Systems : Theory and Prescription". In: *Public Administration Review* 46.Special Issue, pp. 475–487.

Brans, M. and A. Hondeghem (2005). "Competency Frameworks in The Belgian Governments: Causes, Construction and Contents". In: *Public Administration* 83.4, pp. 823–837.

Bredemeier, M. E. and C. S. Greenblat (1981). "The Educational Effectiveness of Simulation Games: A Synthesis of Findings". In: *Simulation & Games* 12.3, pp. 307–332.

Breytenbach, J. and C. De Villiers (2015). "Increasing the Quality and Quantity of Tertiary-Level Information Systems Students: A Graduate Development Framework". In: *Information Technology for Development* 21.2, pp. 178–195.

Brinkmann, S. (2013). *Qualitative Interviewing*. New York: Oxford University Press.

Bryman, A. and E. Bell (2003). "Business Research Methods". In: New York: Oxford University Press. Chap. Interviewing in qualitative research, pp. 478–510.

Brynjolfsson, E. and A. Saunders (2010). *Wired For Innovation - How Information Technology Is Reshaping the Economy*. Cambridge: MIT Press.

Bundestag (2013). "Act to promote electronic government". In: *Federal Law Gazette* 43.I, pp. 2749–2760.

Business Dictionary (2018). *Role*. URL: http://www.businessdictionary.com/definition/role.html (visited on 11/06/2018).

Caffrey, E. and J. McDonagh (2015). "Information and Communication Technologies in Public Administration: Innovations from Developed Countries". In: ed. by C. Reddick and L. Anthopoulos. Boca Raton: CRC Press. Chap. Aligning Strategy and Information and Communication Technology in Public Organizations: A Critical Management Challenge, pp. 141–164.

Careers in Government (2019). *Soft Skills Are the Springboard to Success in the Public Sector*. URL: www.careersingovernment.com/tools/gov-talk/career-advice/soft-skills-springboard-success-public-sector (visited on 06/10/2019).

Carte, T. A., A. Dharmasiri, and T. Perera (2011). "Building IT capabilities: learning by doing". In: *Information Technology for Development* 17.4, pp. 289–305.

Carter, L. and F. Bélanger (2005). "The utilization of e-government services: citizen trust, innovation and acceptance factors". In: *Information Systems Journal* 15, pp. 5–25.

Carter, L., V. Weerakkody, B. Phillips, and Y. K. Dwivedi (2016). "Citizen Adoption of E-Government Services: Exploring Citizen Perceptions of Online Services in the United States and United Kingdom". In: *Information Systems Management* 33.2, pp. 124–140.

Carter, L. (2011). "Ideas for adding soft skills education to service learning and capstone courses for computer science students". In: *Proceedings of the 42nd ACM technical symposium on Computer science education (SIGCSE 2011)*. Dallas, pp. 517–521.

Chalmers, A. (2013). *What is this thing called Science?* 4th ed. Indianapolis: Hackett Publishing Company, Inc.

Chandavimol, P., O. Natakuatoong, and P. Tantrarungroj (2013). "Blended Training Model with Knowledge Management and Action Learning Principles to Develop Training Program Design Competencies". In: *International Journal of Information and Education Technology* 3.6, pp. 619–623.

Chanias, S. (2017). "Mastering Digital Transformation: The Path of a Financial Services Provider Towards a Digital Transformation Strategy". In: *Proceedings of the 25th European Conference on Information Systems (ECIS 2017)*. Guimarães, pp. 16–31.

Chen, W. and R. Hirschheim (2004). "A paradigmatic and methodological examination of information systems research from 1991 to 2001". In: *Information Systems Journal* 14.3, pp. 197–235.

Cherns, A. (1976). "The Principles of Sociotechnical Design". In: *Human Relations* 29.8, pp. 783–792.

Class Central (2018). *Growth of MOOCs*. URL: `https://www.classcentral.com/report/mooc-stats-2018` (visited on 07/13/2019).

Cordella, A. (2013). "E-Government Success: How to Account for ICT, Administrative Rationalization, and Institutional Change". In: *E-Government Success Factors and Measures: Theories, Concepts, and Methodologies*. IGI Global, pp. 40–51.

Cordella, A. and F. Iannacci (2010). "Information systems in the public sector: The e-Government enactment framework". In: *Journal of Strategic Information Systems* 19.1, pp. 52–66.

Cordella, A. and N. Tempini (2015). "E-government and organizational change: Reappraising the role of ICT and bureaucracy in public service delivery". In: *Government Information Quarterly* 32.3, pp. 279–286.

Córdoba-Pachón, J.-R. (2015). "Systems Thinking to Improve E-Government Evaluation". In: *International Journal of Public Administration in the Digital Age* 2.4, pp. 1–15.

Coreynen, W., P. Matthyssens, and W. Van Bockhaven (2017). "Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers". In: *Industrial Marketing Management* 60, pp. 42–53.

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4th ed. Thousand Oaks, CA: SAGE Publications.

Dada, D. (2006). "The Failure of E-Government in Developing Countries: A Literature Review". In: *The Electronic Journal of Information Systems in Developing Countries* 26.7, pp. 1–10.

Daft, R. L., J. Murphy, and H. Willmott (2014). *Organization Theory and Design – An International Perspective*. 2nd ed. Hampshire: Cengage Learning EMEA.

Dalkey, N. and O. Helmer (1963). "An Experimental Application of the DELPHI Method to the Use of Experts". In: *Management Science* 9.3, pp. 458–467.

Danziger, J. N. and K. V. Andersen (2002). "The Impacts of Information Technology on Public Administration: An Analysis of Empirical Research from the "Golden Age" of Transformation". In: *International Journal of Public Administration* 25.5, pp. 591–627.

Daradoumis, T., R. Bassi, F. Xhafa, and S. Caballe (2013). "A Review on Massive E-Learning (MOOC) Design, Delivery and Assessment". In: *Proceedings of the 8th International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC 2013)*. Compiegne.

Darling, S. D. and J. B. Cunningham (2016). "Underlying values and competencies of public and private sector managers". In: *Asian Education and Development Studies* 5.4, pp. 371–387.

Das, J., C. DiRienzo, and J. Burbridge John (2009). "Global E-Government and the Role of Trust: A Cross Country Analysis". In: *International Journal of Electronic Government Research* 5.1, pp. 1–18.

Davis, S., K. Siau, and K. Dhenuvakonda (2003). "A fit-gap analysis of e-business curricula vs. industry needs". In: *Communications of the ACM* 46.12, pp. 167–177.

Dawes, S. S. (2004). "Training the IT-Savvy Public Manager: Priorities and Strategies for Public Management Education". In: *Journal of Public Affairs Education* 10.1, pp. 5–17.

de Freitas, S. (2018). "Are Games Effective Learning Tools? A Review of Educational Games". In: *Educational Technology & Society* 21.2, pp. 74–84.

de Freitas, S. I., J. Morgan, and D. Gibson (2015). "Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision". In: *British Journal of Educational Technology* 46.3, pp. 455–471.

de Freitas, S. and M. Oliver (2006). "How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?" In: *Computers & Education* 46.3, pp. 249–264.

Debortoli, S., O. Müller, I. Junglas, and J. vom Brocke (2016). "Text Mining for Information Systems Researchers: An Annotated Topic Modeling Tutorial". In: *Communications of the Association for Information Systems* 39, pp. 110–135.

Deist, F. D. L. and J. Winterton (2005). "What Is Competence?" In: *Human Resource Development International* 8.1, pp. 27–46.

Deng, H. (2008). "Towards objective benchmarking of electronic government: an inter-country analysis". In: *Transforming Government: People, Process and Plicy* 2.3, pp. 162–176.

Deterding, S., D. Dixon, R. Khaled, and L. Nacke (2011). "From Game Design Elements to Gamefulness: Defining "Gamification"". In: *Proceedings of the 15th International Academic MindTrek Conference (MindTrek 2011)*. Tampere, pp. 9–15.

Devaux, A., S. Grand-Clement, C. Manville, and J. Belanger (2017). "Digital learning's role in enabling inclusive skills development for a connected world". In: *Proceedings of the 5th European MOOCSs Stakeholder Summit (EMOOCs 2017)*. Madrid, pp. 104–111.

Dewey, J. (1916). *Democracy and Education: An Introduction to the Philosophy of Education*. New York: The Macmillan Company.

Dewey, J. (1938). *Experience and Education*. Indianapolis: The Macmillan Company.

Distel, B. (2016). "Die Einführung der elektronischen Akte in Deutschland". In: *Digitale Transformation: Methoden, Kompetenzen und Technologien für die Verwaltung*. Ed. by D. Rätz, M. Breidung, D. Lück-schneider, S. Kaiser, and E. S. Hrsg. Köllen Druck+Verlag GmbH, pp. 113–124.

Distel, B. and N. Ogonek (2016). "To Adopt or Not To Adopt: A Literature Review on Barriers to Citizens' Adoption of E-Government Services". In: *Proceedings of the 24th European Conference on Information Systems (ECIS 2016)*. Istanbul.

Distel, B., N. Ogonek, and J. Becker (2019). "E-Government Competences revisited – A Literature Review on necessary Competences in a Digitalized Public Sector". In: *Proceedings of the 14th International Conference on Wirtschaftsinformatik*. Siegen, pp. 286–300.

Djaouti, D., J. Alvarez, and J.-P. Jessel (2011). "Handbook of Research on Improving Learning and Motivation through Educational Games: Multidisciplinary Approaches". In: IGI Global. Chap. Classifying Serious Games: The G/P/S Model, pp. 118–136.

Douglas-Lenders, R. C., P. J. Holland, and B. Allen (2017). "Building a better workforce: A case study in management simulations and experiential learning in the construction industry". In: *Education & Training* 59.1, pp. 2–14.

Dufner, D., L. M. Holley, and B. J. Reed (2002). "Can Private Sector Strategic Information Systems Planning Techniques Work for the Public Sector?" In: *Communications of the Association for Information Systems* 8.1, pp. 413–431.

e-Estonia Briefing Centre (2019). *e-estonia*. URL: `https://e-estonia.com/` (visited on 07/03/2019).

Ebrahim, Z. and Z. Irani (2005). "E-government adoption: architecture and barriers". In: *Business Process Management Journal* 11.5, pp. 589–611.

El-Haddadeh, R., V. Weerakkody, S. H. Al-Shafi, and M. Ali (2010). "E-Government implementation Challenges: A Case study". In: *Proceedings of the 16th Americas Conference on Information Systems (AMCIS 2010)*. Lima.

Ellis, T. J. and Y. Levy (2010). "A Guide for Novice Researchers: Design and Development Research Methods". In: *Proceedings of the Informing Science & IT Education Conference (InSITE 2010)*. Cassino.

Elo, S. and H. Kyngäs (2008). "The qualitative content analysis process". In: *Journal of Advanced Nursing* 62.1, pp. 107–115.

Eshet-Alkali, Y. (2004). "Digital Literacy: A Conceptual Framework for Survival Skills in the Digital Era". In: *Educational Multimedia and Hypermedia* 13.1, pp. 93–106.

Estevez, E. and T. Janowski (2013). "Landscaping Government Chief Information Officer Education". In: *Proceedings of the 46th Hawaii International Conference on System Sciences (HICSS-46)*. Wailea: IEEE, pp. 1684–1693.

European Commission (2006). *eGovernment*. URL: http://bit.ly/1UyXy1U (visited on 03/18/2016).

European Commission (2008). *The European Qualifications Framework for Lifelong Learning (EQF)*. Tech. rep. Belgium: European Commission.

European Commission (2009). *Ministerial Declaration on eGovernment*. Tech. rep. Malmö: European Commission.

European Commission (2010). *European eGovernment Action Plan 2011-2015*. Tech. rep. Brussels: European Commission.

European Commission (2014a). *Measuring Digital Skills across the EU: EU wide indicators of Digital Competence*. Tech. rep. Brussels: European Commission.

European Commission (2014b). *Understanding the transformation of European public administrations*. URL: https://cordis.europa.eu/programme/rcn/700269/en (visited on 02/28/2016).

European Commission (2015). *A Digital Single Market Strategy for Europe*. Tech. rep. Brussels: European Commission.

European Commission (2016a). *Digital Single Market - Digital Skills & Jobs*. URL: https://ec.europa.eu/digital-single-market/en/skills-jobs (visited on 05/03/2017).

European Commission (2016b). *eGovernment Benchmark 2016 A turning point for eGovernment development in Europe?* Tech. rep. Luxembourg: European Commission.

European Commission (2016c). *EU eGovernment Action Plan 2016-2020 - Accelerating the Digital Transformation of Government*. Tech. rep. Brussels: European Commission.

European Commission (2017a). *e-Identification*. URL: https://ec.europa.eu/digital-single-market/en/e-identification (visited on 05/15/2018).

European Commission (2017b). *eGovernment Benchmark 2017 - Taking stock of user-centric design and delivery of digital public services in Europe*. Tech. rep. Luxembourg: European Commission.

European Commission (2018a). *eGovernment & Digital Public Services*. URL: https://ec.europa.eu/digital-single-market/en/policies/egovernment (visited on 11/10/2018).

European Commission (2018b). *eGovernment Benchmark 2018: Securing eGovernment for all*. Tech. rep. Luxembourg: European Commission.

European Committee for Standardization (2019). *European e-Competence Framework*. URL: http://bit.ly/1wJWqNt (visited on 07/05/2019).

Evangelopoulos, N., X. Zhang, and V. R. Prybutok (2012). "Latent Semantic Analysis: five methodological recommendations". In: *European Journal of Information Systems* 21.1, pp. 70–86.

Evans, K., I. Schoon, and M. Weale (2013). "Can Lifelong Learning Reshape Life Chances?" In: *British Journal of Educational Studies* 61.1, pp. 25–47.

Faria, A. J. and W. J. Wellington (2004). "A Survey of Simulation Game Users, Former-Users, and Never-Users". In: *Simulation & Gaming* 35.2, pp. 178–207.

Featherman, M. S. and P. A. Pavlou (2003). "Predicting e-services adoption: a perceived risk facets perspective". In: *International Journal of Human-Computer Studies* 59.4, pp. 451–474.

Federal German Government (2013). *Gesetz zur Förderung der elektronischen Verwaltung (E-Government-Gesetz - EGovG)*.

Federal Ministry of the Interior (2013). *Mini comment on the Act to promote electronic government and to amend other legislation*. Tech. rep. Federal Ministry of the Interior.

Federal Ministry of the Interior (2018). *IT Planning Council*. URL: https://www.it-planungsrat.de/EN/home/home%7B%5C_%7Dnode.html (visited on 05/15/2018).

Fletcher, J. D. and S. Tobias (2006). "Using Computer Games and Simulations for Instruction: A Research Review". In: *Proceedings of the Society for Applied Learning Technology and New Learning Technologies*. Orlando.

Fountain, J. E. (2001). "The Virtual State: Transforming American Government?" In: *National Civic Review* 90.3, pp. 241–252.

Fountain, J. and C. Osorio-Urzua (2001). "The Economic Payoff From The Internet Revolution". In: ed. by R. Litan and A. Rivlin. Washington, D.C.: Brookings Institution Press. Chap. Public Sector: Early Stage of a Deep Transformation, pp. 235–268.

Freiheit, J. and F. A. Zangl (2007). "Model-based User-interface Management for Public Services". In: *Electronic Journal of e-Government* 5.1, pp. 53–62.

Fumarola, M., J.-P. van Staalduinen, and A. Verbraeck (2012). "A Ten-Step Design Method for Simulation Games in Logistics Management". In: *Journal of Computing and Information Science in Engineering* 12.1.

Garris, R., R. Ahlers, and J. E. Driskell (2002). "Games, Motivation, and Learning: A Research and Practice Model". In: *Simulation & Gaming* 33.4, pp. 441–467.

Gartner (2014). *Creating Your Digital Edge Through a Competency-Based Talent System*. Tech. rep. G00263938. Gartner Inc.

Gartner (2016). *Hype Cycle for Education*. Tech. rep. Gartner Inc.

Gascó, M. (2003). "New Technologies and Institutional Change in Public Administration". In: *Social Science Computer Review* 21.1, pp. 6–14.

German Federal Government (2017). *German Digital Agenda 2014–2017*.

Gest, J., T. Reny, and J. Mayer (2017). "Roots of the Radical Right: Nostalgic Deprivation in the United States and Britain". In: *Comparative Political Studies* 51.13, pp. 1694–1719.

Getha-Taylor, H. and R. Morse (2013). "Collaborative Leadership Development For Local Government Officials: Exploring Competencies and Program Impact". In: *Public Administration Quarterly* 37.1, pp. 71–102.

Getha-Taylor, H. (2008). "Identifying Collaborative Competencies". In: *Review of Public Personnel Administration* 28.2, pp. 103–119.

Getha-Taylor, H. and J. Lee (2008). "Changing competencies for human resource management: examining e-government scorecard and Federal Human Capital Survey evidence". In: *International Journal of Public Sector Performance Management* 1.2, pp. 150–166.

Gharawi, M., E. Estevez, and T. Janowski (2014). "Identifying Government Chief Information Officer Education and Training Needs: The Case of Saudi Arabia". In: *Proceedings of the 15th Annual International Conference on Digital Government Research (dg.o 2014)*. Aguascalientes, pp. 280–289.

Gibson, J. L., J. M. Ivancevich, J. H. D. Jr., and R. Konopaske (2012). *Organizations: Behavior, Structure, Processes*. 14th ed. New York: McGraw-Hill.

Gil-Garcia, J. R., S. S. Dawes, and T. A. Pardo (2017). "Digital government and public management research: finding the crossroads". In: *Public Management Review* 20.5, pp. 633–646.

Gil-García, J. R. and T. A. Pardo (2005). "E-government success factors: Mapping practical tools to theoretical foundations". In: *Government Information Quarterly* 22.2, pp. 187–216.

Gilbert, D., P. Balestrini, and D. Littleboy (2004). "Barriers and benefits in the adoption of e-government". In: *International Journal of Public Sector Management* 17.4, pp. 286–301.

Goi, C.-L. (2018). "The use of business simulation games in teaching and learning". In: *Journal of Education for Business* 94.5, pp. 342–349.

Goings, D., D. Young, and S. H. Hendry (2003). "Critical Factors in the Delivery of e-Government Services : Perceptions of Technology Executives". In: *Communications of the International Information Management Association* 3.3, pp. 1–15.

Gorbacheva, E., A. Stein, T. Schmiedel, and O. Müller (2016). "The Role of Gender in Business Process Management Competence Supply". In: *Business and Information Systems Engineering (BISE)* 58.3, pp. 213–231.

Government of the United Kingdom (2003). *In the service of democracy: A consultation paper on a policy for electronic democracy*. Tech. rep. London: Government of the United Kingdom.

Gredler, M. E. (2004). "Handbook of research for educational communications and technology". In: ed. by D. H. Jonassen. 2nd ed. Mahwah: Lawrence Erlbaum Associaates. Chap. Games and Simulations and their Relationships to Learning, pp. 571–581.

Greger, V., D. Balta, and H. Krcmar (2014). "Analyzing Sakeholders in Complex E-Government Projects: Towards a Stakeholder Interaction Model". In: *Electronic Gov-*

ernment: Proceedings of the 13th IFIP WG 8.5 International Conference (EGOV 2014). Ed. by M. Janssen, H. G. Scholl, M. A. Wimmer, and F. Bannister. Dublin: Springer, pp. 194–205.

Greiling, D. (2006). "Performance measurement: a remedy for increasing the efficiency of public services?" In: *International Journal of Productivity and Performance Management* 55.6, pp. 448–465.

Grönlund, Å. (2002). *Electronic Government: Design, Applications and Management*. Ed. by Å. Grönlund. Hershey: Idea Group Publishing.

Grönlund, Å. (2005). "State of the Art in E-Gov Research: Surveying Conference Publications". In: *International Journal of Electronic Government Research* 1.4, pp. 1–25.

Guest, G., K. M. MacQueen, and E. E. Namey (2012). *Applied Thematic Analysis*. Thousand Oaks: SAGE Publications, pp. 3–20.

Guijarro, L. (2007). "Interoperability frameworks and enterprise architectures in e-government initiatives in Europe and the United States". In: *Government Information Quarterly* 24.1, pp. 89–101.

Gunn, E., J. B. Cunningham, and J. N. MacGregor (2014). "Developing Benchmarks for Guiding CAO Performance". In: *Local Government Studies* 40.6, pp. 851–868.

Gunther, M., E. Kiesling, and C. Stummer (2010). "Game-based learning in technology management education". In: *Proceedings of the 1st IEEE Global Engineering Education Conference (EDUCON 2010)*. Madrid: IEEE, pp. 191–196.

Gupta, V., S. Chopra, and R. K. Kakani (2017). "Leadership competencies for effective public administration: a study of Indian Administrative Service officers". In: *Journal of Asian Public Policy* 11.1, pp. 98–120.

Hall, T. E. and J. Owens (2011). "The digital divide and e-government services". In: *Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2011)*. Tallinn: ACM Press.

Halvorsen, T., J. Hauknes, I. Miles, and R. Røste (2005). *On the differences between public and private sector innovation*. Research rep. Oslo: Publin Report.

Haq, S. (2011). "Ethics and leadership skills in the public service". In: *Procedia - Social and Behavioral Sciences* 15, pp. 2792–2796.

Harel, G. H. and S. S. Tzafrir (2001). "HRM Practices in the Public and Private Sectors: Differences and Similarities". In: *Public Administration Quarterly* 25.3, pp. 316–355.

Heeks, R. (2003). *Most e-Government-for-Development Projects Fail How Can Risks be Reduced?* Research rep. Manchester: Institute for Development Policy and Management, University of Manchester.

Hellberg, A.-S. and Å. Grönlund (2013). "Conflicts in implementing interoperability: Re-operationalizing basic values". In: *Government Information Quarterly* 30.2, pp. 154–162.

Hevner, A. (2007). "A Three Cycle View of Design Science Research". In: *Scandinavian Journal of Information Systems* 19.2, pp. 87–92.

Hevner, A., S. March, J. Park, and S. Ram (2004). "Design Science in Information Systems Research". In: *Management Information Systems Quarterly* 28.1, pp. 75–105.

Hoberg, P., H. Krcmar, and B. Welz (2017). *Skills for Digital Transformation*. Tech. rep. Munich: Initiative for Digital Transformation (IDT).

Hoefer, R. (2003). "Administrative Skills and Degrees". In: *Administration in Social Work* 27.1, pp. 69–81.

Hofmann, S. and N. Ogonek (2018). "Different but still the same? How public and private sector organisations deal with new digitalisation competences". In: *Electronic Journal of e-Government* 16.2, pp. 127–135.

Hofmann, S., M. Räckers, and J. Becker (2012). "Identifying Factors of E-Government Acceptance – A Literature Review". In: *Proceedings of the 33rd International Conference on Information Systems (ICIS 2012)*. Orlando, pp. 1–10.

Hofstede, G. J. and P. Pedersen (1999). "Synthetic Cultures: Intercultural Learning Through Simulation Games". In: *Simulation & Gaming* 30.4, pp. 415–440.

Hogenboom, K. (2008). "Lessons Learned about access to government information after World War II can be applied after September 11". In: *Government Information Quarterly* 25.1, pp. 90–103.

Holmes, L. (2008). "Why Talking Cures". In: *Modern Psychoanalysis* 33.2, pp. 71–78.

Holsapple, C. W. and K. D. Joshi (2002). "Knowledge manipulation activities: results of a Delphi study". In: *Information & Management* 39.6, pp. 477–490.

Hondeghem, A. and F. Vandermeulen (2000). "Competency management in the Flemish and Dutch civil service". In: *International Journal of Public Sector Management* 13.4, pp. 342–353.

Hung, S.-Y., C.-M. Chang, and T.-J. Yu (2006). "Determinants of user acceptance of the e-Government services: the case of online tax filing and payment system". In: *Government Information Quarterly* 23.1, pp. 97–122.

Hunnius, S., B. Paulowitsch, and T. Schuppan (2015). "Does E-Government education meet competency requirements? An analysis of the German university system from international perspective". In: *Proceedings of the 48th Hawaii International Conference on System Sciences (HICSS-48)*. Kauai: IEEE, pp. 2116–2123.

Hunnius, S. and T. Schuppan (2013). "Competency requirements for transformational e-government". In: *Proceedings of the 46th Hawaii International Conference on System Sciences (HICSS-46)*. Wailea: IEEE, pp. 1664–1673.

Irani, Z., P. E. D. Love, T. Elliman, S. Jones, and M. Themistocleous (2005). "Evaluating e-government: learning from the experiences of two UK local authorities". In: *Information Systems Journal* 15.1, pp. 61–82.

Iwasaki, N. (2014). "The gap between CIO core competencies and the real roles of CIOs". In: *Proceedings of the 8th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2014)*. Guimarães, pp. 244–250.

Janowski, T., W. Cellary, and J. Davies (2013). "Introduction to Electronic Government Education , Training and Professionalization". In: *Proceedings of the 46th Hawaii International Conference on System Sciences (HICSS-46)*. Wailea: IEEE, pp. 1662–1663.

Janowski, T., E. Estevez, and A. Ojo (2012). "Conceptualizing Electronic Governance Education". In: *Proceedings of the 45th Hawaii International Conference on System Sciences (HICSS-45)*. Wailea: IEEE, pp. 2269–2278.

Jussila, J., V. Sillanpää, T. Lehtonen, N. Helander, and L. Frank (2019). "An Activity Theory Perspective on Creating a New Digital Government Service in Finland". In: *Proceedings of the 52nd Hawaii International Conference on System Sciences (HICSS-52)*. Wailea: IEEE, pp. 2923–2931.

Kaiser, S. (2004). "Qualification Requirements in e-Government: The Need for Information Systems in Public Administration Education". In: *Electronic Government: Proceedings of the 3rd IFIP WG 8.5 International Conference (EGOV 2004)*. Ed. by R. Traunmüller. Zaragoza: Springer, pp. 464–467.

Kalb, A., B. Geys, and F. Heinemann (2012). "Value for money? German local government efficiency in a comparative perspective". In: *Applied Economics* 44.2, pp. 201–218.

Kankanhalli, A., Y. Charalabidis, and S. Mellouli (2019). "IoT and AI for Smart Government: A Research Agenda". In: *Government Information Quarterly* 36.2, pp. 304–309.

Kaur, M. (2013). "Blended Learning - Its Challenges and Future". In: *Procedia - Social and Behavioral Sciences* 93, pp. 612–617.

Keen, P. G. W. (1981). "Information systems and organizational change". In: *Communications of the ACM* 24.1, pp. 24–33.

Kickert, W. J. M., T. Randma-Liiv, and R. Savi (2015). "Politics of fiscal consolidation in Europe: a comparative analysis". In: *International Review of Administrative Sciences* 81.3, pp. 562–584.

Kim, G., B. Shin, K. K. Kim, and H. G. Lee (2011). "IT Capabilities, Process-Oriented Dynamic Capabilities, and Firm Financial Performance". In: *Journal of Association for Information Systems* 12.7, pp. 487–517.

Kim, H.-W. and A. Kankanhalli (2009). "Investigating User Resistance to Information Systems Implementation: A Status Quo BiasPerspective". In: *Management Information Systems Quarterly* 33.3, pp. 567–582.

Kim, J. B. and E. Watson (2018). "Flow in Business Simulation Games: Comparison between Online and Face-to-Face MBA". In: *Proceedings of the 51st Hawaii International Conference on System Sciences (HICSS-51)*. Waikoloa: IEEE, pp. 13–22.

Kim, S. and K. Layne (2001). "Making the Connection: E-Government and Public Administration Education". In: *Journal of Public Affairs Education* 7.4, pp. 229–240.

Kim, S. and H. Lee (2006). "The impact of organizational context and information technology on employee knowledge-sharing capabilities". In: *Public Administration Review* 66.3, pp. 370–385.

Kitchenham, B. and S. Charters (2007). *Guidelines for performing Systematic Literature Reviews in Software Engineering*. Tech. rep. EBSE.

Kitchenham, B., R. Pretorius, D. Budgen, O. P. Brereton, M. Turner, M. Niazi, and S. Linkman (2010). "Systematic literature reviews in software engineering – A tertiary study". In: *Information and Software Technology* 52.8, pp. 792–805.

Kitzinger, J. (1995). "Qualitative Research: Introducing focus groups". In: *British Medical Journal* 311.7000, pp. 299–302.

Klassen, K. J. and K. A. Willoughby (2003). "In-Class Simulation Games: Assessing Student Learning". In: *Journal of Information Technology Education* 2, pp. 1–13.

Klievink, B. and M. Janssen (2010). "Simulation games for collaborative development in e-Government". In: *Proceedings of the 43rd Hawaii International Conference on System Sciences (HICSS-43)*. Koloa: IEEE.

Kolb, A. Y. and D. A. Kolb (2009a). "The Learning Way: Meta-cognitive aspects of Experiential Learning". In: *Simulation & Gaming* 40.3, pp. 297–327.

Kolb, A. Y. and D. A. Kolb (2009b). "The SAGE Handbook of Management Learning, Education and Development". In: *The SAGE Handbook of Management Learning, Education and Development*. Ed. by S. J. Armstrong and C. V. Fukami. SAGE Publications. Chap. Experiential Learning Theory: A Dynamic, Holistic Approach to Management Learning, Education and Development, pp. 42–68.

Kolb, D. (1984). *Experiential learning: Experience as a source of learning and development*. Upper Saddle River: Prentice Hall.

Korn Ferry Institute (2013). *The Gamification of Everything*. URL: `www.kornferry.com/institute/618-the-gamification-of-everything` (visited on 09/03/2019).

Kraemer, K. and J. L. King (2006). "Information Technology and Administrative Reform: Will E-Government be different?" In: *International Journal of Electronic Government Research* 2.1, pp. 1–20.

Krathwohl, D. R., B. S. Bloom, and B. B. Masia (1964). "Taxonomy of educational objectives: The classification of Educational Goals". In: *Handbook II: The Affective Domain*. New York: David McKay.

Krathwohl, D. R. (2002). "A Revision of Bloom's Taxonomy: An Overview". In: *Theory Into Practice* 41.4, pp. 212–218.

Krems, B. (2015). *Größenklassen kommunaler Gebietskörperschaften*. URL: `http://www.olev.de/g/gr-klassen.htm` (visited on 09/26/2016).

Krippendorff, K. (2004). *Content Analysis: An Indtroduction to Its Methodology*. 2nd ed. Thousand Oaks: SAGE Publications.

Kriz, W. C. (2003). "Creating Effective Learning Environments and Learning Organizations through Gaming Simulation Design". In: *Simulation & Gaming* 34.4, pp. 495–511.

Kubicek, H. and M. Wind (2004). *Integrated E-Government in a Federal State Structure? Challenges on the Way to Effective Administrative Procedures*. URL: http://bit.ly/2xD1lSA (visited on 08/23/2017).

Kumar, R. (2019). *Research Methodology: a staep by step guide for beginners*. Ed. by A. Owen. 5th ed. London: SAGE Publications.

Kumar, V., B. Mukerji, I. Butt, and A. Persaud (2007). "Factors for successful e-government adoption: a conceptual framework". In: *Electronic Journal of e-Government* 5.1, pp. 63–76.

Layne, K. and J. Lee (2001). "Developing fully functional E-government: A four stage model". In: *Government Information Quarterly* 18.2, pp. 122–136.

Lean, J., J. Moizer, M. Towler, and C. Abbey (2006). "Simulations and games: Use and barriers in higher education". In: *Active Learning in Higher Education* 7.3, pp. 227–242.

Lederman, L. C. (1992). "Debriefing: Toward a Systematic Assessment of Theory and Practice". In: *Simulation & Gaming* 23.2, pp. 145–160.

Legner, C., T. Eymann, T. Hess, C. Matt, T. Böhmann, P. Drews, A. Mädche, N. Urbach, and F. Ahlemann (2017). "Digitalization: Opportunity and Challenge for the Business and Information Systems Engineering Community". In: *Business & Information Systems Engineering* 59.4, pp. 301–308.

Leiponen, A. (2005). "Skills and innovation". In: *International Journal of Industrial Organization* 23.5–6, pp. 303–323.

Leitner, C. (2006). "eGovernment: People and skills in Europe's administrations". In: *Proceedings of the 39th Hawaii International Conference on System Sciences (HICSS-39)*. Kauai: IEEE.

Levy, Y. and T. J. Ellis (2006). "A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research". In: *Informing Science: The International Journal of an Emerging Transdiscipline* 9, pp. 181–212.

Lewis, G. B. and Y. J. Cho (2010). "The Aging of the State Government Workforce: Trends and Implications". In: *The American Review of Public Administration* 41.1, pp. 48–60.

Lewis, L. H. and C. J. Williams (1994). "Experiential learning: Past and Present". In: *New Directions for Adult and Continuing Education* 1994.62, pp. 5–16.

Linstone, H. A. and M. Turoff, eds. (2002). *The Delphi Method: Techniques and Applications*. Boston: Addison-Wesley Publishing.

Liu, S. (and R. Fidel (2007). "Managing aging workforce". In: *Proceedings of the 1st international conference on Theory and practice of electronic governance - ICEGOV '07*. ACM Press.

Liu, S. M. and Q. Yuan (2015). "The Evolution of Information and Communication Technology in Public Administration". In: *Public Administration and Development* 35.2, pp. 140–151.

Macintosh, A. (2004). "Characterizing E-Participation in Policy-Making". In: *Proceedings of the 37th Hawaii International Conference on System Sciences (HICSS-37)*. Big Island: IEEE.

Madsen, C. Ø., J. B. Berger, and M. Phythian (2014). "The Development in Leading e-Government Articles 2001-2010: Definitions, Perspectives, Scope, Research Philosophies, Methods and Recommendations: An Update of Heeks and Bailur". In: *Electronic Government: Proceedings of the 13th IFIP WG 8.5 International Conference (EGOV 2014)*. Ed. by M. Janssen, H. J. Scholl, M. A. Wimmer, and F. Bannister. Dublin, pp. 17–34.

Mancebo Fernandez, N., A. Rafart Serra, A. Bikfalvi, and M. D. Munoz Soler (2008). "Aligning leadership and competences in recruitment and staff development: an empirical analysis in the context of regional public administration". In: *International Journal of Public Sector Performance Management* 1.2, pp. 167–182.

March, S. T. and G. F. Smith (1995). "Design and natural science research on information technology". In: *Decision Support Systems* 15.4, pp. 251–266.

March, S. T. and V. C. Storey (2008). "Design Science in the Information Systems Discipline: An Introdcution to the Special Issue on Design Science Research". In: *Management Information Systems Quarterly* 32.4, pp. 725–730.

Marcovecchio, I., E. Estevez, and P. Fillottrani (2013). *Government Chief Information Officer (GCIO) Ontology: A Tool to Formalize the GCIO Function*. Seoul.

Marzullo, F. P. and J. M. de Souza (2009). "New Directions for IT Governance in the Brazilian Government". In: *International Journal of Electronic Government Research* 5.4, pp. 57–69.

Marzullo, F. P. and J. M. de Souza (2011). "Applied Technology Integration in Governmental Organizations: New E-Government Research". In: *Applied Technology Integration in Governmental Organizations*. Ed. by V. Weerakkody. IGI Global. Chap. New Directions for IT Governance in the Brazilian Government, pp. 313–334.

Mayer, I., G. Bekebrede, H. Warmelink, and Q. Zhou (2013). "A Brief Methodology for Researching and Evaluating Serious Games and Game-Based Learning". In: *Psychology, Pedagogy, and Assessment in Serious Games*. Ed. by T. M. Connolly, T. Hainey, E. Boyle, G. Baxter, and P. Moreno-Ger. IG, pp. 357–393.

Mayring, P. (2000). "Qualitative Content Analysis". In: *Forum Qualitative Social Research* 1.2, pp. 1–10.

McIntosh, D. (2001). "The uses and limits of the model United Nations in international relations classroom". In: *International Studies Perspectives* 2.3, pp. 269–280.

McQuiston, J. M. and A. P. Manoharan (2017). "Developing E-Government Coursework through the NASPAA Competencies Framework". In: *Teaching Public Administration* 35.2, pp. 173–189.

Meredith, J. (1993). "Theory Building through Conceptual Methods". In: *International Journal of Operations & Production Management* 13.5, pp. 3–11.

Michelacci, C. (2003). "Low returns in R&D due to the lack of entrepreneurial skills". In: *The Economic Journal* 113.484, pp. 207–225.

Michelucci, F. V., A. De Marco, and A. Tanda (2016). "Defining the Role of the Smart-City Manager: An Analysis of Responsibilities and Skills". In: *Journal of Urban Technology* 23.3, pp. 23–42.

Miller, D., S. R. Madsen, and C. R. John (2006). "Readiness for Change: Implications on Employees' Relationship with Management, Job Knowledge and Skills and Job Demands". In: *Journal of Applied Management and Entrepreneurship* 11.1, pp. 3–16.

Mincu, C. (2016). "Building Transformational Leadership Competencies in the Public Sector to Secure Quality Service." In: *Proceedings of the International Conference of the Institute for Business Administration*. Bucharest, pp. 29–33.

Mincu, C. (2017). "Sharpening Leadership Edge in the Public Sector and Private Business for Adaptive-to-Change Organizations". In: *Quality-Access to Success* 18.3, pp. 9–15.

Mingers, J. (2001). "Combining IS Research Methods: Towards a Pluralist Methodology". In: *Information Systems Research* 12.3, pp. 240–259.

Mohsen, K., S. Abdollahi, and S. Omar (2018). "Evaluating the educational value of simulation games: Learners' perspective". In: *Innovations in Education and Teaching International* 56.4, pp. 517–528.

Moon, M. J. (2002). "The Evolution of E-Government among Municipalities: Rhetoric or Reality?" In: *Public Administration Review* 62.4, pp. 424–433.

Moon, M. J. and D. F. Norris (2005). "Does managerial orientation matter? The adoption of reinventing government and e-government at the municipal level". In: *Information Systems Journal* 15.1, pp. 43–60.

Mora, M., O. Gelman, D. Paradice, and F. Cervantes (2008). "The Case for Conceptual Research in Information Systems". In: *Proceedings of the International Conference on Information Resources Management (CONF-IRM 2008)*. Niagra Falls.

Müller, S. D. and S. A. Skau (2015). "Success factors influencing implementation of e-government at different stages of maturity: a literature review". In: *International Journal of Electronic Governance* 7.2, pp. 136–170.

Mumford, E. (2000a). "A Socio-Technical Approach to Systems Design". In: *Requirements Engineering* 5.2, pp. 125–133.

Mumford, E. (2000b). "Socio-technical Design: An unfulfilled promise or a future opportunity?" In: *Organizational and Social Perspectives on Information Technology*. Ed. by R. Baskerville, J. Stage, and J. I. DeGross. Boston: Springer. Chap. 3, pp. 33–46.

Murawski, M. and M. Bick (2017). "Digital competences of the workforce – a research topic?" In: *Business Process Management Journal* 23.3, pp. 721–734.

Myers, M. D. and M. Newman (2007). "The qualitative interview in IS research: Examining the craft". In: *Information and Organization* 17.1, pp. 2–26.

National Performance Review (1993). *Reengineering Through Information Technology*. Tech. rep. National Performance Review. URL: http://govinfo.library.unt.edu/npr/library/reports/it.html (visited on 05/03/2017).

National Performance Review (1997). *Report of the National Performance Review and the Government Information Technology Services Board*. Tech. rep. National Performance Review.

Ndou, V. D. (2004). "E - Government for Developing Countries: Opportunities and Challenges". In: *The Electronic Journal of Information Systems in Developing Countries* 18.1, pp. 1–24.

Nevo, D. and Y. E. Chan (2007). "A Delphi Study of Knowledge Management Systems: Scope and Requirements". In: *Information & Management* 44.6, pp. 583–597.

Niehaves, B. (2011). "Iceberg ahead: On electronic government research and societal aging". In: *Government Information Quarterly* 28.3, pp. 310–319.

Niehaves, B., K. Ortbach, and J. Becker (2009). "The Demographic Challenge: Aging and Depopulation and their Consequences for E-Government - A Case Study". In: *Proceedings of the 42nd Hawaii International Conference on System Sciences (HICSS-42)*. Waikoloa: IEEE.

Niehaves, B. (2010). "Demographic Awareness and E-Government – A Quantitative Analysis of Germany and Japan". In: *Proceedings of the 16th Americas Conference on Information Systems (AMCIS 2010)*. Lima.

Noordegraaf, M. (2000). "Professional sense-makers: managerial competencies amidst ambiguity". In: *International Journal of Public Sector Management* 13.4, pp. 319–332.

Nordhaug, O. (1993). *Human capital in organizations: competence, training, and learning*. Oxford: Oxford University Press.

North Rhine-Westfalia (2018). *Municipal code for the state of North Rhine-Westphalia (GO NRW)*. URL: http://www.lexsoft.de/cgi-bin/lexsoft/justizportal%7B%5C_%7Dnrw.cgi?xid=146702,76 (visited on 05/31/2018).

Nunamaker, J. F., M. Chen, and T. D. M. Purdin (1990). "Systems Development in Information Systems Research". In: *Journal of Management Information Systems* 7.3, pp. 89–106.

Nunohiro, E., K. Matsushita, K. J. Mackin, and M. Ohshiro (2012). "Development of game-based learning features in programming learning support system". In: *Artificial Life and Robotics* 17.3-4, pp. 373–377.

O'Leary, R., C. M. Gerard, and Y. Choi (2012). "The Skill Set of the Successful Collaborator". In: *Public Administration Review* 72.Special Issue, pp. 70–83.

OECD (2017). *Core Skills for Public Sector Innovation: a Beta Model*. Tech. rep. OECD.

Ogonek, N. and J. Becker (2018). "Can we Learn from Down Under How to Rise Up in E-Government? A Comparative Analysis of the Public Sector Competences in the German

and Australian Higher Education Systems". In: *Proceedings of the 51st Hawaii International Conference on System Sciences (HICSS-51)*. Waikoloa: IEEE, pp. 2256–2265.

Ogonek, N. (2017). "The Tale of e-Government: A Review of the Stories that Have Been Told So Far and What is Yet to Come". In: *Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS-50)*. Waikoloa: IEEE, pp. 2468–2477.

Ogonek, N., B. Distel, and J. Becker (2019a). "Let's Play … eGovernment! A Simulation Game for Competence Development among Public Administration Students". In: *Proceedings of the 52nd Hawaii International Conference on System Sciences (HICSS-52)*. Wailea: IEEE, pp. 3087–3096.

Ogonek, N., B. Distel, and J. Becker (2019b). "Playing is knowing! Using a simulation game to impart competences to public servants". In: *MIS Quarterly Executive (submitted)*.

Ogonek, N., E. Gorbacheva, M. Räckers, J. Becker, R. Krimmer, B. Broucker, and J. Crompvoets (2016). "Towards Efficient EGovernment: Identifying Important Competencies for EGovernment in European Public Administrations". In: *Electronic Government: Proceedings of the 15th IFIP WG 8.5 International Conference and 8th International Conference on eParticipation (Dual EGOV 2016 and ePart 2016)*. Guimarães, pp. 155–162.

Ogonek, N. and S. Hofmann (2018). "Governments' Need for Digitization Skills – Understanding and Shaping Vocational Training in the Public Sector". In: *International Journal of Public Administration in the Digital Age* 5.4, pp. 61–75.

Ogonek, N., M. Räckers, and J. Becker (2019c). "How to Master the "E": Tools for Competence Identification, Provision and Preservation in a Digitalized Public Sector". In: *Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2019)*. Melbourne, pp. 56–64.

Okoli, C. (2015). "A Guide to Conducting a Standalone Systematic Literature Review". In: *Communications of the Association for Information Systems* 37, pp. 879–910.

Okoli, C. and S. D. Pawlowski (2004). "The Delphi method as a research tool: an example, design considerations and applications". In: *Information & Management* 42.1, pp. 15–29.

Onwuegbuzie, A. J. and W. B. Dickinson (2009). "A Qualitative Framework for Collecting and Analyzing Data in Focus Group Research". In: *International Journal of Qualitative Methods* 8.3, pp. 1–21.

Österle, H., J. Becker, U. Frank, T. Hess, D. Karagiannis, H. Krcmar, P. Loos, P. Mertens, A. Oberweis, and E. J. Sinz (2011). "Memorandum on design-oriented information systems research". In: *European Journal of Information Systems* 20.1, pp. 7–10.

Pardo, T. A., T. Nam, and G. B. Burke (2011). "E-Government Interoperability: Interaction of Policy, Management, andTechnology Dimensions". In: *Social Science Computer Review* 30.1, pp. 7–23.

Peffers, K., T. Tuunanen, M. A. Rothenberger, and S. Chatterjee (2007). "A Design Science Research Methodology for Information Systems Research". In: *Journal of Management Information Systems* 24.3, pp. 45–77.

Pérez-Escoda, A. and N. G. Fernández-Villavicencio (2016). "Digital competence in use: from DigComp 1 to DigComp 2". In: *Proceedings of the 4th International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 2016)*. Salamanca, pp. 619–624.

Petter, S., D. Barber, C. S. Barber, and R. A. Berkley (2018). "Using Online Gaming Experience to Expand the Digital Workforce Talent Pool". In: *Management Information Systems Quarterly Executive* 2018.4.

Pieterson, W. (2010). "Citizens and Service Channels: Channel Choice and Channel Management Implications". In: *International Journal of Electronic Government Research* 6.2, pp. 37–53.

Pinsonneault, A. and K. Kraemer (1993). "Survey Research Methodology in Management Information Systems: An Assessment". In: *Journal of Management Information Systems* 10.2, pp. 75–105.

Prahalad and Hamel (1990). "The Core Competence of the Corporation". In: *Harvard Business Review* 68.3, pp. 79–91.

PricewaterhouseCoopers (2015). *Demographic and social change*. URL: `https://www.pwc.co.uk/issues/megatrends/demographic-and-social-change.html` (visited on 09/24/2016).

Puron-Cid, G. (2013). "Interdisciplinary application of structuration theory for e-government: A case study of an IT-enabled budget reform". In: *Government Information Quarterly* 30.Supplement 1, pp. 46–58.

Quinn, K. M., B. L. Monroe, M. Colaresi, M. H. Crespin, and D. R. Radev (2010). "How to analyze political attention with minimal assumptions and costs". In: *American Journal of Political Science* 54.1, pp. 209–228.

Rana, N. P., M. D. Williams, Y. K. Dwivedi, and J. Williams (2011). "Reflecting on E-Government Research". In: *International Journal of Electronic Government Research* 7.4, pp. 64–88.

Ranchhod, A., C. Gurău, E. Loukis, and R. Trivedi (2014). "Evaluating the educational effectiveness of simulation games: A value generation model". In: *Information Sciences* 264, pp. 75–90.

Randel, J. M., B. A. Morris, C. D. Wetzel, and B. V. Whitehill (1992). "The Effectiveness of Games for Educational Purposes: A Review of Recent Research". In: *Simulation & Gaming* 23.3, pp. 261–276.

Rapley, T. J. (2001). "The art(ful)ness of open-ended interviewing: Some considerations on anaysing interviews". In: *Qualitative Research* 1.3, pp. 303–323.

Recker, J. (2013). *Scientific Research in Information Systems. A Beginner's Guide*. Berlin, New York: Springer.

Reding, V. (2005). "eGovernment in i2010 – citizens first". In: *Proceedings of the 3rd eGovernment Ministerial Conference: Transforming Public Services*. Manchester.

Redmond, P. (2011). "From face-to-face teaching to online teaching: Pedagogical transitions". In: *Proceedings of the 28th International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education (ASCILITE 2011)*. Hobart, pp. 1050–1060.

Reichard, C. and T. van der Krogt (2014). "Towards a set of specific competences for academic degree programmes in Public Administration in Europe". In: *Proceedings of the 22nd The Network of Institutes and Schools of Public Administration in Central and Eastern Europe Annual Conference (NISPAcee Conference 2014)*. Budapest.

Roberts, B. W. and D. Mroczek (2008). "Personality Trait Change in Adulthood". In: *Current Directions in Psychological Science* 17.1, pp. 31–35.

Robey, D., C. Anderson, and B. Raymond (2013). "Information Technology, Materiality, and Organizational Change: A Professional Odyssey". In: *Journal of the Association for Information Systems* 14.7, pp. 379–398.

Rochet, C., J. Peignot, and A. Peneranda (2012). "Digitizing the Public Organization: Information System Architecture as a Key Competency to Foster Innovation Capabilities in Public Administration". In: *Halduskultuur - Administrative Culture* 13.1, pp. 49–66.

Rogers, E. (2003). *Diffusion of Innovations*. 5th ed. New York: Free Press.

Rose, W. and G. Grant (2010). "Critical Issues pertaining to the planning and implementation of E-Government initiatives". In: *Government Information Quarterly* 27.1, pp. 26–33.

Rosenberg, M. J. (2001). *E-Learning: Strategies for Delivering Knowledge in the Digital Age*. New York: McGraw-Hill.

Sabbagh, K., R. Friedrich, B. El-Darwiche, M. Singh, and S. Ganediwalla (2012). "Maximizing the Impact of Digitization". In: *The Global Information Technology Report*. Ed. by S. Dutra and B. Bilbao-Osorio. World Economic Forum. Chap. 1.11, pp. 121–133.

Salas, E., J. Wildman, and R. Piccolo (2009). "Using Simulation-Based Training to Enhance Management Education". In: *The Academy of Management Learning and Education (AMLE)* 8.4, pp. 559–573.

Salem, J. (2003). "Public and private sector interests in e-government: a look at the DOE's PubSCIENCE". In: *Government Information Quarterly* 20.1, pp. 13–27.

Sarantis, D., S. B. Dhaou, C. Alexopoulos, A. Ronzhyn, G. V. Pereira, and Y. Charalabidis (2019). "The Evolving e-Governance Curriculum: A Worldwide mapping of Education Programs". In: *Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2019)*. Melbourne: ACM Press, pp. 378–386.

Sauvé, L., L. Renaud, D. Kaufman, and J.-S. Marquis (2007). "Distinguishing between games and simulations: A systematic review". In: *Educational Technology & Society* 10.3, pp. 247–256.

Schank, R. C. (2005). *Lessons in Learning, e-Learning and Training*. 1st ed. San Francisco: Pfeiffer.

Schedler, K., A. A. Guenduez, and R. Frischknecht (2019). "How smart can government be? Exploring barriers to the adoption of smart government". In: *Information Polity* 24.1, pp. 3–20.

Scherer, S. and M. A. Wimmer (2014). "Trust in e-Participation: Literature Review and Emerging Research Needs". In: *Proceedings of the 8th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2014)*. Guimarães: ACM, pp. 61–70.

Scholl, H. J. (2005). *Organizational Transformation Through E-Government: Myth or Reality?* Ed. by M. A. Wimmer, R. Traunmüller, Å. Grönlund, and K. V. Andersen. Copenhagen.

Scholl, H. J. (2013). "Electronic Government Research: Topical Directions and Preferences". In: *Electronic Government: Proceedings of the 12th IFIP WG 8.5 International Conference (EGOV 2013)*. Ed. by M. A. Wimmer, M. Janssen, and H. J. Scholl. Koblenz: Springer, pp. 1–13.

Scholl, H. J. (2014). "The EGOV Research Community: An Update on Where We Stand". In: *Electronic Government: Proceedings of the 13th IFIP WG 8.5 International Conference (EGOV 2014)*. Ed. by M. Janssen, H. J. Scholl, M. A. Wimmer, and F. Bannister. Dublin, pp. 1–16.

Scholl, H. J. and Y. K. Dwivedi (2014). "Forums for electronic government scholars: Insights from a 2012/2013 study". In: *Government Information Quarterly* 31.2, pp. 229–242.

Schulz, B. (2008). "The Importance of Soft Skills: Education beyond Academic Knowledge". In: *Journal of Language and Communication* 2.1, pp. 146–154.

Schulz, S. and T. Schuppan (2011). "Competence Modelling for Human Resources Development and European Policies. Bridging Business, Education, and Training". In: ed. by C. M. Stracke. Duisburg, Essen: GITO Verlag. Chap. A European Framework for e-Government Competences, pp. 142–154.

Schulz, S. and T. Schuppan (2012). "Development of a European Framework for e-Government Competences". In: *Proceedings of the Fachtagung Verwaltungsinformatik (FTVI) & Rechtsinformatik (FTRI) - Auf dem Weg zu einer offenen, smarten und vernetzten Verwaltungskulturo*. Ed. by J. Lucke, C. P. Geiger, and S. Kaiser. Bonn, pp. 47–58.

Schuppan, T. (2010). "Handbook of Public Information Systems". In: 3rd ed. Boca Raton: Taylor & Francis. Chap. E-government competencies: looking beyond technology, pp. 353–370.

Schuppan, T. (2014). "E-Government at Work Level: Skilling or De-skilling?" In: *Proceedings of the 47th Hawaii International Conference on System Sciences (HICSS-47)*. Waikoloa: IEEE, pp. 1927–1934.

Schuppan, T., T. A. Pardo, and E. Wihlborg (2015). "Introduction to emerging topics in electronic government minitrack". In: *Proceedings of the 48th Hawaii International Conference on System Sciences (HICSS-48)*. Kauai: IEEE, pp. 2116–2123.

Schwester, R. W. (2009). "Examining the Barriers to e-Government Adoption". In: *Electronic Journal of e-Government* 7.1, pp. 113–122.

Scott, J. E. (2007). "An e-Transformation Study Using the Technology – Organization – Environment Framework". In: *Proceedings of the 20th Bled eConference (BLED 2007)*. Bled, pp. 50–61.

Sethibe, T., J. Campbell, and C. McDonald (2007). "IT governance in public and private sector organizations: Examining the differences and defining future research directions". In: *Proceedings of the 18th Australasian Conference on Information Systems (ACIS 2007)*. Toowoomba, pp. 833–843.

SFIA Foundation (2017). *The Skills Framework for the Information Age (SFIA)*. URL: https://www.sfia-online.org/en/reference-guide (visited on 10/12/2017).

Shah, N., Z. Irani, and A. M. Sharif (2017). "Big data in an HR context: Exploring organizational change readiness, employee attitudes and behaviors". In: *Journal of Business Research* 70, pp. 366–378.

Simon, H. A. (1996). *The Sciences of the Artificial*. 3rd ed. Cambridge (Massachusetts): MIT Press.

Sipior, J. C., B. T. Ward, and R. Connolly (2011). "The Digital Divide and T-Government in the United States: Using the Technology Acceptance Model to Understand Usage". In: *European Journal of Information Systems* 20.3, pp. 308–328.

Stare, J. and M. Klun (2018). "Required competencies in public administration study programs". In: *Transylvanian Review of Administrative Sciences* 55, pp. 80–97.

Teece, D. J. (2004). "Handbook of Knowledge Management 1". In: ed. by C. W. Holsapple. Berlin, Heidelberg: Springer. Chap. Knowledge and Competence as Strategic Assets, pp. 129–152.

The Independent (2014). *Gamification is Taking Over Our Lives, And it All Came From Video Games*. URL: www.independent.co.uk/life-style/gadgets-and-tech/gaming/gamification-is-taking-over-our-lives-and-it-all-came-from-video-games-9779149.html (visited on 09/03/2019).

Thompson, R. L., C. A. Higgins, and J. M. Howell (1994). "Influence of Experience on Personal Computer Utilization: Testing a Conceptual Model". In: *Journal of Management Information Systems* 11.1, pp. 167–187.

Thudugala, K. and S. M. Weerawarana (2013). "Requisite competencies for government Chief Information Officer in Sri Lanka". In: *Global Business and Economics Research Journal* 2.7, pp. 1–11.

Tijdens, K. and B. Steijn (2005). "The determinants of ICT competencies among employees". In: *New Technology, Work and Employment* 20.1, pp. 60–73.

Tobias, S. and J. D. Fletcher (2007). "What Research Has to Say About Designing Computer Games for Learning". In: *Educational Technology* 47.5, pp. 20–29.

Tobias, S., J. D. Fletcher, and F. Chen (2015). "Digital Games as Educational Technology: Promise and Challenges in the Use of Games toTeach". In: *Educational Technology* 55.5, pp. 3–12.

Turner, D. W. (2010). "Qualitative Interview Design: A Practical Guide for Novice Investigators". In: *The Qualitative Report* 15.3, pp. 754–760.

Turney, P. D. and P. Pantel (2010). "From frequency to meaning: Vector space models of semantics". In: *Journal of Artificial Intelligence Research* 37, pp. 141–188.

United Nations (2014). *United Nations E-Government Survey 2014 - E-Government for the future we want*. Tech. rep. New York: United Nations.

United Nations (2016). *United Nations E-Government Survey 2016 - E-Government in support of sustainable development*. Tech. rep. New York: United Nations.

United Nations (2018). *United Nations E-Government Survey 2018 - Gearing e-Government to support transformation towards sustainable and resilient societies*. Tech. rep. New York: United Nations.

United States Department of Labor, Employment and Training Administration (2019). *O*NET database of occupational information*. URL: https://www.onetonline.org/ (visited on 03/16/2019).

Urquhart, C. (2001). "An Encounter with Grounded Theory: Tackling the Practical and Philosophical Issues". In: *Qualitative Research in IS: Issues and Trends*. Hershey: Idea Group Publishing. Chap. 5, pp. 104–140.

Vakulenko, S., O. Müller, and J. vom Brocke (2014). "Enriching iTunes App Store Categories via Topic Modeling". In: *Proceedings of the 35th International Conference on Information Systems*. Auckland.

Venkatesh, V., S. Brown, and H. Bala (2013). "Bridging the Qualitative–Quantitative Divide: Guidelines for Conducting Mixed Methods Research in Information Systems". In: *Management Information Systems Quarterly* 37.1, pp. 21–54.

Venkatesh, V., M. G. Morris, G. B. Davis, and F. D. Davis (2003). "User Acceptance of Information Technology: Toward a Unified". In: *Management Information Systems Quarterly* 27.3, pp. 425–478.

Vieru, D., S. Bourdeau, A. Bernier, and S. Yapo (2015). "Digital Competence: A Multidimensional Conceptualization and a Typology in an SME Context". In: *Proceedings of the 48th Hawaii International Conference on System Sciences (HICSS-48)*. Kauai: IEEE, pp. 4681–4690.

Virtanen, T. (2000). "Changing competences of public managers: tensions in commitment". In: *International Journal of Public Sector Management* 13.4, pp. 333–341.

Vlachopoulos, D. and A. Makri (2017). "The effect of games and simulations on higher education: a systematic literature review". In: *International Journal of Educational Technology in Higher Education* 14.1.

vom Brocke, J., A. Simons, B. Niehaves, and K. Riemer (2009). "Reconstructing the Giant: On the Importance of Rigour in Documenting the Literature Search Process". In: *Proceedings of the 17th European Conference on Information Systems (ECIS 2009)*. Verona.

vom Brocke, J., A. Simons, K. Riemer, B. Niehaves, R. Plattfaut, and A. Cleven (2015). "Standing on the Shoulders of Giants: Challenges and Recommendations of Literature Search in Information Systems Research". In: *Communications of the Association for Information Systems* 37, pp. 205–224.

Weber, R. P. (1990). *Basic Content Analysis*. 2nd ed. Newbury Park: SAGE Publications.

Webster, J. and R. T. Watson (2002). "Analyzing the Past to Prepare for the Future: Writing a Literature Review." In: *Management Information Systems Quarterly* 26.2, pp. xiii–xxiii.

Weerakkody, V. and J. Choudrie (2005). "Exploring E-Government in the UK: Challenges, Issues and Complexities". In: *Journal of Information Science and Technology* 2.2, pp. 25–43.

Westera, W., R. J. Nadolski, H. G. K. Hummel, and I. G. J. H. Wopereis (2008). "Serious games for higher education: A framework for reducing design complexity". In: *Journal of Computer Assisted Learning* 24.5, pp. 420–432.

White House (2009). *Memorandum on Transparency and Open Government*. Tech. rep. Washington: White House, pp. 4685–4686.

Wikidot (2019). *Game loop tutorial*. URL: `http://gamedesign.wikidot.com/freebasic:game-loop-tutorial-i` (visited on 06/14/2019).

Wilkinson, S. (1998). "Focus group methodology: A review". In: *International Journal of Social Research Methodology* 1.3, pp. 181–203.

Wilkinson, S. (2016). "Qualitative Research". In: ed. by D. Silverman. 4th ed. Thousand Oaks: SAGE Publications. Chap. Analysing Focus Group Data, pp. 83–100.

Williams, P. (2002). "The Competent Boundary Spanner". In: *Public Administration* 80.1, pp. 103–124.

Wilson, W. (1887). "The Study of Administration". In: *Political Science Quarterly* 2.2, pp. 197–222.

Wimmer, M. A., C. Codagnone, and M. Janssen (2008). "Future e-government research: 13 research themes identified in the eGovRTD2020 project". In: *Proceedings of the 41st Hawaii International Conference on System Sciences (HICSS-41)*. Waikoloa: IEEE.

Wood, L. C. and T. Reiners (2012). "Gamification in logistics and supply chain education: Extending active learning". In: *Proceedings of the International Association for the Develop-*

ment of the Information Society (IADIS) International Conference on Internet Technologies and Society (ITS 2012). Perth, pp. 101–108.

World Bank (2016). *World Development Report: Digital Dividends*. Tech. rep. Washington, D.C.: World Bank.

World Economic Forum (2016). *The Global Competitiveness Report 2016-2017*. Tech. rep. Geneva: World Economic Forum.

Yadav, M. S. (2010). "The Decline of Conceptual Articles and Implications for Knowledge Development". In: *Journal of Marketing* 74.1, pp. 1–19.

Yang, D., A. N. Zhang, and W. Yan (2017). "Performing literature review using text mining, Part I: Retrieving technology infrastructure using Google Scholar and APIs". In: *Proceedings of the International Conference on Big Data*. IEEE.

Yang, T.-M. and T. A. Maxwell (2011). "Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors". In: *Government Information Quarterly* 28.2, pp. 164–175.

Yildiz, M. (2007). "E-government research: Reviewing the literature, limitations, and ways forward". In: *Government Information Quarterly* 24.3, pp. 646–665.

Ylinen, M. and S. Pekkola (2018). "Looking for a five-legged sheep". In: *Proceedings of the 19th Annual International Conference on Digital Government Research Governance in the Data Age (dg.o 2018)*. Delft: ACM Press.

Yu, D. X. and B. Parmanto (2011). "United States state government websites demonstrate better in terms of accessibility compared to federal government and commercial websites". In: *Government Information Quarterly* 28.4, pp. 484–490.

Yuryeva, O. V., G. N. Butov, I. G. Malganova, and O. V. Pratchenko (2015). "Professionalism of Civil Servants as the Factor of Public Administration Efficiency Growth". In: *Mediterranean Journal of Social Sciences* 6.1, pp. 481–485.

Zhonggen, Y. (2019). "A Meta-Analysis of Use of Serious Games in Education over a Decade". In: *International Journal of Computer Games Technology* 2019, pp. 1–8.

Zimmerling, E. (2017). "Anwendung der E-Kompetenzstudie im IT-Bereich einer kommunalen Behörde". In: *Proceedings of the 20th Conference Gemeinschaften in Neuen Medien (GeNeMe 2017)*. Dresden, pp. 57–66.

Appendix

A.1 Questionnaire

Survey Questions

1. About your organisation

- City
- What kind of organisation do you work for?
- How many residents live in the area of responsibility of your organisation?
- How many employees work in your organisation?
- What is your position within the organisation?
- How many e-government projects have already been implemented in your organisation?

2. Profile of a professional typically hired by your organisation

- How often does your organisation hire new employees internationally? [5-point Likert scale: never to always]
- How often does your organisation hire graduates from international universities? [5-point Likert scale: never to always]
- Is/Are there (a) university(ies), which your organisation hires graduates preferably/particularly often from? [Yes/No]
- If yes, pleas indicate [free text]
- Is your organisation interested in hiring employees holding a rather general degree (e.g. in Laws or in Business Administration) or a specialised degree (e.g. in e-government)? [5-point Likert scale: always general to – always specialised]
- If your organisation is interested in hiring employees holding specialised degrees, what kind of specialisation does your organisation prefer? [free text]

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Survey Questions

3. Demanded (e-government-related) competences

- *Practical Experience* (e.g. completed internship) [5-point Likert scale: unimportant to very important]
- An internship in what area is valued by your organisation (e.g. ministries, public administrations etc.)?
- *Language proficiency* [5-point Likert scale: unimportant to very important]:
  - Local language proficiency
  - English language proficiency
  - Proficiency in further foreign languages
- Proficiency in what further foreign language(s) is valued by your organisation? [free text]
- Experience in working in international and intercultural teams [5-point Likert scale: unimportant to very important]

- *Technical competences* [5-point Likert scale: unimportant to very important]:
  - Information Technology
  - Expertise in Information Systems design
  - Information Systems competences
- To what extent do you agree or disagree with the following statements for each of the above-mentioned competences [5-point Likert scale: strongly disagree to strongly agree]:
  - At the moment, there are enough professionals in the organisation/on the job market who offer one or more of the above-mentioned competences
  - Employees in the organisation have been/are planned to be sent for an additional training to obtain one or more of the above-mentioned competences

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Survey Questions

- *Socio-technical* competences [5-point Likert scale: unimportant to very important]:
  - Expertise in e-government impact
  - Expertise in technology and e-government adoption
  - Expertise in politics of e-government
- To what extent do you agree or disagree with the following statements for each of the above-mentioned competences [5-point Likert scale: strongly disagree to strongly agree]:
  - At the moment, there are enough professionals in the organisation/on the job market who offer one or more of the above-mentioned competences
  - Employees in the organisation have been/are planned to be sent for an additional training to obtain one or more of the above-mentioned competences

- *Organisational* competences [5-point Likert scale: unimportant to very important]:
  - Expertise in e-government structures
  - Expertise in organisational design
  - Process management competences
- To what extent do you agree or disagree with the following statements for each of the above-mentioned competences [5-point Likert scale: strongly disagree to strongly agree]:
  - At the moment, there are enough professionals in the organisation/on the job market who offer one or more of the above-mentioned competences
  - Employees in the organisation have been/are planned to be sent for an additional training to obtain one or more of the above-mentioned competences

- *Managerial competences* [5-point Likert scale: unimportant to very important]:
  - Business/Public management competences
  - Project management competences
  - Financial management competences
  - Performance management competences
  - Change management competences
- To what extent do you agree or disagree with the following statements for each of the above-mentioned competences [5-point Likert scale: strongly disagree to strongly agree]:
  - At the moment, there are enough professionals in the organisation/on the job market who offer one or more of the above-mentioned competences
  - Employees in the organisation have been/are planned to be sent for an additional training to obtain one or more of the above-mentioned competences

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Survey Questions

- *Political-administrative* competences [5-point Likert scale: unimportant to very important]:
  - E-Policy competences
  - Expertise in legal framework
  - Expertise in administrative workflows
  - Expertise in public policies
- To what extent do you agree or disagree with the following statements for each of the above-mentioned competences [5-point Likert scale: strongly disagree to strongly agree]:
  - At the moment, there are enough professionals in the organisation/on the job market who offer one or more of the above-mentioned competences
  - Employees in the organisation have been/are planned to be sent for an additional training to obtain one or more of the above-mentioned competences
- Are there any other competences required by your organisation for successful implementation of e-government-related projects/activities? [Yes/No]
- If yes, please indicate, what other competences are required and for each of them please specify, whether there enough professionals within the organisation/ on the job market who offer it. [free text]

A.2 Public & Private Sector Interview Guideline

Variable	Description/Example
Interview Number	
Duration	
Municipality name	
Information about interviewee	Role and tasks within the organisation
Impact of digitalisation on organisation	
Changed competence requirements	
Required new competences	Which new competences are needed?
Availability of new competences	Do the employees have the needed competences?
Missing competences	Which competences are missing?

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Variable	Description/Example
Actions taken	What does your organisation do if competences are missing?
Existence of trainings	Do you offer trainings in case of missing competences?
Existence of a (regular) training offer	Is there a regular training offer for the training of digital competences?
Current training offer	What kinds of trainings are currently offered?
Type of participating employees	What types of employees participate in trainings?
Target group-specific training offer	Are there specific training offers for different target groups?
Process for selecting participants	How are participants selected?
Employee training motivation	What is the motivation for employees to participate in a training?
Mandatory trainings	Are trainings mandatory?
Possibility to suggest trainings	Can employees suggest trainings?
Training organisation	Who is responsible for the organisation of trainings (HR, departments)?
Training duration	What is the approximate duration of trainings?
Training provision	Who provides training (external training providers, internal departments)?
Existence of ad-hoc trainings	Is there the possibility of offering trainings on short notice if needed?
Alternatives for institutional training	Are there any training alternatives?
Change after having pursued trainings	Do you perceive changes after employees have participated in a training?
Assessment of training effectiveness	Do you measure the training effectiveness?
Knowledge test	Is there any form of test for newly gained knowledge?
Satisfaction after training completion	Do you perceive a higher satisfaction after employees participated in a training?

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Variable	Description/Example
Problems with trainings	Do you perceive any problems in the planning and organisation of trainings?
Obstacles with regard to trainings	Are there any obstacles with regard to trainings?
Satisfaction with training offer	Are you and your employees satisfied with the current training offer?
Interest in training offer	How much interest in trainings is there on the employees' side?
Sufficiency of current training offer	Is the current training offer sufficient with regard to the exigencies induced by digitalisation?
Missing training topics	Are there topics that are currently not covered?
Reasons for missing training topics	
Training budget	