INDERSCIENCE PUBLISHERS
Linking academia, business and industry through research

International Journal of Electronic Governance

ISSN online: 1742-7517 - ISSN print: 1742-7509
https://www.inderscience.com/ijeg

Beyond utility: unpacking the enjoyment gap in e-government service use

Dapeng Liu, Meijun Wu, Hongyan Sun, Michael Ho

DOI: 10.1504/IJEG.2024.10065715

Article History:

Received:	12 March 2024
Last revised:	21 March 2024
Accepted:	06 July 2024
Published online:	29 October 2024

Beyond utility: unpacking the enjoyment gap in e-government service use

Dapeng Liu*

Department of Information Systems and Business Analytics,
Baylor University,
Waco, TX 76706, USA
Email: dapeng_liu@baylor.edu
*Corresponding author

Meijun Wu

Department of Accounting,
Shandong Management University,
Jinan, Shandong 250357, China
Email: meganwu.acc@gmail.com

Hongyan Sun

School of Accounting,
Hebei University of Economics and Business,
Shijiazhuang, Hebei 050067, China
Email: hongyan_sun@hueb.edu.cn

Michael Ho

Department of Information Systems and Business Analytics,
Baylor University,
Waco, TX 76706, USA
Email: Michael_Ho1@baylor.edu

Abstract: E-government serves as a vital channel for citizen interactions with the public sector, where user enjoyment is of paramount importance. To date, few studies have comprehensively examined the determinants of citizen enjoyment in e-government. To address this research gap, we administered a survey and gathered data from 363 Australian residents using myGov for tax filing. Our analysis revealed a pronounced discrepancy between reported enjoyment and the intention to continue using the services. Although users demonstrated a strong intent to use e-government services, this intent did not uniformly align with enjoyment. Additionally, informed by self-determination theory, we developed and tested an e-government service enjoyment model to study the impacts of effort expectancy, technophilia, technology humanness, and engagement in fostering user enjoyment. Unexpectedly, the results showed that information privacy concerns, commonly seen as a deterrent in e-government adoption, did not significantly affect enjoyment. Our findings advance the discourse on e-government service improvement.

Keywords: enjoyment; digital government; self-determination theory; technology humanness; e-government.

Reference to this paper should be made as follows: Liu, D., Wu, M., Sun, H. and Ho, M. (2024) 'Beyond utility: unpacking the enjoyment gap in e-government service use', *Int. J. Electronic Governance*, Vol. 16, No. 3, pp.334–353.

Biographical notes: Dapeng Liu is an Assistant Professor in the Department of Information Systems and Business Analytics at Baylor University. He has published in leading journals including the *Journal of the Association for Information Systems, European Journal of Information Systems, Decision Support Systems, Computers and Security,* and *International Journal of Information Management*. His research interests include business intelligence, AI ethics, and information security and privacy. He has served as the e-government mini-track Chair for the Americas Conference on Information Systems and the Hawaii International Conference on System Sciences.

Meijun Wu is a Lecturer at Shandong Management University. Her research interests include accounting information system adoption, AI ethics, and AI in auditing.

Hongyan Sun is an Assistant Professor in the School of Accounting at Hebei University of Economics and Business. She received her PhD from the Nankai University. Her research interests include corporate governance, technological innovations in accounting, and institutional investment.

Michael Ho is a Research Assistant and a Business Fellow at Baylor University. His academic pursuits are rooted in the intersection of big data management and digital innovation diffusion. His research focuses on leveraging big data to drive innovation and efficiency in business processes, aiming to transform industries through data-driven decision-making.

1 Introduction

As public sectors worldwide increasingly leverage e-government to optimise services, advancements in technology have significantly influenced these initiatives. The public sector harnesses a diverse array of information technologies, including the internet, mobile platforms, and AI, to create substantial benefits for stakeholders and to respond effectively to evolving circumstances (Carter et al., 2022). In particular, technological innovations empower e-government to deliver quality government services to citizens, enhance civic engagement, and provide efficient public administration, thereby increasing citizens' enjoyment of using e-government (Li and Shang, 2023).

The sustained success of e-government initiatives is contingent upon the positive experiences of the citizen users. E-government literature posits that citizens' enjoyment in using e-government is important because e-government services can occasionally be excessively serious by nature (tax filing, driver's license renewal, etc.) (Sharma et al., 2021). Accordingly, e-government initiatives have increasingly endeavoured to improve

user enjoyment of digital services (Kagoya and Mbamba, 2021). Despite the importance of users' enjoyment, researchers have devoted limited efforts toward comprehensively investigating the determinants of such psychological outcome of using e-government. Hence, this study tackles the following two research questions:

Q1. Does a disparity exist between using e-government services and enjoying them?

Q2. What are the key factors that impact users' enjoyment of e-government services?

To answer the research questions, we administered a survey to assess citizens' perceptions concerning enjoyment derived from using e-government services. We compared the means of e-government enjoyment and continued use intention to investigate the extent of difference between these two outcome variables. Then, we drew upon self-determination theory and developed a research model to investigate the impact of effort expectancy, technophilia, technology humanness, engagement, user interface quality, and information privacy concerns on citizens' enjoyment of using e-government services. The results identified factors that increase citizen enjoyment and provide recommendations for the government to improve citizens' positive experience in using e-government services. Our findings also provide guidance for design strategies to sustain e-government success.

2 Theoretical background and hypotheses

2.1 Technology enjoyment

Recent advancements in information and communication technology have been integral to the development of enjoyable and affordable information system artefacts, such as digital platforms and applications. Enjoyment, indicating an individual's positive perception of an entity (e.g., technology), typically arises from a pleasant experience (Kautish and Khare, 2022). Enjoyment is one of the four primary emotions that elicit individual responses, the others being fear, anger, and sadness (Taverner et al., 2021). The psychology literature has extensively documented the importance of enjoyment in sustaining positive interaction outcomes. For instance, An et al. (2021) emphasise the critical role that enjoyment plays in learning, framing it as a powerful facilitator of educational engagement. In IS research, perceived enjoyment is often employed as a metric to assess users' pleasure derived from using digital innovations (Holdack et al., 2020). Perceived enjoyment reflects the extent to which individuals find the experience of using technology to be pleasant. It is one of the most salient intrinsic motivators in the discourse of user interaction with digital services (Oliveira et al., 2022; Pereira and Tam, 2021).

Perceived enjoyment extends beyond the task-oriented utility of technology to encompass emotional and affective aspects of human-computer interaction (Kim et al., 2021). It is linked to a technology's ability to engage users with pleasant emotions, through the appeal of visual design, the friendliness of interaction, or the sense of fulfilment derived from its use (Gómez-Rico et al., 2023). IS scholars have empirically investigated perceived enjoyment in innovation diffusion, revealing how individual enjoyment influences technological innovations, including wearable devices, robots, natural language processing, and virtual reality (Lee et al., 2019; Park, 2020). These innovations feature convenient human-computer interfaces that provide users with

unparalleled experiences. For instance, Jang and Park (2019) develop an integrated VR game adoption model tested with data from 1227 players and find that enjoyment is a key factor in fostering VR adoption.

2.2 Enjoyment of e-government

In e-government literature, perceived enjoyment is measured by the extent to which citizens find using e-government services inherently satisfying. The cultivation of enjoyment is crucial for the success of e-government initiatives because these platforms serve not merely as transactional intermediaries but also as comprehensive service providers (Li and Mao, 2015; Pribadi, 2021). Citizens anticipate that e-government services provide a user experience superior to that of traditional, non-digital channels (Le Blanc, 2020). The e-government literature reflects a growing focus on how enjoyment influences citizens' interactions with digital government platforms and other related outcomes, underlining its significance as a pivotal component of user engagement (Sawalha et al., 2019).

IS scholars have delineated the lifecycle of e-government service engagement, which includes adoption, sustained usage, and the potential for channel switching, with a notable emphasis on the role of enjoyment throughout these phases. The initial adoption phase is characterised by a user's intention to engage with an e-government service, a decision influenced by the attributes of the technology and individual perceptions, as posited by the diffusion of innovation theory and the technology acceptance model (Lin et al., 2021). As users navigate through the e-government service, they undertake a dynamic journey marked by an exploration of functionalities that influence their ongoing satisfaction and enjoyment, factors pivotal to their continuous engagement and eventual loyalty to the platform (Li and Shang, 2020). This exploratory engagement, shaped by system quality, reliability, security, interactivity, and accessibility, feeds into an iterative evaluation process. Conversely, channel switching behaviour, prompted by the allure of more accessible alternatives or discontentment with existing services, signals the need for a deeper understanding of how enjoyment is derived from using e-government services to mitigate such transitions and sustain user commitment (Kumar et al., 2017). Thus, the pleasure users derive from interacting with e-government platforms is not peripheral but central to the success of digital innovations, asserting that enjoyable experiences are integral to fostering constructive civic engagement and enhancing the effectiveness of public administration.

While there has been a concerted effort to analyse enjoyment's influence on technology adoption, reuse, and switching, a nuanced understanding of how enjoyment specifically arises in e-government remains less explored. Moreover, the enjoyment of using e-government services is not ancillary but a critical metric of digital innovation success (Sharma et al., 2021). Enjoyable interactions with e-government platforms are believed to promote constructive engagement in civic activities, thereby advancing the efficacy of public administration (Mensah, 2019).

2.3 Self-determination theory

According to self-determination (SD) Theory, individuals have three basic psychological needs: competence, relatedness, and autonomy (Gagné et al., 2022). When these needs

are met, intrinsic motivation increases, resulting in positive psychological effects such as enjoyment.

Competence is the psychological need to feel proficient and effective in one's activities (Vasconcellos et al., 2020). Online services can enhance this sense of competence by offering streamlined, user-friendly transactions that make users feel capable and efficient. Kniazieva et al. (2023) explore the digitalisation of public services in Ukraine and find digital platforms like Diia have improved service quality and availability, promoting user experience and competence. Relatedness is the need for social connection and engagement (Mills et al., 2018). Tejedo-Romero et al. (2022) examine how Portuguese municipalities implement participatory processes and channels through e-government services, suggesting that these services enhance citizen interaction and connection. E-government services that facilitate interactions between citizens and the government, as well as among citizens themselves, can foster a sense of community and social connection (Pham et al., 2023). Autonomy refers to the need to feel in control of one's actions and decisions (Krause et al., 2019). By providing secure and reliable access to services, e-government platforms can empower users, enhancing their sense of control over their personal information and privacy. According to SDT, when e-government services meet these psychological needs, they can enhance user enjoyment in using these services (Ju et al., 2023).

To study the enjoyment derived from e-government services, we opted for proxy variables rather than directly measuring the three constructs – competence, relatedness, and autonomy – for two-fold considerations. On one hand, measuring these constructs directly is challenging in the e-government context due to their highly abstract nature. Individuals may interpret their sense of competence, relatedness, and autonomy in varied ways, potentially resulting in construct ambiguity and personal biases (Ryan and Deci, 2000). On the other hand, e-government services encompass a wide range of activities and features that are closely related to these constructs (Zahid et al., 2022). By employing proxy variables, we can represent the three constructs in a way pertinent to the e-government context, providing a more reliable understanding of what influences users' enjoyment.

In this study, we employ effort expectancy and technophilia as proxy variables to represent the construct of competence. Effort expectancy refers to users' perception of the ease associated with the use of an information system (Al-Saedi et al., 2020; Hujran et al., 2023). This concept is closely associated with competence in the context of e-government services, as it reflects individuals' confidence in their ability to effectively utilise these services. Technophilia is an individual's enthusiasm for technology. It is another proxy for competence because it depicts the level of comfort and proficiency a user has with technological platforms (Hannan et al., 2023).

We utilise technology humanness and engagement as proxies for the construct of relatedness within the context of e-government services. Technology humanness measures how much a digital service, such as e-government, is perceived to emulate human-like interactions in terms of understanding and responsiveness (Hu and Lu, 2021). Engagement refers to the level of involvement that users perceive when interacting with e-government services (Khan and Krishnan, 2021).

We employ the variable of information privacy concern as a proxy for 'autonomy over privacy', one of the key aspects of autonomy within the e-government context. Autonomy, in the context of digital services, often translates into control over one's information and privacy (Zarsky, 2019). Similarly, information privacy concerns reflect

users' apprehensions about the control, usage, and protection of their personal information in a digital environment (Mutimukwe et al., 2020). Therefore, by measuring users' information privacy concerns, we indirectly gauge their perceived level of autonomy over privacy when using e-government services.

2.4 Hypotheses development

According to SD theory, e-government services have the potential to stimulate user enjoyment through three mechanisms. Firstly, these services (e.g., online tax filing) can boost users' sense of competence by offering functions that are easy to use and align with their expectations for effort. Secondly, e-government services can enhance user engagement through interactive and participatory features, thereby fulfilling citizens' need for social connection. Thirdly, by incorporating robust security tools, e-government services can offer users a sense of empowerment and control over their privacy, thereby enhancing their overall experience when interacting with the government online.

Effort expectancy is a crucial determinant of citizens' enjoyment, gauging an individual's perceived ease of use of a system or technology and assessing the user-friendly nature of e-government services (Hujran et al., 2023). Effort expectancy plays a key role in influencing an individual's motivation and overall performance in various aspects of life (e.g., learning and problem-solving). Scholars in various fields have made attempts to study the relationship between effort expectancy and enjoyment. For example, in investigating the financial education fallacy, Willis (2011) posits that numerous individuals do not find financial planning enjoyable because they perceive it as a time-consuming and labour-intensive task. In studying social media enablers and inhibitors, Sullivan and Koh (2019) posit that "complexity is associated with uncertainty and unpredictability," which often results in anxiety.

E-government services are becoming increasingly popular for various tasks (e.g., tax filing, digital driver's license, passport application, and healthcare service) (Carter et al., 2022). It is interesting to investigate the potential relationships between enjoyment and effort expectancy in the e-government context. To enjoy the various features of an online tax filing service, citizens may expect less effort-consuming activities (e.g., navigation, information filing, and form submitting). In other words, citizens who believe e-government services are too complex are likely to struggle with using these services. Additionally, it is logically impossible for users who are exhausted from using e-government to have a pleasant user experience. Therefore, we propose the following.

H1: Effort expectancy positively impacts user enjoyment.

Technophilia manifests in various forms, such as a passion for video games, an interest in artificial intelligence, or a fascination with new digital features (Bel and Coeugnet, 2023). While technophilia can be associated with negative consequences such as addiction, it often reflects one's passion and competence in relation to technology use. Individuals who have a strong interest in technology tend to invest time and effort into learning about and mastering emerging technological innovations (Ben Amor and Ben Yahia, 2022). Therefore, technophilia can boost technological proficiency and competence, which in turn can lead to improved efficiency and productivity in the use of technology. For example, Dastjerdi et al. (2019) find technophiles are often early adopters of travel information systems and passionate about experimenting with new technologies and discovering new features and functionalities. Enjoyment in using e-government services

is often attributed to the sense of accomplishment that comes with mastering new technology. Therefore, technophiles who have a strong interest and enthusiasm for technology are more likely to experience a sense of enjoyment in using e-government.

H2: Technophilia positively impacts user enjoyment.

Technological advancements have made services more human-like (Lankton et al., 2015). Information systems scholars have used social presence theory to study human-like technologies and their role in human-computer communication (e.g., online learning) (Kreijns et al., 2022). Social presence gauges the prominence of the other person in interpersonal interactions (Short et al., 1976). Social presence theory suggests that some technological attributes transmitting visual and verbal cues can lead users to perceive the technology as being more sociable, friendly, and personal. Accordingly, the technology creates a psychological illusion of individuals being present, even in the absence of any human beings or their direct involvement (Lankton et al., 2015). In this regard, technologies that offer human-like interactions tend to be more engaging because they facilitate natural interactions. These human-like interactions can make the technology more relatable, increasing overall enjoyment (Shank et al., 2019). In line with social presence theory, we posit that humanness is a crucial factor that significantly affects enjoyment in using e-government. Therefore, we have the following hypotheses.

H3: Technology humanness positively impacts user enjoyment.

H4: Technology humanness positively impacts engagement.

User interface quality depicts how users perceive the usability and quality of the user-system interface (González-Pérez et al., 2021; Hartmann et al., 2008). A well-designed user interface features high usability and engages users in using the system, facilitating users in completing tasks and better achieving their goals (Shneiderman, 2020). For instance, Turetken et al. (2019) explore three aspects of enterprise information systems (information overload, control familiarity, and user interface fit) and their influence on system adoption, suggesting that a well-designed user interface results in greater engagement and improved user performance. Kim et al. (2022) find that a quality user interface can reduce frustration and cognitive load, contributing to higher levels of user engagement. Moreover, a visually appealing interface often arouses users' willingness to engage, as users feel that the system is adapted to their unique preferences. For instance, Castiblanco Jimenez et al. (2022) study user engagement in advergames vs. traditional advertising, finding that visually appealing interfaces boost engagement and influence purchase intention.

Engagement reflects the extent to which users actively participate, interact, and are involved in using information systems (Fan et al., 2017; Kim et al., 2013). Peters et al. (2018) argue that engaging user interfaces can positively impact user engagement and enjoyment within various contexts, including the computer game, workplace and healthcare. In addition, Kamis et al. (2010) find that effective system navigation significantly fosters user engagement and improves user loyalty toward e-commerce websites. Similarly, Tang et al. (2016) argue that engaging design elements in healthcare platforms, such as interactivity and customisation, are positively related to positive user experience. In the e-government context, Chen et al. (2021) suggest engaging and personalised information system designs can foster more immersive and satisfying interactions with e-government services, thereby triggering a pleasant user experience.

Overall, designing e-government services that engage citizens is an important strategy for promoting user experience. Therefore, we propose the following:

H5: Engagement positively impacts user enjoyment.

H6: User interface quality positively impacts engagement.

As technology becomes more integrated into our daily lives and media disclosures about security incidents continue to increase, concerns about information privacy keep growing (Lin et al., 2021). Bhave et al. (2020) argue privacy concerns arise when individuals feel that their autonomy over privacy is being compromised. For instance, Zhang et al. (2021) find that patient privacy and autonomy are crucial ethical principles in healthcare, and breaches in privacy can significantly compromise individuals' autonomy, leading to ethical dilemmas and trust issues in medical settings. Additionally, investigating AI-based tools for healthcare purposes, Esmaeilzadeh (2020) suggests that with the increasing awareness of security vulnerabilities in digital systems and greater cognizance of the risks associated with sharing personal information online, individuals are becoming increasingly concerned about how their data is collected and used.

Accordingly, promoting autonomy over privacy and addressing privacy concerns is critical to users' enjoyment of using technological innovations. For example, in the smartphone social networking context (e.g., Facebook), users have information privacy concerns stemming from the fear of privacy loss, unauthorised access, and loss of data control (Van der Schyff et al., 2020). These concerns can lead to decreased enjoyment in using the technology (Choi, 2016). Users who perceive e-government services to be secure with low concerns may report higher levels of enjoyment. Similarly, users who have serious privacy concerns are likely to enjoy these services less. Therefore, we propose the following:

H7: Privacy concerns negatively impact user enjoyment.

The research model in Figure 1 incorporates the constructs to be tested in our study.

3 Methodology

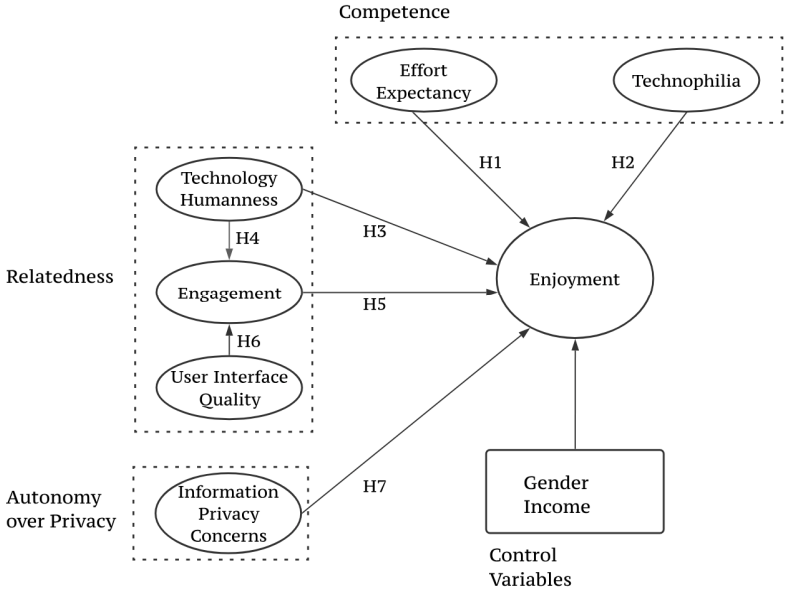
The overarching objective of this research is to investigate the determinants that engender enjoyment among users of e-government services. Our research comprises two interconnected analyses utilising a singular dataset derived from a survey administered to users of the myGov platform for income tax filing. First, we examined the disparity between the enjoyment of using e-government services and the intention to continue using them. Second, we tested an e-government service enjoyment model to assess the factors that contribute to users' enjoyment of these services.

3.1 Data sampling

Our research employed a cross-sectional survey design to gather data from Australian residents. We collected data from individuals who had utilised the myGov platform for income tax filing in the previous year. myGov is extensively adopted throughout Australia for a variety of government services, including tax filings, making it a highly relevant subject for studying the use of e-government services. We utilised Qualtrics for

survey distribution, reaching a diverse group of users with experience in using myGov for their tax-related needs.

Figure 1 Research model



The sample comprised 363 participants, with 52.34% identified as female and 46.83% as male (Table 1). Among the respondents, 40.77% were fully employed. The age of the participants varied from 18 to over 65 years, with 249 individuals (68.60%) falling within the 18–54 age group. 43.80% of the participants held a degree at a bachelor level or above. 54.82% of the respondents have a yearly income of $50,000 or above. 148 participants (40.77%) were full-time employees, while others were part-time workers or self-employed.

Table 1 Demographics

Demographics	*Frequency*	*Percentage* (%)
Gender		
Male	190	46.83%
Female	170	52.34%
Others	3	0.83%
Age		
18–24	45	12.40%
25–34	74	20.39%
35–44	71	19.56%
45–54	59	16.25%
55–64	57	15.70%
65 and over	57	15.70%

Table 1 Demographics (continued)

Demographics	*Frequency*	*Percentage* (%)
Education		
High School	163	44.90%
Associate Degree	41	11.29%
Bachelor	119	32.78%
Master or Higher	40	11.02%
Yearly income ($AUD)		
Less than $10,000	16	4.41%
$10,000–29,999	62	17.08%
$30,000–49,999	65	17.91%
$50,000–69,999	66	18.18%
$70,000–89,999	52	14.33%
$90,000–119,999	39	10.74%
$120,000 and above	42	11.57%
Prefer not to say	21	5.79%
Employment		
Full time	148	40.77%
Part time	117	32.23%
Self-employed	98	27.00%

Furthermore, 211 individuals (58.1%) reported a positive experience in using myGov for tax filing, while 112 individuals (30.9%) indicated that their experience was less than enjoyable. In addition, 40 participants (11%) demonstrated a neutral experience (neither enjoyable nor unenjoyable).

3.2 Construct measures

The survey instrument was designed to measure various constructs related to e-government service use and user engagement. Construct measures were adapted from established scales in the literature (Table 2). The measurement items for technology humanness and enjoyment were based on scales developed by Lankton et al. (2015). The items measuring e-government use were adapted from Lin et al. (2021). The items measuring self-efficacy were developed based on the work of Venkatesh et al. (2003). To measure user interface quality, we adopted the items proposed by Alharbi et al. (2017). To measure engagement, we adopted the items from Fan et al. (2017). The technophilia items were derived from Globisch et al. (2018), and the measurement items for information privacy concerns were adapted from Malhotra et al. (2004). Respondents rated all items using a seven-point Likert scale from ‘strongly disagree’ to ‘strongly agree’, allowing for a nuanced capture of their attitudes and perceptions.

Table 2 Measurement development

Latent variable	*Definition*	*References*
Effort expectancy (EE)	An individual's belief in their ability to effectively use information systems and technology	Venkatesh et al. (2003)
Technophilia (TENO)	The degree of an individual's enthusiasm toward technology	Globisch et al. (2018)
Technology humanness (TH)	The degree to which technology exhibits human-like characteristics and behaviours	Lankton et al. (2015)
Engagement (EG)	The extent to which users actively participate, interact, and are involved in using information systems or services	Fan et al. (2017)
User interface quality (UIQ)	The effectiveness of the interface through which users interact with information systems	Alharbi et al. (2017)
Information privacy concerns (IPC)	The degree of users' concerns about the collection, use, access, and disclosure of their personal information	Malhotra et al. (2004)
Enjoyment (ENJ)	The extent to which individuals find using information systems enjoyable	Lankton et al. (2015)

4 Analysis and results

User adoption and enjoyment are two important aspects of e-government success. E-government adoption refers to how extensively citizens use e-government services, while enjoyment portrays how pleasant they find the experience of using these services. High adoption rates do not equate to positive user experiences. For instance, a citizen might rely on an e-government service out of necessity, even if they find it cumbersome or frustrating.

We conducted a paired samples *t*-test to assess the mean differences between citizens' use intention and e-government enjoyment for the same individuals (Table 3). The mean difference was found to be 1.46 ($t(9) = 25.546$, $p < 0.001$), indicating the difference is significant. Cohen's criteria for reporting effect sizes categorises them as very small (0.01), small (0.2), medium (0.5), and large (0.8). In our study, the effect size is 1.14 suggesting a large effect. In other words, the disparity between enjoyment and use intention is notably observable, with citizens expressing a higher intention to reuse e-government services despite a relatively lower level of enjoyment.

Table 3 Mean difference between enjoyment and use intention

Variable	*Min*	*Max*	*Mean*	*Std*
Continued use intention	1	7	5.891	1.138
Enjoyment	1	7	4.435	1.386

Then, we examined the mechanisms that underpin how e-government services elicit user enjoyment. To test our hypotheses, we conducted partial least squares structural equation modelling (PLS-SEM) using SmartPLS (Version 3.3.3). The descriptive statistics of the latent variables are presented in Table 4.

Table 4 Descriptive statistics of latent variables

Latent variable	*Mean*	*SD*	*CR*	*AVE*	*Correlations and square roots of AVEs of latent variables*						
					EE	*TENO*	*TH*	*EG*	*UIG*	*IPC*	*ENJ*
EE	5.51	1.166	0.908	0.768	0.876						
TENO	4.41	1.431	0.890	0.730	0.258	0.854					
TH	4.09	1.439	0.867	0.684	0.344	0.254	0.827				
EG	4.62	1.243	0.898	0.688	0.658	0.311	0.424	0.829			
UIG	4.89	1.197	0.924	0.752	0.755	0.317	0.362	0.824	0.867		
IPC	3.45	1.685	0.902	0.754	–0.143	0.213	0.215	0.018	–0.038	0.868	
ENJ	4.44	1.384	0.908	0.768	0.741	0.382	0.520	0.812	0.780	–0.005	0.876

EE: Effort Expectancy, TENO: Technophilia, TH: Technology Humanness, EG: Engagement, UIQ: User interface quality, IPC: Information privacy concerns, ENJ: Enjoyment.

To assess the reliability and internal consistency of the measurement scales, we calculated composite reliability (CR), where scores above 0.70 indicate satisfactory reliability (Hair et al., 2020). Our CR scores fall between 0.867 and 0.924, affirming robust reliability among the variables.

We assessed the convergent validity through the average variance extracted (AVE), which is a measure of the amount of variance that a latent variable captures from the relevant indicators (Hair et al., 2016). The AVE scores ranged from 0.684 to 0.768, well above the benchmark of 0.5, thus confirming the convergent validity. Additionally, all item loadings were significant at $p < 0.001$ and exceeded 0.7, except for IPC3. We then ran a loading relevance test and dropped the item based on the test's results.

We examined the discriminant validity using the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. The Fornell-Larcker criterion involves comparing the square roots of the AVEs with cross-construct correlations (Hair et al., 2020). In our study, the square root of each construct's AVE was higher than its correlation with any other construct (Table 4). The HTMT values ranged from 0.015 to 0.825, well below 0.9 (Söllner et al., 2022). Cross-loading analysis revealed that all items loaded highest on their respective constructs, further confirming the discriminant validity.

We conducted a common method bias test, using the full collinearity approach (Kock, 2015), which yielded VIF values between 1.070 and 1.985. These fall below the threshold of 3.3, dismissing concerns for common method bias.

For model fit, we examined the standardised root mean square residual (SRMR), and the discrepancy measures d_{ULS} and d_G (Benitez et al., 2020). The SRMR value was 0.028, comfortably below the 0.080 threshold, indicating a good model fit (Table 5). d_{ULS} and d_G, which assess model discrepancies, were 0.251 and 0.182, respectively. Both values are favourable against the 95% quantile of their reference distributions, suggesting that the model is well-fitted to the data.

We synthesise the results of the hypothesis testing in Table 6. Six of the seven hypotheses are supported (see Figure 2). Effort expectancy, technophilia, technology humanness, and engagement directly impact enjoyment. In addition, user interface quality significantly influences users' engagement. The hypothesis H7 is not supported – information privacy concerns do not significantly decrease enjoyment. A plausible explanation for this could be that privacy concerns are an enduring issue, and users may

have adapted to these concerns over time, accepting them as an inherent part of using digital systems and services, thus minimising their impact on enjoyment.

Table 5 Model fit

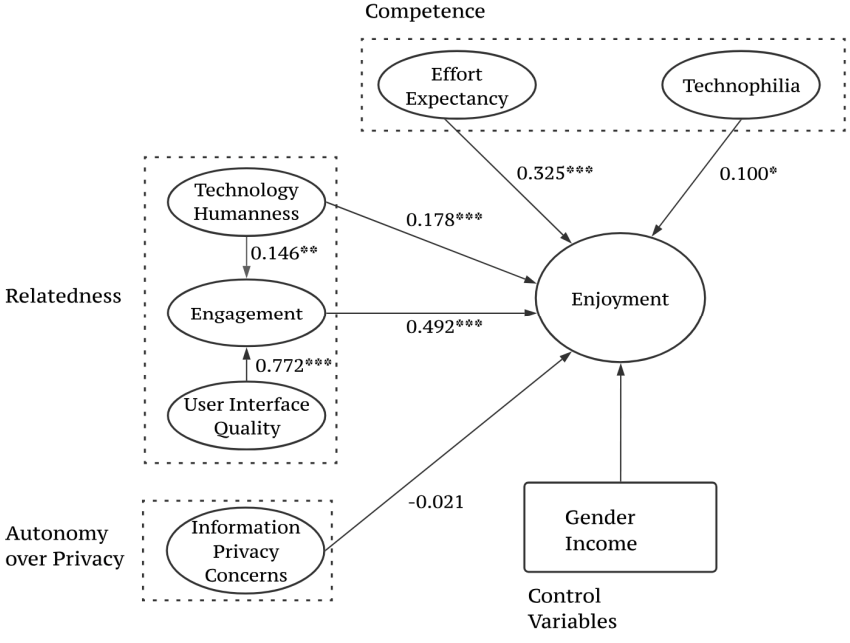
Index	*Overall Saturated Model Fit Evaluation*		
	Value	*HI95*	*Conclusion*
SRMR	0.028	0.033	Supported
d_{ULS}	0.251	0.346	Supported
d_G	0.182	0.224	Supported

Table 6 Path coefficients and hypothesis testing

No.	*Path*	*Coefficient*	*t-Value*	*p-Value*	f^2	*Supported*
H1	Effort expectancy → Enjoyment	0.325	6.196	0.000***	0.243	Yes
H2	Technophilia → Enjoyment	0.100	2.415	0.016*	0.037	Yes
H3	Technology humanness → Enjoyment	0.178	3.624	0.000***	0.104	Yes
H4	Technology humanness → Engagement	0.146	3.075	0.002**	0.060	Yes
H5	Engagement → Enjoyment	0.492	8.643	0.000***	0.542	Yes
H6	User interface quality → Engagement	0.772	22.905	0.000***	1.710	Yes
H7	Privacy concerns → Enjoyment	–0.021	0.696	0.487	0.002	No

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Figure 2 Testing results



5 Discussion

Our study uncovers a notable gap between citizens' intention to reuse e-government services and their actual enjoyment of these services. This discrepancy highlights the transformative potential of e-government for civic interaction and underscores the necessity for providers to prioritise user experience and enjoyment, in addition to adoption and usage rates. Additionally, the study assesses the influence of factors such as effort expectancy, technophilia, technology humanness, user engagement, interface quality, and privacy concerns on the enjoyment of e-government services. By pinpointing the drivers of positive user experiences, the research offers insights for governments to refine their digital offerings and amplify citizen engagement to enhance user experience, strategically guiding e-government initiatives towards future advancements and increased societal impact.

5.1 Research implication

With the continuous popularisation and development of technological innovations, e-government is building interactive and humanised services and designs with high-quality interfaces. The success of technology should not only meet users' functional needs but also their psychological needs, such as enjoyment. Our findings suggest that effort expectancy also leads to citizens' enjoyment. More importantly, this study reveals that technology humanness impacts e-government enjoyment. Furthermore, this study finds that citizens' enjoyment of e-government services is positively related to users' technophilia. These findings provide empirical evidence to reveal how users' enjoyment is impacted when using e-government services. Our research provides a theoretical framework that e-government researchers, in both empirical research and design science research, can take advantage of to understand such user experience as enjoyment. Future research can expand on this study and explore citizens' enjoyment perceptions of e-government in different regions to document global perspectives.

Research on e-government implementations (e.g., smart cities) that successfully equip AI and big data in the US, Europe, India, China, and others with varying success may also yield interesting results. It is pressing that future research takes advantage of our research results to investigate the interplay of AI and e-government in engaging citizens. And we call for more research to study the cues and characteristics of technological innovation resulting in enjoyable use. In addition, future research can also explore the differences in user enjoyment of services hosted by governments and the private sector. Moreover, a comparison of different e-government app specifications can also help to understand how e-government designs stimulate citizens' enjoyment.

We call for future comparative studies of developed and developing countries that successfully promoted e-government initiatives with different approaches. Examining demographic differences, such as education levels and innovation adopter categories, and their impact on citizens' enjoyment of e-government services will provide valuable insights. For example, studies of e-government enjoyment by elderly people with weak digital competencies are valuable in determining the extent to which the digital divide affects enjoyment perception. Furthermore, analysing cultural differences and their impact on the enjoyment of government-hosted services will further develop the literature in this area. In addition, longitudinal studies of the dynamic perceptions of citizens could also be very interesting. Studies juxtaposing e-government alternatives are valuable for

investigating mutable designs and their corresponding features in relation to citizens' enjoyment.

5.2 Practical implications

Although e-government has been making a positive difference in the everyday lives of citizens and the pursuit of e-government that serves citizens remains the ultimate goal, many government sectors struggle to effectively engage with citizens through digital channels. It is critical to effectively empower governments at all levels to forge enjoyable and effective digital solutions. Our findings feature the mechanisms through which technological innovations evoke enjoyment. By identifying the determinants of enjoyment in e-government use, policymakers and designers can improve the design and implementation of e-government services.

Our research reveals that effort expectancy, indicating an individual's perception of ease associated with using digital innovation to accomplish a task (e.g., tax filing), can notably increase citizens' enjoyment of e-government services. In other words, e-government requiring minimum effort will be beneficial not only for promoting technology adoption but also for augmenting citizens' enjoyment. Therefore, the public sector should keep this aspect in mind when delivering e-government services – the design of e-government services should prioritise simplicity and user-friendliness, making functions accessible and easy to use for all citizens. In addition, the public sector can utilise artificial intelligence tools to streamline services and automate basic tasks, allowing users to enjoy using their services with less effort and time.

When delivering e-government services, the public sector may assess citizens' effort expectancy to early identify the population who feel overwhelmed or challenged by the complexity of the services. Effort expectancy beliefs are not unchangeable in citizens' interaction with e-government procedures; governments may take advantage of the malleable nature of effort expectancy and elevate technology training to prepare citizens in advance. By doing so, targeted support can be provided to these individuals, improving their comfort level. In particular, for countries with an increasingly aging population, governments should be prepared to provide e-government services that senior citizens have access to and are competent to use to ensure that they can enjoy using e-government services. Additionally, e-government services can leverage intuitive features and interactive guidance to facilitate e-government transactions.

Our findings indicate that technology humanness is related to enjoyment. It is important that the public sector designs e-government applications that are not only useful but also incorporate features or interfaces related to humanness, such as social presence, engaging interaction, and customised responsiveness. As AI innovations are increasingly being used to personalise business services, modern e-government may also adopt AI to boost citizens' enjoyment via customised, engaging, and responsive services. In brief, the public sector (e.g., government departments and agencies) should be aware of the expectations of citizens in enjoying e-government services.

6 Conclusion

In an era where e-government initiatives are increasingly emphasising the citizen experience, this research presents a multifaceted model to examine the various aspects of

technology enjoyment within the public sector. We identify the key factors that elevate citizens' enjoyment of e-government services, offering insights that can guide governments worldwide to implement and optimise user-centric design elements. Our findings illuminate pathways for refining e-government strategies to boost user engagement and foster deeper, more meaningful interactions between citizens and their governments. Furthermore, this study advocates for systems that not only operate efficiently but also support the psychological well-being of users. Our research underscores the importance of focusing on user enjoyment as a critical metric for the success of digital innovations in the public sector, providing a new perspective for future advancements in e-government initiatives.

Declaration of interest statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Alharbi, N., Papadaki, M. and Dowland, P. (2017) 'The impact of security and its antecedents in behaviour intention of using e-government services', *Behaviour and Information Technology*, Vol. 36, No. 6, pp.620–636.

Al-Saedi, K., Al-Emran, M., Ramayah, T. and Abusham, E. (2020) 'Developing a general extended UTAUT model for M-payment adoption', *Technology in Society*, Vol. 62, p.101293.

An, Z., Wang, C., Li, S., Gan, Z. and Li, H. (2021) 'Technology-assisted self-regulated English language learning: associations with English language self-efficacy, English enjoyment, and learning outcomes', *Frontiers in Psychology*, Vol. 11, p.558466.

Bel, M. and Coeugnet, S. (2023) 'The delegation-level choice of an automated vehicle: an analysis by structural equation modeling', *International Journal of Human–Computer Interaction*, Vol. 40, No. 10, pp.2484–2499.

Ben Amor, N. and Ben Yahia, I. (2022) 'Investigating blockchain technology effects on online platforms transactions: do risk aversion and technophilia matter?', *Journal of Internet Commerce*, Vol. 21, No. 3, pp.271–296.

Benitez, J., Henseler, J., Castillo, A. and Schuberth, F. (2020) 'How to perform and report an impactful analysis using partial least squares: guidelines for confirmatory and explanatory IS research', *Information and Management*, Vol. 57, No. 2, p.103168.

Bhave, D.P., Teo, L.H. and Dalal, R.S. (2020) 'Privacy at work: a review and a research agenda for a contested terrain', *Journal of Management*, Vol. 46, No. 1, pp.127–164.

Carter, L., Yoon, V. and Liu, D. (2022) 'Analyzing e-government design science artifacts: a systematic literature review', *International Journal of Information Management*, Vol. 62, p.102430.

Castiblanco Jimenez, I.A., Gomez Acevedo, J.S., Olivetti, E.C., Marcolin, F., Ulrich, L., Moos, S. and Vezzetti, E. (2022) 'User engagement comparison between advergames and traditional advertising using EEG: does the user's engagement influence purchase intention?', *Electronics*, Vol. 12, No. 1, p.122.

Chen, T., Guo, W., Gao, X. and Liang, Z. (2021) 'AI-based self-service technology in public service delivery: user experience and influencing factors', *Government Information Quarterly*, Vol. 38, No. 4, p.101520.

Choi, S. (2016) 'The flipside of ubiquitous connectivity enabled by smartphone-based social networking service: social presence and privacy concern', *Computers in Human Behavior*, Vol. 65, pp.325–333.

Dastjerdi, A.M., Kaplan, S., e Silva, J.d.A., Nielsen, O.A. and Pereira, F.C. (2019) 'Use intention of mobility-management travel apps: the role of users goals, technophile attitude and community trust', *Transportation Research Part A: Policy and Practice*, Vol. 126, pp.114–135.

Esmaeilzadeh, P. (2020) 'Use of AI-based tools for healthcare purposes: a survey study from consumers' perspectives', *BMC Medical Informatics and Decision Making*, Vol. 20, No. 1, p.170.

Fan, L., Liu, X., Wang, B. and Wang, L. (2017) 'Interactivity, engagement, and technology dependence: understanding users' technology utilisation behaviour', *Behaviour and Information Technology*, Vol. 36, No. 2, pp.113–124.

Gagné, M., Parker, S.K., Griffin, M.A., Dunlop, P.D., Knight, C., Klonek, F.E. and Parent-Rocheleau, X. (2022) 'Understanding and shaping the future of work with self-determination theory', *Nature Reviews Psychology*, Vol. 1, No. 7, pp.378–392.

Globisch, J., Dütschke, E. and Wietschel, M. (2018) 'Adoption of electric vehicles in commercial fleets: why do car pool managers campaign for BEV procurement?', *Transportation Research Part D: Transport and Environment*, Vol. 64, pp.122–133.

Gómez-Rico, M., Santos-Vijande, M.L., Molina-Collado, A. and Bilgihan, A. (2023) 'Unlocking the flow experience in apps: fostering long-term adoption for sustainable healthcare systems', *Psychology and Marketing*, Vol. 40, No. 8, pp.1556–1578.

González-Pérez, L.I., Ramírez-Montoya, M.S. and García-Peñalvo, F.J. (2021) 'Improving institutional repositories through user-centered design: indicators from a focus group', *Future Internet*, Vol. 13, No. 11, p.282.

Hair Jr., J.F., Howard, M.C. and Nitzl, C. (2020) 'Assessing measurement model quality in PLS-SEM using confirmatory composite analysis', *Journal of Business Research*, Vol. 109, pp.101–110.

Hair Jr., J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2016) *A Primer on Partial Least Squares Structural Equation Modeling* (*PLS-SEM*), Sage Publications, Los Angeles.

Hannan, A., Hussain, A. and Tab, M.A. (2023) 'Towards a more general theory of blockchain technology adoption–investigating the role of mass media, social media and technophilia', *Technology in Society*, Vol. 73, p.102225.

Hartmann, J., Sutcliffe, A. and Angeli, A.D. (2008) 'Towards a theory of user judgment of aesthetics and user interface quality', *ACM Transactions on Computer-Human Interaction*, Vol. 15, No. 4, p.15.

Holdack, E., Lurie-Stoyanov, K. and Fromme, H.F. (2020) 'The role of perceived enjoyment and perceived informativeness in assessing the acceptance of AR wearables', *Journal of Retailing and Consumer Services*, Vol. 65, p.102259.

Hu, P. and Lu, Y. (2021) 'Dual humanness and trust in conversational AI: a person-centered approach', *Computers in Human Behavior*, Vol. 119, p.106727.

Hujran, O., Al-Debei, M.M., Al-Adwan, A.S., Alarabiat, A. and Altarawneh, N. (2023) 'Examining the antecedents and outcomes of smart government usage: an integrated model', *Government Information Quarterly*, Vol. 40, No. 1, p.101783.

Jang, Y. and Park, E. (2019) 'An adoption model for virtual reality games: the roles of presence and enjoyment', *Telematics and Informatics*, Vol. 42, p.101239.

Ju, J., Meng, Q., Sun, F., Liu, L. and Singh, S. (2023) 'Citizen preferences and government chatbot social characteristics: evidence from a discrete choice experiment', *Government Information Quarterly*, Vol. 40, No. 3, p.101785.

Kagoya, S. and Mbamba, U. (2021) 'User participation approach to key attributes of e-government implementation in developing countries: a case of Tanzania', *Business Management Review*, Vol. 24, No. 1, pp.87–107.

Kamis, A., Stern, T. and Ladik, D.M. (2010) 'A flow-based model of web site intentions when users customize products in business-to-consumer electronic commerce', *Information Systems Frontiers*, Vol. 12, pp.157–168.

Kautish, P. and Khare, A. (2022) 'Investigating the moderating role of AI-enabled services on flow and awe experience', *International Journal of Information Management*, Vol. 66, p.102519.

Khan, A. and Krishnan, S. (2021) 'Citizen engagement in co-creation of e-government services: a process theory view from a meta-synthesis approach', *Internet Research*, Vol. 31, No. 4, pp.1318–1375.

Kim, M., Oh, J. and Kim, B. (2021) 'Experience of digital music services and digital self-efficacy among older adults: enjoyment and anxiety as mediators', *Technology in Society*, Vol. 67, p.101773.

Kim, S.Y., Park, H., Kim, H., Kim, J. and Seo, K. (2022) 'Technostress causes cognitive overload in high-stress people: eye tracking analysis in a virtual kiosk test', *Information Processing and Management*, Vol. 59, No. 6, p.103093.

Kim, Y.H., Kim, D.J. and Wachter, K. (2013) 'A study of mobile user engagement (MoEN): engagement motivations, perceived value, satisfaction, and continued engagement intention', *Decision Support Systems*, Vol. 56, pp.361–370.

Kniazieva, T.V., Kazanska, O.O., Orochovska, L.A., Tsymbalenko, Y.Y. and Dergach, A.V. (2023) 'Analysis of the impact of digitalization on the quality and availability of public services in Ukraine–a comparative approach with insights from Estonia', *Statistics*, *Politics and Policy*, Vol. 14, No. 3, pp.375–398.

Kock, N. (2015) 'Common method bias in PLS-SEM: a full collinearity assessment approach', *International Journal of e-collaboration*, Vol. 11, No. 4, pp.1–10.

Krause, A.E., North, A.C. and Davidson, J.W. (2019) 'Using self-determination theory to examine musical participation and well-being', *Frontiers in Psychology*, Vol. 10, p.405.

Kreijns, K., Xu, K. and Weidlich, J. (2022) 'Social presence: conceptualization and measurement', *Educational Psychology Review*, Vol. 34, No. 1, pp.139–170.

Kumar, R., Sachan, A. and Mukherjee, A. (2017) 'Qualitative approach to determine user experience of e-government services', *Computers in Human Behavior*, Vol. 71, pp.299–306.

Lankton, N.K., McKnight, D.H. and Tripp, J. (2015) 'Technology, humanness, and trust: rethinking trust in technology', *Journal of the Association for Information Systems*, Vol. 16, No. 10, pp.880–918.

Le Blanc, D. (2020) *E-Participation: A Quick Overview of Recent Qualitative Trends*, DESA Working Paper No. 163.

Lee, J., Kim, J. and Choi, J.Y. (2019) 'The adoption of virtual reality devices: the technology acceptance model integrating enjoyment, social interaction, and strength of the social ties', *Telematics and Informatics*, Vol. 39, pp.37–48.

Li, M. and Mao, J. (2015) 'Hedonic or utilitarian? Exploring the impact of communication style alignment on user's perception of virtual health advisory services', *International Journal of Information Management*, Vol. 35, No. 2, pp.229–243.

Li, Y. and Shang, H. (2020) 'Service quality, perceived value, and citizens' continuous-use intention regarding e-government: Empirical evidence from China', *Information and Management*, Vol. 57, No. 3, p.1103197.

Li, Y. and Shang, H. (2023) 'How does e-government use affect citizens' trust in government? Empirical evidence from China', *Information and Management*, Vol. 60, No. 7, p.103844.

Lin, J., Carter, L. and Liu, D. (2021) 'Privacy concerns and digital government: exploring citizen willingness to adopt the COVIDSafe app', *European Journal of Information Systems*, Vol. 30, No. 4, pp.389–402.

Malhotra, N.K., Kim, S.S. and Agarwal, J. (2004) 'Internet users' information privacy concerns (IUIPC): The construct, the scale, and a causal model', *Information Systems Research*, Vol. 15, No. 4, pp.336–355.

Mensah, I.K. (2019) 'Factors influencing the intention of university students to adopt and use e-government services: an empirical evidence in China', *SAGE Open*, Vol. 9, No. 2, p.2158244019855823.

Mills, D.J., Milyavskaya, M., Mettler, J. and Heath, N.L. (2018) 'Exploring the pull and push underlying problem video game use: a self-determination theory approach', *Personality and Individual Differences*, Vol. 135, pp.176–181.

Mutimukwe, C., Kolkowska, E. and Grönlund, Å. (2020) 'Information privacy in e-service: effect of organizational privacy assurances on individual privacy concerns, perceptions, trust and self-disclosure behavior', *Government Information Quarterly*, Vol. 37, No. 1, p.101413.

Oliveira, T., Barbeitos, I. and Calado, A. (2022) 'The role of intrinsic and extrinsic motivations in sharing economy post-adoption', *Information Technology and People*, Vol. 35, No. 1, pp.165–203.

Park, E. (2020) 'User acceptance of smart wearable devices: an expectation-confirmation model approach', *Telematics and Informatics*, Vol. 47, p.101318.

Pereira, R. and Tam, C. (2021) 'Impact of enjoyment on the usage continuance intention of video-on-demand services', *Information and Management*, Vol. 58, No. 7, p.103501.

Peters, D., Calvo, R.A. and Ryan, R.M. (2018) 'Designing for motivation, engagement and wellbeing in digital experience', *Frontiers in Psychology*, Vol. 9, p.797.

Pham, L., Limbu, Y.B., Le, M.T.T. and Nguyen, N.L. (2023) 'E-government service quality, perceived value, satisfaction, and loyalty: evidence from a newly emerging country', *Journal of Public Policy*, Vol. 43, No. 4, pp.812–833.

Pribadi, U. (2021) 'Citizens' intention to use e-government services: the case of e-complaint service in Indonesia', *International Journal of Electronic Governance*, Vol. 13, No. 2, pp.114–131.

Ryan, R.M. and Deci, E.L. (2000) 'Intrinsic and extrinsic motivations: classic definitions and new directions', *Contemporary Educational Psychology*, Vol. 25, No. 1, pp.54–67.

Sawalha, S., Al-Jamal, M. and Abu-Shanab, E. (2019) 'The influence of utilising Facebook on e-government adoption', *Electronic Government*, *an International Journal*, Vol. 15, p.1.

Shank, D.B., Graves, C., Gott, A., Gamez, P. and Rodriguez, S. (2019) 'Feeling our way to machine minds: people's emotions when perceiving mind in artificial intelligence', *Computers in Human Behavior*, Vol. 98, pp.256–266.

Sharma, R., Mishra, R. and Mishra, A. (2021) 'Determinants of satisfaction among social entrepreneurs in e-government services', *International Journal of Information Management*, Vol. 60, p.102386.

Shneiderman, B. (2020) 'Human-centered artificial intelligence: reliable, safe and trustworthy', *International Journal of Human–Computer Interaction*, Vol. 36, No. 6, pp.495–504.

Short, J., Williams, E. and Christie, B. (1976) *The Social Psychology of Telecommunications*, London, UK.

Söllner, M., Mishra, A.N., Becker, J-M. and Leimeister, J.M. (2022) 'Use IT again? Dynamic roles of habit, intention and their interaction on continued system use by individuals in utilitarian, volitional contexts', *European Journal of Information Systems*, Vol. 33, No. 1, pp.80–96.

Sullivan, Y.W. and Koh, C.E. (2019) 'Social media enablers and inhibitors: understanding their relationships in a social networking site context', *International Journal of Information Management*, Vol. 49, pp.170–189.

Tang, C., Lorenzi, N., Harle, C.A., Zhou, X. and Chen, Y. (2016) 'Interactive systems for patient-centered care to enhance patient engagement', *Journal of the American Medical Informatics Association*, Vol. 23, No. 1, pp.2–4.

Taverner, J., Vivancos, E. and Botti, V. (2021) 'A fuzzy appraisal model for affective agents adapted to cultural environments using the pleasure and arousal dimensions', *Information Sciences*, Vol. 546, pp.74–86.

Tejedo-Romero, F., Araujo, J.F.F.E., Tejada, A. and Ramírez, Y. (2022) 'E-government mechanisms to enhance the participation of citizens and society: exploratory analysis through the dimension of municipalities', *Technology in Society*, Vol. 70, p.101978.

Turetken, O., Ondracek, J. and IJsselsteijn, W. (2019) 'Influential characteristics of enterprise information system user interfaces', *Journal of Computer Information Systems*, Vol. 59, No. 3, pp.243–255.

Van der Schyff, K., Flowerday, S. and Furnell, S. (2020) 'Privacy risk and the use of Facebook apps: a gender-focused vulnerability assessment', *Computers and Security*, Vol. 96, p.101866.

Vasconcellos, D., Parker, P.D., Hilland T., Cinelli, R., Owen, K.B., Kapsal, N., Lee, J., Antczak, D., Ntoumanis, N. and Ryan, R.M. (2020) 'Self-determination theory applied to physical education: a systematic review and meta-analysis', *Journal of Educational Psychology*, Vol. 112, No. 7, pp.1444–1469.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003) 'User acceptance of information technology: toward a unified view', *MIS Quarterly*, Vol. 27, No. 3, pp.425–478.

Willis, L.E. (2011) 'The financial education fallacy', *American Economic Review*, Vol. 101, No. 3, pp.429–434.

Zahid, H., Ali, S., Abu-Shanab, E. and Javed, H.M.U. (2022) 'Determinants of intention to use e-government services: an integrated marketing relation view', *Telematics and Informatics*, Vol. 68, p.101778.

Zarsky, T.Z. (2019) 'Privacy and manipulation in the digital age', *Theoretical Inquiries in Law*, Vol. 20, No. 1, pp.157–188.

Zhang, H., Zhang, H., Zhang, Z. and Wang, Y. (2021) 'Patient privacy and autonomy: a comparative analysis of cases of ethical dilemmas in China and the United States', *BMC Medical Ethics*, Vol. 22, p.8.