



The (next) savior has arrived? New technologies in the public sector and related citizens' expectations

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Abstract

Advancements in technology prompt debates on their transformative potential in public service delivery. We explore citizens' perceptions through analyzing their empirical and normative expectations towards the implementation of new technology (such as AI, big data, and robotization). Findings from Germany (n=1,577) and Austria (n=413) reveal modest expectations both related to public and private sector services, tempered by contextual factors such as digitalization levels in both countries. Expectations have been analyzed related to different public values, suggesting that the highest hopes related to the impact of new technologies are related to gains in efficiency and affordability of services. Despite aspirational hopes for improved public service delivery, citizens remain skeptical about governments' capacity to fulfill them. We advocate for a citizen-centered approach, emphasizing societal dialogue and participatory decision-making to ensure technological interventions align with citizens' needs and values. Ultimately, realizing meaningful transformation in public services requires bridging the gap between citizens' expectations and pragmatic assessments.

Key words

Digitalization, artificial intelligence, machine learning, citizen expectation, public values

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Extra information

Original datasets can be found here: <https://osf.io/vqtgc/>

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Introduction

Recent technological developments, which we coin as *new technology* here, such as artificial intelligence, big data, machine learning, and advanced robotization, have led to an increased debate on how they could *revolutionize* the delivery of public services [1–3]. What these technologies have in common is the belief that they are able to make use of the massive amount of data that governments process every day. Based on these data, public organizations hope to adjust their service provision to contingencies that were previously ignored due to their complexity and the lack of processing capacities [4]. Accordingly, services and their management are expected to be automated to an increasing extent [2]. Thus, public organizations hope to improve their efficiency as processing routines can be automated without human work [5]. Furthermore, proponents of these technologies hope to improve the effectiveness of their services. For example, algorithms are supposed to decide – or at least inform employees about – when (e.g. smart traffic lights, time-based predictive policing), where (e.g., management of crises and disasters, place-based predictive policing), and to whom (e.g. risk assessments in unemployment services, predicting recidivism of criminal offenders) to deliver services [6–9]. Moreover, data-driven automated decision-making is discussed as an antidote to biased practices in which caseworkers form their decisions based on stereotypes and prejudices, hence improving equity [10].

As Kowalkiewicz and Dootson [11] and Dwivedi *et al.* [12] describe, there is great potential for the use of these new technologies in the public sector. Citizen satisfaction could, for example, be increased due to better service delivery because a better fit can be provided by relying on decision support systems or a service can be delivered faster based on automated processes [13, 14]. However, although the emphasis is put on a need for user satisfaction and user orientation to achieve acceptance, actual impact is yet hard to observe [15, 16].

In contrast, scholars and civic organizations have raised continuous alarm that these new technologies might be a threat to equity [17]. As algorithms are often trained by existing data, deeply embedded discriminatory patterns in the data (e.g., based on social status, race, country of origin or gender) will be adopted by those algorithms [18–20]. This is especially expected in unsupervised machine learning applications, in which programmers and practitioners lack the opportunity to adjust for these patterns [21].

Decision-making support systems based on algorithms might help to de-bias and limit human error in decision making, but they might also introduce new biases [10, 17, 19]. Moreover they might also suffer from missing transparency and accountability [22], and therefore they could negatively impact governmental legitimacy [23]. The implementation of such new technologies might also add additional strain, especially for professionals and citizens without at least some digital competencies or basic infrastructure [24].

Be it positively or negatively, both proponents and opponents attribute the highest potential of changing organizational practices and standards to these new technologies, ultimately creating a strong impact. Blockchain, for example, is suggested to enforce governmental impartiality, enhance transparency and citizens' trust [25]. Virtual reality is envisioned to increase participation [26]. Robots are suggested to change service delivery dramatically, enhancing enjoyment and usability [27, 28]. However, especially long-term impact of these technologies can hardly be assessed in the current stage of implementation [29]. Even more so, we lack the perspective of the services' target group: the citizens. Therefore, we are posing the following three questions here: How do citizens perceive these new technologies? Do they expect them to *revolutionize* public services as well? Furthermore, do they see essential differences in the



potential for private versus public services? We provide evidence from two studies that raise concerns about these often-promised possibilities of new technologies.

Unlike other studies that focus more on technical aspects of technology implementation, this article provides differentiated insights by directly capturing citizens' voices and experiences. This offers practitioners a nuanced understanding of the social dimensions surrounding technological innovation in public services. Understanding citizens' expectations allows practitioners to make informed decisions about the adoption and implementation of new technologies and to align them better with the needs and values of the community. By gauging citizens' expectations, public managers can optimize resource allocation and prioritize areas where technological interventions are most likely to yield tangible benefits. This ensures that limited resources are utilized effectively to meet citizens' needs and preferences. At the same time, recognizing and addressing citizens' concerns and wishes foster greater acceptance and engagement with technological initiatives and ultimately might even increase satisfaction with and trust into government in general.

Citizens' true expectations: some empirical grounding

When asking about citizens expectations, it quickly becomes clear that it is hard to define what this term entails and to claim what true expectations are. An expectation can, for example, be an overarching judgement about the value of a technology but there might also be more detailed reasoning that constitute an overall opinion in the end. We argue here that the assessment of different expected effects is required to be able to weigh them against each other, to examine whether negative and positive expectations counterbalance each other. Second, expectations can either (i) rely on experience and past observations and depict what citizens find realistic to achieve or (ii) can describe wishes that are not yet restricted by thoughts about feasibility [30]. We argue here that it is therefore needed to assess both – empirical expectations and normative wishes [31] – and that a difference between both is rather telling in terms of what citizens think their government is able to achieve. This is especially relevant as consumers of public services are often unwilling, mandated, or coerced into interactions with the state – quite in contrast with most private services [32]. Thus, citizens' expectations are essential as there is otherwise a lack of market mechanisms that would make those expectations detectable.

In a first study, we collected data via an online survey (n=1,577, November 2020) by using a representative sample (in regard to age, gender and region) of German citizens. We asked respondents about their expectations on how they think that new technologies will affect public and private services. Specifically, we refer to new technologies as technical innovations that are still in their development cycle (sometimes also called emerging technologies) and considered to be radically novel instead of just a new application of an existing technology [33]. Examples with a potential application field in the public sector are artificial intelligence and machine learning, big data applications, robotics, distributed ledger technology, or augmented and virtual reality.

Respondents were asked to rate expectations according to different outcomes using a multi-dimensional scale (the question was: “To what extent do you expect that these new technologies will affect the services provided by public organizations/for-profit companies?”). These dimensions build on public values related to the implementation of technology (e.g., quality, efficiency, data protection but also more general service outcomes, such as general well-being and citizen satisfaction, the full scale is depicted in each of the following figures at the left). This enables us to get a more detailed empirical assessment of citizens' expectation while



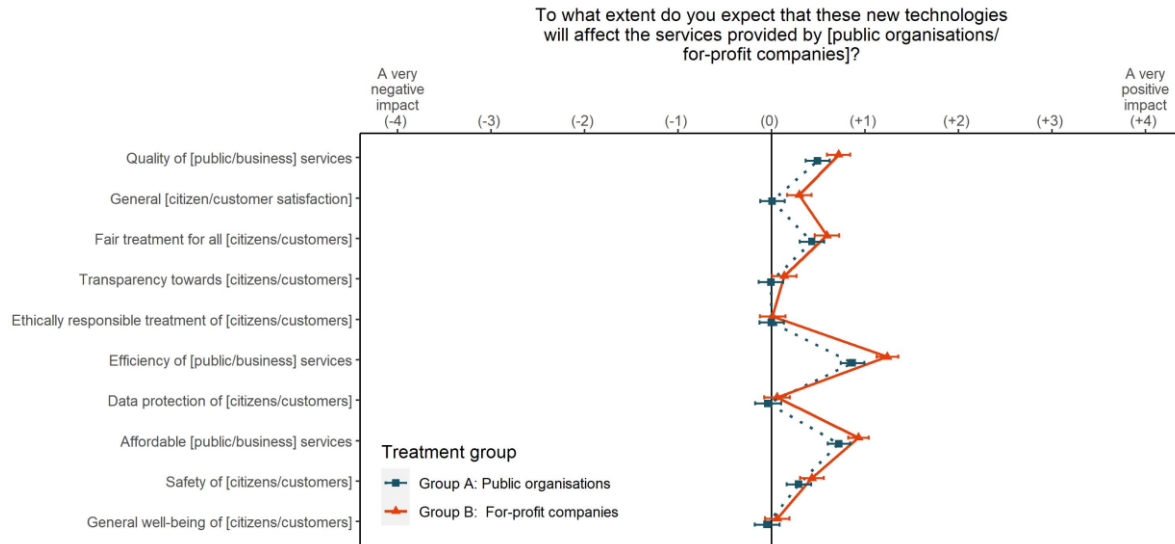
allowing for comparisons between public and private services. At the same time, distinguishing different outcomes related to the implementation of new technology adds another level of detail to the literature that focuses rather on general satisfaction or trust so far [13, 34]. Respondents were asked to rate these dimensions of outcomes on a scale from -4 (very negative impact) to +4 (very positive impact), with the middle value (0) representing no expected change or impact.

Asking about public and private services is based on the assumption that individuals might expect governmental services to mostly foster certain (public) values, such as impartiality or equity, in contrast to services offered by private sector firms [35]. In the data collection, we compare public organizations with for-profit companies. Public organizations cover governmental services, including core administration (e.g., ministries, agencies, municipality administration, law enforcement) as well as state-owned enterprises and organizations that provide public goods such as in the educational or health sector. For-profit companies cover organizations from the private sector, characterized by their need to earn profit. Additionally, we conducted a second study, in which we pursued a comparative approach by collecting additional data in Austria (n=413, October 2021, nationally representative sample in terms of age, gender, region) which is one of the highest performers with regards to digitalized public services in the European Commission [36]. We descriptively compare citizens' assessment of their expectations by presenting mean scores and their standard deviations in the following figures. A strong overlap of the visualized intervals between categories and within categories indicates a lack of statistical difference.

Figure 1 gives an overview of citizens' expectations regarding the impact of new technologies. Overall, two findings are especially striking here. Firstly, there is very little difference between expectations about private and public services. This indicates that the often-used rhetoric that the private sector is more advanced and makes better use of new technologies seems to be less accurate than often assumed – at least in the perception of citizens. The only noteworthy difference arises regarding the expectation that private companies achieve higher efficiency gains than public organizations. Other than that, differences are not significantly different from each other. This is mirroring other discussions about the not too pronounced differences between public and private sector organizations and many of these arguments about differences being ideological ones [37]. Secondly, considering the entire scale of responses (ranging from -4 to +4) expectations are rather low. For most outcomes, citizens expect no improvements at all (or even a decline), e.g., regarding general satisfaction, well-being, or data protection. Only small gains are expected regarding efficiency, quality, and affordability of services.

Although a lot of issues around built-in biases in big data applications and related decision-support systems are debated [17], surprisingly, respondents expect small improvements of fair treatment when new technologies are utilized. This finding is in line with the findings by Gesk and Leyer [13] concerning general acceptance of AI in public service delivery, as well as Miller and Keiser [38] concerning black citizens' rating of automated policing decisions as fairer.

Figure 1: Empirical expectations concerning the implementation of new technology, split-sample according to expectations for the public or the private sector in Germany (n=1,577) and Austria (n=413).



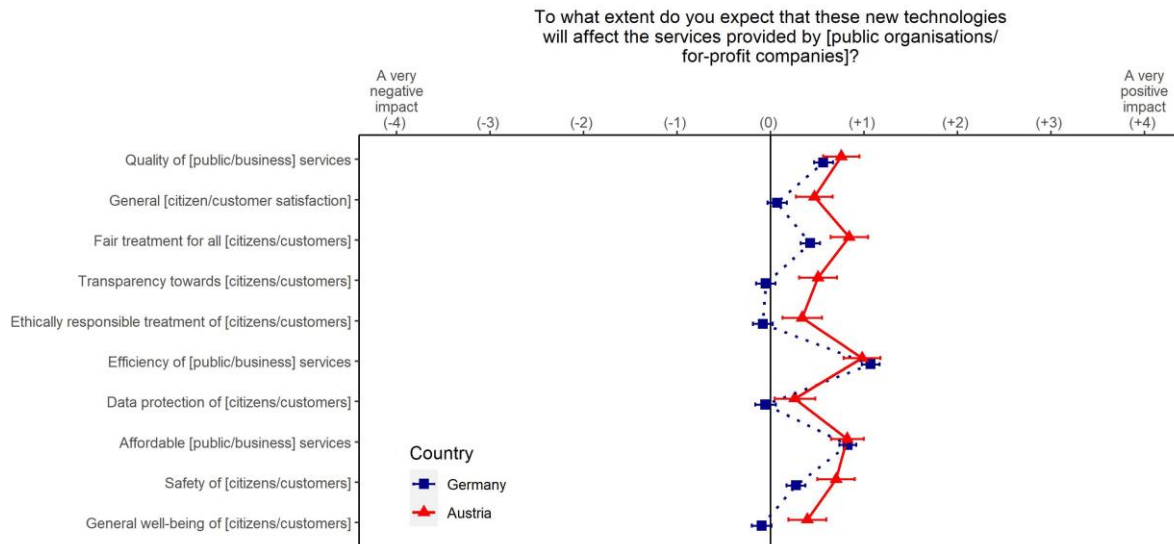
Note: The figure shows the average score on each item (rectangle and triangle) including the 95% confidence intervals around this average score (horizontal lines).

Does (national) context matter?

However, these responses could be affected by the current state and experiences of digitalization in Germany, especially regarding public services. While private services (and their degree of adaptation of new technologies) are mostly comparable between different countries, public services differ substantially in their digital maturity. According to the Digital Economy and Society Index, Germany is among the countries with lower levels of digitalized public services [36]. Accordingly, citizens expectations may be affected by this low level of digitalization as they either have limited experience with such services or they see higher potential for improvements should these technologies be adopted [39]. Especially the commonly voiced connection between experiencing private services and translated expectations towards public services may be a driver [40].

Figure 2 shows that, indeed, Austrian citizens have higher expectations related to the implementation of new technology in almost all dimensions of our multi-dimensional measure of empirical expectations. Citizens expect changes regarding efficiency and similar instrumental values to be the most pronounced ones. However, the overall pattern differs only slightly from the German distribution. In fact, even the Austrian sample has relatively low expectations about the magnitude of change.

Figure 2: Empirical expectations concerning the implementation of new technology in the public sector in Germany (n=1,577) and Austria (n=413).



Note: The figure shows the average score on each item (rectangle and triangle) including the 95% confidence intervals around this average score (horizontal lines).

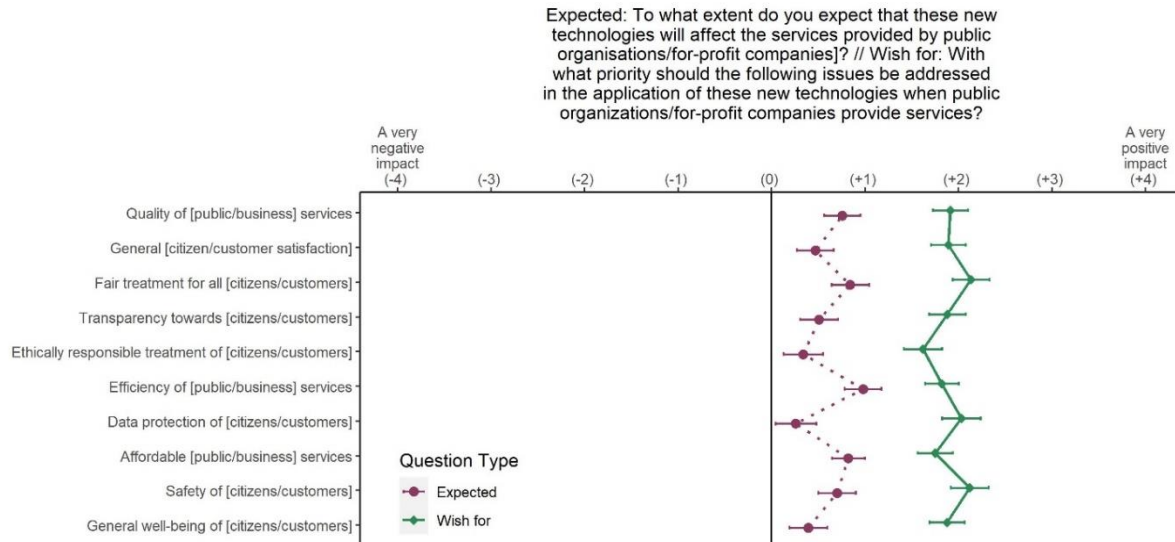
Wishes and realistic expectations

Lastly, we differentiate between empirical and normative expectations regarding the impact of new technologies to assess the difference between expectations based on experiences with public services and (normative) wishes [30, 31, 41]. In addition to the question what citizens expect from new technologies, we asked the Austrian sample how much these technologies should affect different criteria of services. Hence, we are able to show differences between empirically informed expectations and normatively desired expectations (Figure 3).

Normative expectations are substantially higher than empirical expectations in all analyzed outcomes. We observe the most pronounced difference regarding data security, whereas expectations concerning efficiency are closer to each other. This allows us to account for experienced frustration about the often-discussed inability of public organizations to adapt to new challenges, in particular when it comes to data protection [42, 43].



Figure 3: Empirical and normative expectations concerning the implementation of new technology in the public as well as the private sector in Austria (n=413).



Note: The figure shows the average score on each item (rectangle and triangle) including the 95% confidence intervals around this average score (horizontal lines).

This gap between wishes regarding the impact of new technology and expectations based on experience, implies that there is indeed a space that could be filled by a user-centered implementation of such new technologies. However, citizens seem to be skeptical whether their government could fulfill these high hopes and implement technologies in a way to exploit its promises to satisfy citizens' wishes. The sizable gaps might be explained by citizens' skepticism towards public organizations' main goals of implementing these technologies. Indeed, citizens seem to hope that such main goals are focusing more on seemingly *softer* topics like data protection, equity, and ethics rather than mere efficiency gains. However, as Kirklies *et al.* [44] argue, this could also be explained by the fact public organizations have traditionally neglected aspects of design which might affect citizens' empirical expectations.

However, lower levels of empirical expectations in comparison to normative expectations could also be explained by a lack of knowledge about what the government is able to achieve, and which technologies already deliver which impact, rather than just by a pessimistic mindset towards government and/or technology. Both could be cured by better information about the state of digital change and related impacts and participation, by listening to what citizens find important when implementing new technologies, which outcomes they would like to see, and what their priorities are when it comes to certain values. Finally, the survey did not focus on a specific service which might increase the abstractness for the respondents. At the very least, we do not know which services respondents had in mind when they answered the questions.

Citizens are neither skeptical nor optimistic about technology

Overall, these results raise doubts about whether these new technologies are able to satisfy the (normative) expectations of their main target group: the citizens. Rather than sharing the enthusiasm of their proponents, citizens' (empirical) expectations remain rather reasonable. Simultaneously, they remain more optimistic than pessimistic about technologies' potential and



threats. However, their wishes differ fundamentally from what they think is actually to be expected. Hence, they are skeptical about their government's capability to implement new technology in a way they would desire. Although they do not run high on promises of new technologies, they also do not worry too much about issues such as safety or data security, which is an often-used argument against change in the public sector. However, since the data used in this study was collected during the Covid-19 pandemic, these expectations might have already changed, since more citizens might have gotten used to the impact of technological solutions in their everyday life. The progress of digitalization we saw happening due to the pandemic [45–47] might have increased their expectations concerning what public organizations are able to deliver.

Keeping in mind that the implementation of artificial intelligence systems, big data tools, and others are notoriously expensive (financially as well as logistically), our results raise questions about whether such resources should better be used to focus on instruments that are better able to fulfill citizens' needs, for example, the core building blocks of organization: improved structures and processes. This is especially important in times of resource scarcity – be it financial resources and personnel. Governments around the world have to implement budget cuts and are facing an increasing staffing crisis – especially regarding developers and other IT personnel. This all limits their capacity to take multiple avenues in (technological) innovation. When analyzing citizens' needs and wishes in more detail, governments can focus on improvements to public service that promise a real potential.

The debate about new technologies seems to mirror early debates about E-Government when scholars emphasized the importance of re-designing and advancing underlying processes rather than simply adding a new tool to the pool [48]. With even more complex tools based on machine learning procedures, for example, this may become a topic that is even easier to ignore. Therefore, we argue that both researchers and practitioners should re-emphasize the importance of focusing on existing problems and issues raised by the citizens than solutions without matching problems. While we are certain that there are cases in which new technologies will help solving such problems, recent debates and pilot projects seem to focus overly on vague promises of solutions. Agreeing with Sousa *et al.* [2], we suggest that an intense societal debate and more citizen participation is needed to decide for or against the implementation of certain technologies and the actual design of these technologies and related processes.

Conclusion

Altogether, our results highlight that new technologies are not likely to revolutionize public services on their own –at least not in the perception of citizens. Rather, a holistic and transformational [49], as well as a citizen-centered approach (as has been preached in the early phases of digitalization) will be required to live up to citizens' expectations.

This article underscores the importance for practitioners in the public sector to adopt a citizen-centric approach to technology adoption and implementation, prioritizing citizen engagement and participation to ensure alignment with citizens' needs and values. Contextual factors such as the level of digitalization in public services must be considered, alongside principles of transparency and accountability, to mitigate equity concerns and uphold ethical standards. Accordingly, practitioners should not fall for false promises of new technological solutions being advertised as panacea. At least from the citizens' perspective, there are considerable doubts about new technologies solving all the problems we encounter on a daily basis.



Improving public services is likely to remain a comprehensive and holistic challenge that single innovations will not be able to solve.

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