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ORIGINAL ARTICLE



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Talk or type? The effect of digital interfaces on citizens' satisfaction with standardized public services

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Abstract

Although digital interfaces are increasingly pervading public administration, little is known about how replacing face-to-face interaction with digital interfaces affects citizens' satisfaction with public service encounters. This study presents evidence from a vignette experiment conducted on a sample of German citizens ($N = 1.234$) whereby we randomly varied the type of public service request with regard to its psychological costs, service quality, and the type of interaction (face-to-face, self-service terminal, or app). We found that replacing face-to-face communication with a digital interface has no effect on citizens' satisfaction, nor does it mitigate the effect of psychological costs, service failure, and recovery. Corroborating previous research on service recovery, we found that explaining and apologizing partially compensates for failure. Based on these results, we conclude that using digital interfaces does not undermine the goal to enhance citizen satisfaction with public services.

1 | INTRODUCTION

Along with the rise of e-government, digital public services, also referred to as e-services, begin to alter state–citizen interaction (e.g., Pleger et al. 2020). Public e-services can be understood as digital interactions between a provider of public services and citizens as an end user (Jansen & Ølnes 2016, p. 648). In these e-services, civil servants are

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partially or fully replaced by digital interfaces like self-service terminals (SSTs) or apps installed on a personal mobile device. Although the profound changes that digital interfaces bring to service encounters have been discussed in the context of the private sector (e.g., Meuter et al. 2000), there is mostly conceptual work on the potential consequences of digital interfaces for public service encounters (e.g., Lindgren et al. 2019; Lindgren & Jansson 2013). The lack of empirical research is surprising since digital interfaces are expected to become the default in public service encounters in the near future, particularly with standardized public services.

Although e-services are attractive to policymakers as a means to reduce personal costs, public organizations are lagging behind in taking advantage of digital interfaces compared to the private service sector. Rather than thinking about e-services from an end-user perspective, most of the attention has been paid to the technological and design aspects of public e-services (e.g., Verdegem & Verleye 2009). Ignorance of user satisfaction, however, can result in low acceptance and adoption rates of e-services (e.g., Pleger et al. 2020). This study takes an end-user-centric approach to study how replacing face-to-face interaction with digital interfaces – SST or apps – changes citizen satisfaction in public service encounters.

The state–citizen interaction is known to be of particular importance for how citizens perceive the state and how expectations toward the state are formed (e.g., Lipsky 1980). Issuing official documents at a local public office is among citizens' most common experiences with state representatives. Citizens hold normative expectations (e.g., honesty, impartiality, rule adherence) based on personal experience with the way state officials in such service encounters treated them. These expectations affect citizens' acceptance of the state and its administration (Ariely 2013) as well as the willingness to coproduce (Parrado et al. 2013). Lindgren et al. (2019, p. 428) argued that digitalization has already altered the underlying conditions for public service encounters. They call for a systematic empirical analysis of how e-services affect the interaction between citizens and public authorities, because implementing digital interfaces to make public services more convenient could also undermine the goal to enhance citizen satisfaction with public services (Arendsen et al. 2014).

Given the pace of technological innovation in the domain of e-services, it is critical to understand how citizens react toward digital interfaces. This study represents a first step in this direction. Advocates of e-services highlight their potential to offer greater convenience to citizens (e.g., reduced use time, reduced travel time, easier access). In public discourse, the digitization of public administration is combined with the promise to make public services more accessible and easier to use (OECD 2020). The European Commission (2016a, p. 2), for example, proposes e-service as a means to reduce administrative burden on citizens by making the interaction with the state more effective and convenient for citizens. Whether these non-monetary benefits of e-services are reflected in citizens' satisfaction has, however, not been studied yet. We bring this promise of greater satisfaction through e-services to an empirical test by asking: What is the effect of digital interfaces on citizens' satisfaction in standardized public service encounters?

In a second step, we ask whether the explanations of satisfaction in interpersonal public service encounters also apply as explanations for satisfaction in digital public service encounters. There is a rich public administration literature examining the determinants of citizens' satisfaction with public services in interpersonal settings. Among the various determinants that have been proposed to explain citizens' satisfaction with public services (e.g., see Van den Bekerom et al. 2021), the type of service and the service quality are most influential. We investigate whether the set of factors that lead to satisfaction in public service encounters matter with digital interfaces, too (e.g., Meuter et al. 2000, p. 51). Digital interfaces could be expected to lower the psychological entry barriers, in particular, when the type of public service comes with psychological costs due to potential stigmatization (Herd & Moynihan 2019). On the other hand, service failure in digital interaction could severely decrease satisfaction when the promise of e-service comfort was not fulfilled. Although there is no coherent theoretical framework to derive answers to these questions, it is crucial to know whether our theories of citizen satisfaction with public services adapt to the digital era of governance.

To answer these questions, we conduct a vignette experiment with visual cues on a sample of German citizens ($N = 1234$). The vignette randomly varies the type of interface (SST, app, or face-to-face with a street-level bureaucrat), the type of service (issuing a passport, a certificate of good conduct, or social housing benefits), and the service quality (no service failure, service failure with and without an explanation). Citizens' self-reported satisfaction with

the public service situation serves as the dependent variable. The vignette design allows us to mimic a relatable public service encounter and to benefit from the internal validity of an experiment, as well as the representativeness of a large-scale survey (James et al. 2017). The limitations of the design will be discussed in the conclusions.

This study aims to advance the literature on the digitalization of the public administration in three ways. First, it contributes to the research agenda on public e-services suggested by Lindgren et al. (2019) and others (Jansen & Ølnes 2016). Second, it contributes to the research on the determinants of citizens' satisfaction with public services by testing whether the explanatory power of established theories, namely public service recovery (e.g., Thomassen et al. 2017) and administrative burden (e.g., Herd & Moynihan 2019) is affected by the use of digital interfaces. Third, it discusses the possibilities and limits of experimental designs to study digital innovations in public service encounters.

2 | THEORETICAL FRAMEWORK

2.1 | Digital public service encounters

How electronic information and communication technology (ICT) can be integrated into the management architecture and service procedures of public organizations is a major topic in the e-government literature (Dawes 2008; Thomas & Streib 2003). According to Shareef et al. (2011, p. 17) e-government is broadly defined as the study of government systems using ICT to serve citizens. With respect to the digitalization of public services, e-government studies tend to focus on design- and technology-based aspects (e.g., Grimsley & Meehan 2007; Nielsen & Persson 2017). This study, however, is interested in the consequences of digital interface for state–citizen interaction (Lindgren et al. 2019, p. 427).

In an effort to connect the emergence of ICT with theoretical paradigms that guide administrative reform paths, Margetts and Dunleavy (2013) distinguished two waves of digital era governance (DEG). The new public management (NPM) paradigm of the 1990s was replaced by the first wave of DEG around 2002. This first wave focused on reducing the duplicate organizational hierarchies created by NPM, redesigning public services from a client perspective, and digitalizing interactions with citizens and businesses. The advent of the social web drives the second wave of DEG since 2010. The rapid growth of social media and e-commerce has put pressure on governments to rethink how public authorities interact with citizens (Margetts & Dunleavy 2013, p. 6). Since digital interactions have become a default for service encounters in the private sector, public organizations have begun to modernize their dealings with citizens by offering digital services.

The digitalization of standardized public service encounters can be understood as an outstanding feature of the second wave of DEG. A public service encounter is defined as the interaction between citizens and officials as they communicate to conduct business (Goodsell 1981, p. 4). According to Buckley (2003, p. 455), the term e-service accounts for the electronic provision of a service to customers. For the purpose of this study, we used the more specific definition suggested by Jansen and Ølnes (2016, p. 648), according to which e-services are digital interactions between a service provider and service receiver, which add some value to the receiver.¹ E-services have been distinguished by their purpose, which can be (1) information provision, (2) secure interaction, (3) secure contraction, (4) support functions, or (5) a complete transaction process (Jansen & Ølnes 2016, p. 652). This study will examine the use of digital interfaces at the starting point of a complete transaction process, which consists of a formalized sequence of interactions according to legal rules and ends with a binding decision for the citizen (Table 1).

2.2 | Satisfaction in digital public service encounters

Citizens' satisfaction with e-services is supposed to be key to their success. Satisfaction describes the subjective evaluation of the e-service encounter by the client. The importance of citizens' support toward e-service and their

TABLE 1 Dimensions and theoretical concepts of public service encounters

Dimension	Theoretical concepts	Attributes and levels
Public service interface	Interpersonal versus digital interface	Face-to-face, self-service terminal (SST), app
Type of public service	Administrative burden (psychological costs and stigma)	Passport, housing benefit, certificate of good conduct
Quality of public service	Service failure and non-monetary recovery strategies	No failure, failure without explanation, failure with explanation

satisfaction with e-services has also been highlighted in other theoretical frameworks of public sector digitalization (e.g., Kohlborn 2014). For the digitalization of standardized public services, SSTs (also referred to as interactive kiosks) and apps are the most common user interfaces. SSTs are interfaces that enable customers to produce a service independent of direct service employee involvement (Meuter et al. 2000, p. 50). An SST is a physical computer terminal with a screen (touchscreen or keyboard) and other integrated facilities (e.g., for scanning documents). It is usually connected to the local network of the public authorities where it is located. With an SST, citizens still need to make their way to the government agency at regular office hours, but there is no need for in-person appointments with government officials. An app offers even more personal flexibility. It uses the touchscreen of the mobile device (smartphone or tablet), requires an internet connection, and can be used from any location at any time.

Although we can easily infer that policymakers appreciate e-services with digital interfaces as a means to reduce personal costs, it is more puzzling to explain why citizens may be more satisfied with a digital interface than with face-to-face communication. A core argument why citizens are expected to be more satisfied with e-services delivered via SST or an app is convenience (Meuter et al. 2000). Digital interfaces help to avoid in-person appointments, save time, and give citizens the impression of being more in control of the service process (e.g., Bateson 2000). This presumption is mostly derived from private sector evidence, where speed, efficiency, and convenience have been found to be the three most important factors for customer satisfaction with self-service technologies (e.g., Collier & Kimes 2013). Policymakers also emphasize the alleged non-monetary benefits that e-services are supposed to offer to citizens. According to the European Commission (2016b, p. 44), e-services have the potential to reduce administrative burden for citizens, as they are supposed to increase the inclusiveness of services through easier access and higher availability. These additional, non-monetary benefits of e-services are expected to make citizens more satisfied in digital public service encounters. Our first proposition puts this alleged promise of greater citizen satisfaction with e-services to an empirical test:

P1. *Satisfaction in public service encounters is higher with digital interfaces than in face-to-face encounters.*

2.3 | Type and quality of digital public service encounters

In interpersonal settings, the type of service (Moynihan et al. 2014) and the service quality (Thomassen et al. 2017) are two prominent drivers of citizens' satisfaction with standardized public services. Depending on the type of public service, the application process may impose an administrative burden on citizens. According to Herd and Moynihan (2019, p. 2), this burden involves different types of costs the state imposes on citizens. These costs can be (1) learning costs when citizens need to, for instance, search for information on how to apply for service, (2) compliance costs when citizens stick to the administrative rules and processes, or (3) psychological costs that account for feelings of stress, loss of control, or stigma when citizens apply for a service. Among public services, social services are most likely to impose psychological costs on the applicant (Moynihan et al. 2014), as social services are often associated with stigma. Stigma is a social construct that is attributed by other individuals and felt by the targeted

individual. Stigmatization can have severe negative consequences as individuals eligible for a social benefit program might avoid applying for it to avoid being associated with this program (Pinker & Pinker 2017). This mechanism contributes to the non-take-up of social benefits, which ultimately harms eligible citizens (Friedrichsen et al. 2018; Vinck et al. 2019). Concerning service satisfaction, it is presumed that psychological costs decrease citizens' satisfaction in public service encounters. Based on this theoretical reasoning, we propose:

P2. *Applying for potentially stigmatizing public services harms citizens' satisfaction.*

Service quality, understood as the absence of service failure, is a key factor for citizens' satisfaction with public services (e.g., Van den Bekerom et al. 2021). Service failure is defined as a situation in which customers experience an economic (e.g., money, time) and/or a social loss (e.g., status, esteem) due to a mishap or a problem when experiencing a service regardless of responsibility (Thomassen et al. 2017, p. 896). In public administration, it refers to a situation in which a public service act fails, or citizens perceive it as failed (Van de Walle 2016, 832). Public service failures can have severe negative consequences for citizens, for instance, when monetary benefits are delayed or not granted at all (Mattila 2001). In order to mitigate the negative effect of service failure on satisfaction, service providers may engage in service recovery strategies (Smith & Bolton 2002). Service recovery involves any actions that organizations take in responding to service failure to make up for the perceived loss in hopes of regaining customers' satisfaction (e.g., Hocutt et al. 2006; Mattila 2001). While monetary compensation is a common recovery instrument in the private and semiprivate sector (e.g., Wirtz & Mattila 2004), monetary compensation for service failure is barely used in core public administration domains. Instead, in the context of public service failure, citizens may expect nonmonetary service recovery attempts, such as explanations (Thomassen et al. 2017) and excuses (Roschk & Kaiser 2013), to mitigate the perceived injustice. Existing studies regarding service failure and recovery from private sector management research indicate that recovery attempts positively affect customer satisfaction (e.g., Bradley & Sparks 2012). Thomassen et al. (2017) were the first to employ a survey experiment comparing the effect of monetary compensations in public and private sector service settings among students and citizens. They found similar levels of positive compensation effects in the private as well as the public sectors, which indicates that the principles of restorative justice are similar in both sectors. Drawing on the service recovery argument we expect:

P3. *(a) Service failure has a negative effect on citizens' satisfaction. (b) Explaining and apologizing for service failure increases satisfaction compared to service failure without explanation and apology.*

Although there has been extensive research on how the type of service and service quality affect citizens' satisfaction with public services, there is no research on whether the interface type affects these relationships. From the perspective of the administrative burden and service recovery literature, it is undoubtedly important to understand whether their capacity to explain citizens' satisfaction in public service encounters vanishes with the emergence of digital interfaces. Despite this question's relevance, there is no conclusive theoretical framework for studying the interdependencies between the type of interaction, the type of service, and service quality. Elaborating on the relationship between P1 and P2, one might expect a digital interface to mitigate the negative effect of potentially stigmatizing public services on citizens' satisfaction. Digital service encounters via SST and app do not require interpersonal contact, which could lower the psychological costs for the initial service encounter. According to this argument, the negative effect of stigma on satisfaction with social services would be reduced with a digital interface. Concerning P1 and P3, what happens if digital interfaces fail to provide the alleged additional convenience. Drawing on the expectation-discrepancy theory, Van Ryzin (2013) showed, for example, that disconfirming high service expectations can lead to a sharp decrease in satisfaction. Such a backlash might also occur when digital interfaces do not meet citizens' service expectations. Especially for the development of e-services, it is crucial to know how end-users react to potential technical errors.

3 | RESEARCH DESIGN

3.1 | Experimental design

This study conducts a vignette experiment. In the vignette, participants are asked to imagine being a citizen who applies for an official document (*Type of service*), namely issuing a passport, a certificate of good conduct, or a certificate for social housing. The issuing process is initiated by using either digital or face-to-face interaction (*Type of interaction*). On the announced pick-up date, the citizen goes to the public office and is informed by a public official that the document is either ready to be picked up or that the issuing process has been delayed and the document needs one more day to be issued. In the latter case (delay as service failure), the citizen receives either an explanation and apology or no further information on why the announced pick-up date was not met.

For the type of service, we have chosen public services which most people should be familiar with, or at least have a profound understanding of the nature of these service encounters.² The three services (passport, certificate of good conduct, certificate for social housing) are chosen to reflect different degrees of stigmatization. The passport is an official identification document that imposes no stigmatization. A certificate of good conduct is needed in job application situations and is not genuinely prone to be stigmatizing. To be issued a certificate for social housing, the applicant needs to be in economic need. This type of public service is presumed to impose psychological burden due to its stigmatization.

The categories of service quality vary with regard to the success of the service act, that is, the attempt to recover service failure. When the requested document is ready to be picked up at the announced date, the service is provided successfully. In the other two situations, the documents are not available at the announced pick-up date, which presents a case of service failure that causes an unnecessary visit of the public authority. Service recovery is represented by a public official who offers explanations and apology for the delay in the issuing process.

The categories of the type of interaction (app, self-service terminal, face-to-face) are emphasized in the vignette by showing one of three images representing the respective service interface.³ Including images has been shown to help clarify and emphasize the context of survey questions (Couper et al. 2004). With respect to Jansen and Ølnes (2016, p. 652), it is important to clarify that the part of the public service that is automated is the first encounter of the issuing process. The decision of whether the document is granted is taken by a public official. The design of the vignette experiment is summarized in Table 2.

The vignette reveals a $3 \times 3 \times 3$ design that leads to 27 permutations. Each participant receives three randomly generated vignettes. Before the vignette, participants received a survey asking for sociodemographic characteristics (age, gender) and their expectations toward procedural and outcome satisfaction in public services in general. After reading the vignette, participants are tasked with evaluating their satisfaction with a given service situation in terms of being satisfied with the procedure and the outcome. Satisfaction was measured with the phrase: How satisfied would you be with this service situation...with the procedure?...with the outcome? Levels range from -4 not satisfied at all to 4 very satisfied.

3.2 | Sample

The vignette study was conducted on a representative sample of 1234 German adult citizens. Access to the field was provided by the internationally operating and ISO26362 certified online access panel provider *respondi*. The sample is largely representative regarding gender, age, income, and region of residence according to recent sociodemographic data, based on the German micro census (see online Appendix Tables 1 and 2). Individuals aged 18–29 years (–6.3 percentage points) and 30–39 years (–3.0 percentage points) are slightly underrepresented in this study. Online surveys usually witness an overrepresentation of younger individuals, which is not the case here as we find individuals older than 40 years participating more frequently in this study. This slight deviation from the quotas

TABLE 2 Experimental vignettes and satisfaction measure

Text	Please imagine the following situation: You want to request A. You are using B1. B2 provides you with a pick-up date for the document. On the pick-up date, you are going to the public service center. A civil servant C
A	(1) A passport (2) A certificate of good conduct (3) Social housing benefits
B1	(1) Your municipality's public service-app via the internet (2) Your municipality's self-service terminal (SST) in the public service center (3) The responsible civil servant in the public service center
B2	(1) The app (2) The SST (3) The civil servant
C	(1) Hands you the A. (2) Informs you that the A can be picked-up the next day. (3) Informs you that unfortunately the A can be picked-up the next day due to an internal error of the system. The civil servant apologizes for any inconveniences caused by the delay.
Question	How satisfied would you be... (1) With the process? [−4 not satisfied at all – 4 very satisfied] (2) With the outcome? [−4 not satisfied at all – 4 very satisfied]

might be related to the topic of this survey, which addresses citizen satisfaction with public services. Otherwise, the sample matches the census data in terms of gender and region of residence on acceptable rates. After the data collection was finished, we tested whether the 27 vignettes in our data set were truly random and uniformly distributed across respondents and the three repetitions. The Chi-squared test on uniform distribution (online Appendix Table 3) and the balancing test using multiple regression (online Appendix Table 4) confirmed that both are the case. On average, respondents took 10 min to complete the survey.

3.3 | Estimation approach

The dependent variable measures citizens' satisfaction with the service encounter described in the vignette. Since the two items measuring satisfaction with the outcome and with the procedure are highly correlated (Pearson's pairwise correlation 0.76***), we use the mean of the summed two variables for the statistical analysis. As part of the robustness analysis, we also used the two dependent variables separately and find similar results (online Appendix Figure 1).⁴ The independent variables of main interest are the three sets of dummy variables accounting for the three parameters we manipulate in the vignette, namely, the type of interaction (face-to-face, SST, or app); the type of service (passport, clearance certificate, or social housing); and the service quality (no failure, failure, or failure with explanation).

To identify the effect of these three parameters on citizens' satisfaction with the service encounter, we specify a generalized least squares (GLS) random-effects model with robust standard errors. The results of the Hausman test ($\text{Chi}^2(8) = 8.35$, $\text{prob} > \text{chi}^2 = 0.40$) support the use of a random instead of a fixed-effects model specification. Since each subject receives three vignettes, we also include a set of dummy variables to account for period effects (online Appendix Figure 2). After fitting this model, we apply Šidák's method to adjust for making multiple comparisons. The predicted value and marginal effect plots presented in the following section use Šidák adjusted p values.⁵ As part of the robustness analysis, we re-run the analysis using Bonferroni's method, specify the statistical model without

period dummies, and estimate an ordinary least squares model instead of GLS. All of these changes had no substantive effect on the results (online Appendix Figure 3).

Although the experimental design makes the use of control variables obsolete, we still want to know whether the treatment effects, particularly the effect of the type of interaction, vary systematically between relevant groups. We provide an analysis of heterogeneous treatment effects based on three variables: respondents' expected public service satisfaction, gender, and age. First, gender and age are taken into account as they could signify what has been referred to as the digital divide (e.g., Ebbers et al. 2016). Although gender- and age-differences in the usage of digital services tend to decline (e.g., Hansen et al. 2018, p. 70), sociodemographic characteristic might still affect satisfaction with digital interfaces. Second, we take into account subjects' expectations toward the quality of public service provision. Previous research shows that citizens' opinions on public services affect their evaluation of public service encounters (Van de Walle & Van Ryzin 2011, p. 1438). These pre-existing service quality expectations could also influence citizens' evaluation of the vignettes. Before respondents answered the three vignettes, they received the following question: "Please think for a moment about your previous experience with local public administration. Based on this experience, how satisfied are you in general with the quality of municipal services? Overall, how satisfied have you been with the process and the result?" Again, since both items (process and result) are highly correlated (Pearson's pairwise correlation 0.82***), we have added the two variables and used their mean for expected satisfaction. For the analysis of heterogeneous effects, age was transformed into three age groups, and subjects' expectations were transformed into three quantiles. The youngest age group was set to 18–35 years, indicating that even the oldest subjects in this group were not older than 15 years at the advent of the first wave of DEG. Appendix Table A1 provides the definition of all variables used in the analysis.

4 | EMPIRICAL RESULTS

4.1 | Descriptive baseline results

The baseline descriptive results are summarized in Figure 1. The y-axis of the graphs reports satisfaction with the service situation. The service quality treatments are presented on the x-axis for each type of service. The three different panels refer to the three service interfaces. The types of services are presented in the bars of each panel and

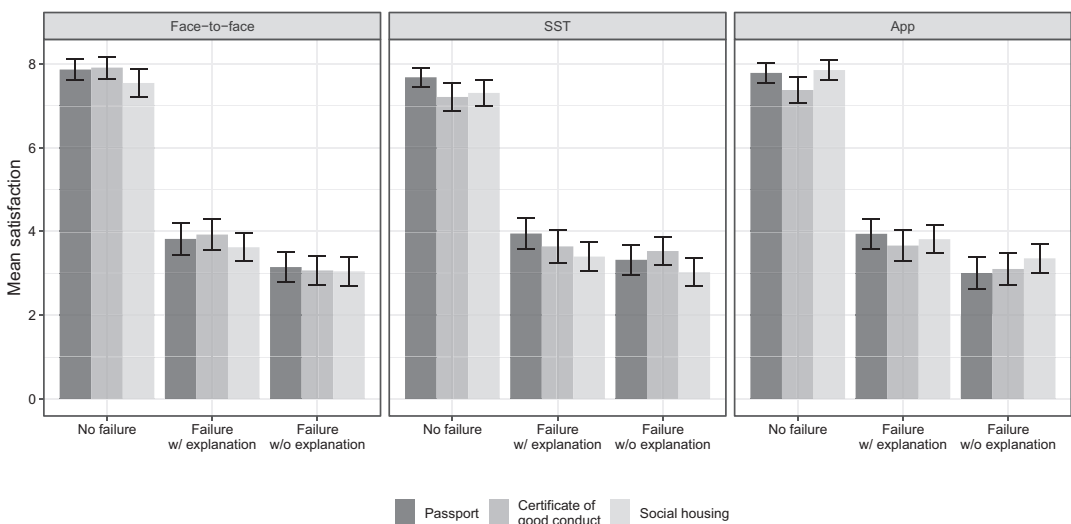


FIGURE 1 Descriptive baseline results. $N = 3702$ (1234 respondents \times 3 vignettes)

each quality condition. Figure 1 shows that contrary to our assumptions, satisfaction levels do not differ significantly whether a service is encountered using a digital interface (P1), and whether a potentially stigmatized public service is requested (P2). However, what can be seen from Figure 1 is that satisfaction is highest in the no failure condition (mean = 7.62, SD = 1.66) and is significantly lower in both failure conditions (P3a). Satisfaction is slightly increased when an explanation is given (mean = 3.18/3.75, SD = 2.10/2.14). These findings are in line with prior research on the effect of service failure on customer satisfaction.

4.2 | Estimating baseline effect

Figure 2 reports the predicted value of service satisfaction (left panel) and the average marginal effect (right panel) for the three treatment variables (online Appendix Table 5, Model 1). We see that the type of service (issuing a new passport, a clearance certificate or social housing allowance) and the type of interface (face-to-face, SST, and app) have no direct effect on citizens' satisfaction in public service encounters. In line with the descriptive findings, service quality exerts a substantive effect on citizens' satisfaction. Service failure causes a sharp decline in satisfaction and receiving an explanation and apology for the occurred failure raises satisfaction levels slightly, but on statistically significant levels.

Next, we take a closer look whether the type of interaction changes the effect of the type and the quality of the service. Figure 3 presents these effects on citizens' satisfaction conditioned by the type of interface. Again, we report the predicted value of service satisfaction (left panel) and the average marginal effects (right panel). We estimate these effects by fitting the GLS random-effects model on three separate samples for the three types of interface (see Online Appendix Table 5, Models 2a–2c). When issuing a new passport or a clearance certificate, the type of interface does not affect citizens' satisfaction with the service encounter. However, for issuing social housing benefits, there is a small but statistically robust effect of the type of interface. Contrary to our initial expectation, satisfaction is slightly lower with a digital interface. Thus, with a potentially stigmatizing public service such as social housing benefits, it looks like citizens tend to be slightly more satisfied with face-to-face communication. Although this result remains tentative, it points toward an interesting direction, namely the relationship between standardized communication in digital interface and street-level bureaucrats. Citizens might anticipate that digital interfaces could restrict street-level bureaucrats' ability to apply administrative discretion for the benefits of their client (e.g., Thunman et al. 2020). This could explain why some citizens prefer a human touch and face-to-face interaction in the case of potentially stigmatizing public services.

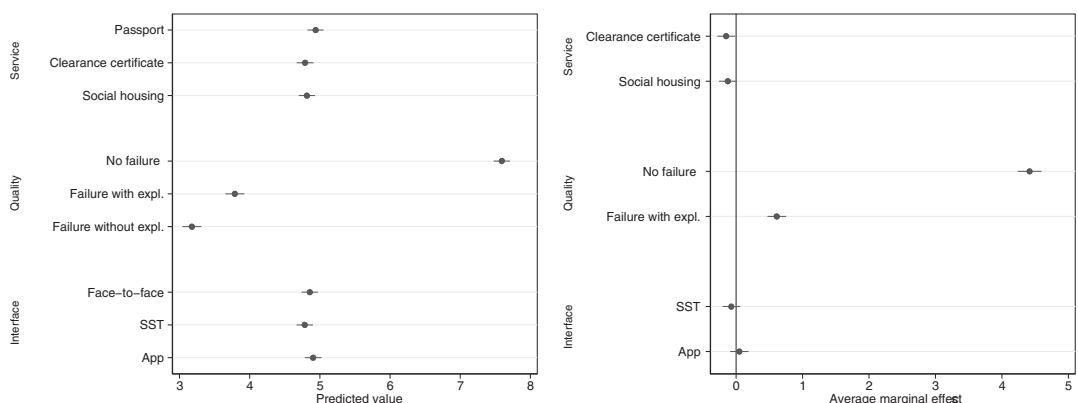


FIGURE 2 Baseline treatment effects. GLS random effects with robust standard errors, Šidák-adjusted p values for multiple comparison, 95% confidence intervals. $N = 3702$ (see online Appendix Table 5 Model 1). GLS, generalized least squares

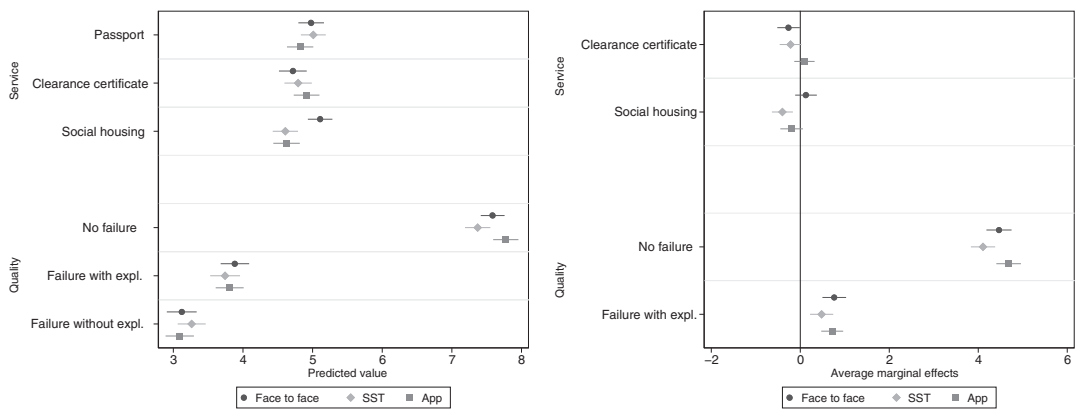


FIGURE 3 Conditional treatment effects. GLS random effects with robust standard errors, Šidák-adjusted p values for multiple comparison, 95% confidence intervals. $N(\text{face-to-face}) = 1243$, $N(\text{SST}) = 1226$, and $N(\text{App}) = 1233$ (see online Appendix Table 5 Model 2a, 2b, and 2c). GLS, generalized least squares

Concerning the question of whether the effects of service failure and recovery are mediated by the type of interface, we see some weak evidence that with successful service provision, subjects tend to be more satisfied with an app compared to the SST. However, there are no significant differences between face-to-face and digital interfaces with successful service delivery. This finding may point into the direction that the alleged nonmonetized benefits that e-service offer tend to apply to apps rather than SST. The additional benefit of SST for initiating a public service may not be apparent to citizens because they still need to get to the public office.

4.3 | Heterogeneous effects: Service expectation and demography

Next, we test whether the effect of the three treatment variables in the vignette differ by subjects' sociodemographic characteristics and their service expectation. Therefore, the statistical model presented in Figure 2 has been re-run on subsamples for relevant groups. The results from these subgroup analyses are summarized in Figure 4 (see online Appendix Table 5, Models 3a–c, 4a–b, and 5a–c). In line with previous studies, citizens' expected service quality has a substantive effect on their satisfaction in the vignette scenarios. Respondents' who expected a low-quality service also report lower levels of satisfaction with the scenarios, and those who expect a high quality reported higher levels of satisfaction. However, respondents' expected satisfaction does not alter the substantive results for the treatment effects. With two notable exceptions, the treatment effects are robust for gender and age groups. First, women tend to be slightly more sensitive toward service failure, as they are minimally more satisfied with successful service delivery than men are, and less satisfied when it comes to service failure without an explanation. Second, with respect to age, we see that younger respondents are more satisfied using the app than respondents in the medium and high age groups. This form of age-related heterogeneity, however, only applied to the app. We do not observe the opposite pattern for face-to-face interaction for elder respondents. This suggests that the result stems from the young preferring to conduct business on mobile devices, but not from the elderlies' objection toward such interfaces.

5 | DISCUSSION AND CONCLUSIONS

Advocates of the implementation of e-service in public administration tend to highlight the nonmonetized benefits such services offer to citizens (European Commission 2016b, p. 44). Although digital technologies are increasingly

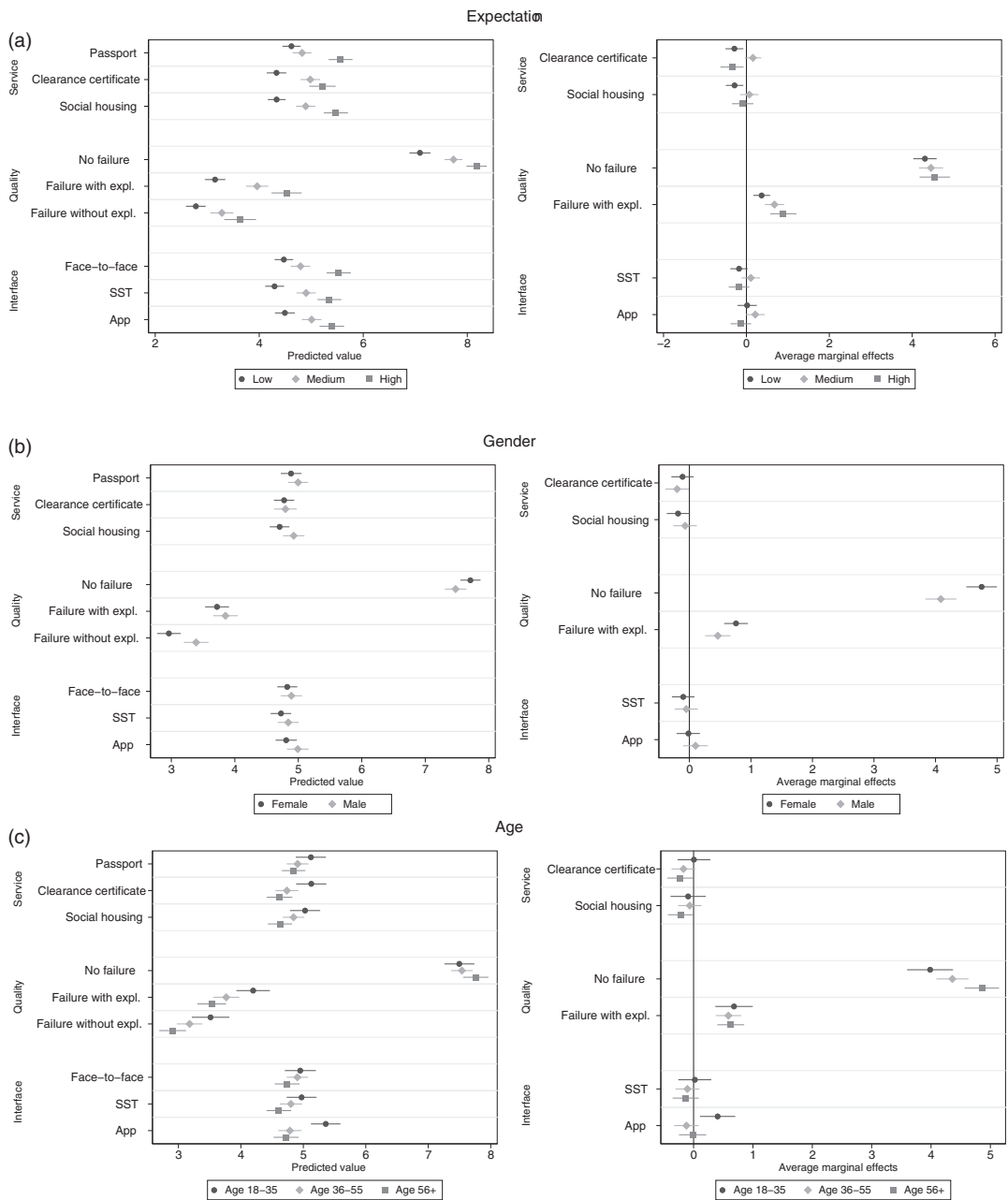


FIGURE 4 Heterogeneous treatment effects. GLS random effects with robust standard errors, Šidák-adjusted p values for multiple comparison, 95% confidence intervals. Expectation $N(\text{low}) = 1434$, $N(\text{medium}) = 1341$, $N(\text{high}) = 927$, gender $N(\text{female}) = 1857$, $N(\text{male}) = 1845$, age $N(18-35) = 876$, $N(36-55) = 1638$, and $N(56+) = 1188$ (see online Appendix Table 5 Model 3a, 3b 3c, 4a, 4b, 5a, 5b, and 5c). GLS, generalized least squares

pervading public service encounters, little is known about how replacing face-to-face interactions with civil servants with digital interfaces affects citizens' satisfaction (Lindgren et al. 2019, p. 427). This study is one of the first to address this question empirically by conducting a vignette online survey experiment among 1234 German citizens. The empirical results can be summarized along our two research questions: Do digital interfaces affect citizens'

satisfaction in public services encounters, and are the explanations of satisfaction in interpersonal service encounters contingent on the type of interface?

First, contrary to P1, digital interfaces (SST and app) have no direct effect on citizens' satisfaction in standardized public service encounters. However, there are signs that a digital interface selectively alters the effect of the type of service and the effect of service quality on citizens' satisfaction. In successful service encounters, citizens are slightly more satisfied with an app than with an SST, while being indifferent between face-to-face interaction and a digital interface. The additional nonmonetized benefits offered by an SST seem to be too small compared to an app, which can be used everywhere with any mobile device. Against our initial expectation, we find that citizens report less satisfaction when applying for social housing benefits using a digital interface, particularly an SST. Speculating on what causes this effect, some citizens may anticipate that digital interfaces could restrict their ability and officials' willingness to carry out administrative discretion in the citizen's interest. Testing for heterogeneous effects for the type of interaction, there is very limited evidence of a digital divide by age and gender. Although gender does not alter the effect of a digital interface on citizens' satisfaction, we find that young respondents are slightly more satisfied with an app compared to SST, if the service is provided successfully. Corroborating previous research, citizens' expected service quality also matters for the overall level of satisfaction in public service encounters. However, the service expectation does not alter any of the three treatment effects.

Second, on the direct effect of the type of service and service quality, we find mixed results. Contrary to P2, potentially stigmatizing services do not reduce citizen satisfaction (Herd & Moynihan 2019). In line with P3a and P3b, there is clear and robust evidence on the negative effect of service failure and the positive effect of recovery on citizens' satisfaction in public service encounters. Hence, explaining and apologizing for failure makes a difference. It increases citizens' satisfaction by one unit on the 9-step scale measuring public service satisfaction. This is a moderate effect size. However, explaining and apologizing for public service failure involves barely any additional costs nor administrative effort compared to other recovery strategies (e.g., monetary compensations), and yet it exerts a robust and positive effect on citizens' satisfaction. In this respect, our results strongly encourage an empathic and transparent error culture in public service encounters.

Before moving toward the policy implications derived from these results, we need to address the theoretical and methodological limitations of this study. In theoretical terms, this study focuses solely on the effect of replacing face-to-face interaction with a digital interface. Jansen and Ølne (2016, p. 650) pointed out that in order to understand the effect of digitalization on state–citizen interactions, it is important to take into account which parts of the service provision is automated. This study focused on the digitalization of the initial information gathering process when citizens apply for some official document, while the decision-making authority remains with a human bureaucrat. Given the pace of innovation in computer science, we can easily envision public e-services with higher degrees of automation and autonomy. At some point, a fully automated e-service could be possible, where the decision to issue an official document is delegated to an algorithmic decision-making (ADM) system. Just recently, scholars in public administration have begun to think more systematically about how bureaucrats and citizens interact with such systems in a way that is consistent with normative and ethical demands on a digitized public administration (Pencheva et al. 2020; Yeung & Lodge 2019). Insights from behavioral research, for instance, suggest that individuals tend to behave less honestly in fully digitalized environments when compared to human interaction (e.g., Cohn et al. 2018). Others, however, consider ADM systems as a way to detect discrimination and to minimize human error in administrative decisions. Miller and Keiser (2021) found tentative evidence that citizens who experienced unfair bureaucratic treatment are more likely to prefer an allegedly bias-free ADM system to a human public official. All these questions need to be addressed theoretically and empirically in future research. This study wanted to take a step in this direction by identifying the effect of replacing face-to-face communication with a digital interface.

In methodological terms, some aspects of the research design need to be discussed. First, while vignette designs' strength lies in their ability to infer causal relationships, a potential weakness may be seen in the fact that respondents are asked to evaluate a hypothetical situation. Since citizens' satisfaction with e-services cannot easily be inferred from their behavior, particularly in the case of issuing of official documents which has no opt-out, instead

asking for self-reported satisfaction in hypothetical service encounters is a common approach (e.g., Van den Bekerom et al. 2021). However, as in any experimental design, a fundamental question refers to the amount of experimental and mundane realism implemented in the vignettes. Although both contribute to the external validity of the experimental results, experimental realism refers to the extent to which participants experience the experimental situation as intended, and mundane realism to the extent to which the experimental situation mimics a real-world setting (Aronson et al. 1998). A less mundane, that is, more hypothetical, experimental scenario reduces the impact of prior beliefs and expectations that participants associated with the given scenario (see, e.g., McDonald 2020). The strength of the vignette design is its capacity to create hypothetical yet relatable customer scenarios. To find the appropriate balance between mundane and experimental realism, we chose standardized public services most citizens are familiar with or can be expected to have a reasonable understanding of. However, the situation is held abstract enough to minimize association with prior subjective experiences. The same holds for the selection of digital interfaces. Both, app and SST, are digital interfaces that subjects can be expected to be familiar with from private sector service encounters. Therefore, we assume that respondents share a common perception of how these interfaces would be used for standardized public e-services. In addition to the carefully designed public service scenarios, we have provided respondents with visual cues of the type of interaction to create a shared image of these interfaces (Couper et al. 2004).

Second, the vignette experiment has been conducted on an online access panel, which means that participants are using digital devices while taking the survey. Because measuring the effect of using digital interfaces is the objective of the experiment, this circumstance might reduce how well the type of interaction treatment is perceived. We tried to mitigate this issue again by using the visual cues to intensify the priming on the communication medium. What is more, online access panels are sometimes criticized for attracting younger participants and for not being representative of the population. We addressed this potential problem by using quotas for key sociodemographic characteristics (age, gender, income, and place of residence). In fact, we observe a slight overrepresentation of older participants, which might be due to the topic of the survey.

Third, our findings are limited to the use of a sample of German citizens. On several occasions, Germany has experienced how dictatorial regimes have misused public administration for the extensive monitoring and control of their citizens. Against this background, it is often assumed that German citizens have a critical attitude toward digital state–citizen interaction. Although this study shows that there is no fundamental rejection of digitization, at least concerning the standardized services examined here, future research might take a cross-cultural perspective to test whether these findings are generalizable for different administrative traditions and technology cultures.

Fourth, vignette designs enable researchers to let citizens evaluate hypothetical and yet realistic technology interactions in public service encounters. The design required that subjects have some common perception of the technology at stake. Although this can be expected for SST and apps, the situation is different with regard to future technologies like ADM systems. For this line of future research, it could be beneficial to take advantage of designs that are more commonly used in human–computer interaction (HCI) studies. Research designs such as Wizard of Oz experiments (Kelley 2018; Palmeiro et al. 2018) and customer journey studies (Lemon & Verhoef 2016) can be fruitful approaches to analyzing citizen satisfaction with novel e-service technologies in public offices.

Despite the theoretical and methodological limitations mentioned earlier, three policy implications can be drawn from this study. First, German citizens seem to have no fundamental objections toward digital interfaces in public service encounters for standardized services. Popular arguments that see citizens' reservations toward digital interfaces as the main reason why public administration's digitization is progressing slowly find little support. In this respect, we conclude that the attempt to enhance public service encounters by using digital interfaces does not undermine citizen satisfaction with public services. Second, a successful strategy to implement e-service should be sensitive toward citizens' needs. This concerns the question of which services are offered digitally (e.g., keep the human touch with potentially stigmatizing services), which interface technology is used (SSTs offer little advantage of comfort compared to app) and how these services should be advertised (younger cohorts do not need to be convinced to choose an e-service). Third, the simplest and most important message from this study, is that e-services

need to work. Service failure continues to have the greatest impact on citizens' satisfaction with public services. Thus, implementing error-prone beta versions of e-services that cause service failures could jeopardize citizens' willingness to engage with e-services for standardized services, as we have seen in the experiment.

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CONFLICT OF INTEREST

The authors declare to have no conflict of interest.

DATA AVAILABILITY STATEMENT

Replication material and dataset are publicly available at: Christine Prokop; Markus Tepe, 2021, "Replication Data for: Talk or Type? The Effect of Digital Interfaces on Citizens' Satisfaction with Standardized Public Services", doi.org/10.7910/DVN/1NQPEZ, Harvard Dataverse, DRAFT VERSION, UNF:6:uzlUWduov2Au7opEJi5ZQ== [fileUNF].

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ENDNOTES

- ¹ The term is used interchangeably with digital service and online service.
- ² See Online Appendix Part B for full instructions of the vignette.
- ³ See Online Appendix Part B for images used in the vignette.
- ⁴ As we would expect, the positive effect of successful service is stronger for subjects' outcome satisfaction, than with their procedural satisfaction. Apart from this qualitative difference; the substantive results remain the same.
- ⁵ We thank the anonymous reviewer for pointing out the need to adjust for multiple comparisons.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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APPENDIX

TABLE A1 Definition of variables

Item	
<i>Dependent variables</i>	
Satisfaction	Please imagine the following situation. [vignette text and visual cue] How satisfied would you be ... with the process?...with the outcome? [1 not satisfied at all – 9 very satisfied]
<i>Treatment variables</i>	
Type of service	The requested document [1 Passport, 2 Certificate of good conduct, 3 Certificate for social housing]
Type of interaction	The interface used for the public service request [1 app (your municipality's public service app via the Internet), 2 SST (self-service terminal at the public service center), 3 face-to-face (a public servant at the public service center)], see below for the additional visual cues for each condition
Service quality	Quality of public service delivery [1 no failure (receive the document); 2 failure with explanation (document delayed by 1 day due to an error in the system); 3 failure without explanation (document delayed by 1 day)]
<i>Group variables</i>	
Expectation	Please think for a moment about your previous experience with local public administration. Based on this experience, how satisfied are you in general with the quality of municipal services? On the whole, how satisfied have you been with... the process?...the result? [1 not satisfied at all – 9 very satisfied] Categorized into three quantiles: low, medium, high
Female	1, female; 0, male
Age	In years, categorized in three groups: 18–35, 36–55, and 56+ years