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3 **What encourages citizens to use e-government? A rapid review and comprehensive**
4 **model**

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ABSTRACT

E-government has the potential to bring substantial benefits to societies by increasing the effectiveness, efficiency, and transparency of government. To attain these benefits, citizens need to be willing to adopt and use e-government services, yet adoption has been identified by researchers as the largest risk facing e-government. Here we use a rapid review methodology to systematically and efficiently compile and synthesise research on the causes and correlates of citizen adoption of e-government services. Through this synthesis, we develop a comprehensive conceptual model of the drivers of citizens' use of e-government. Our model includes eighteen predictors of e-government use across four categories: user perceptions; user background; environmental characteristics; and, service characteristics. It includes a broader array of factors than any other major theoretical approach, and effectively integrates several theories into a single comprehensive model of e-government adoption. Our review also identifies gaps in knowledge, and finds that further research is needed to test whether the relationships identified in existing research are causal, and to develop and test interventions that effectively increase citizens' adoption of e-government.

Keywords: e-government; behaviour; adoption; review; uptake; acceptance; citizens

1. Introduction

All over the developed world, government agencies have been introducing “electronic government” (e-government) systems. E-government has been defined simply as “the application of information technology by public sector organisations to provide services and information to individuals and business organisations” (Khosrow-Pour, 2006, p. 216). Other definitions have included a stronger value stance with respect to the intended outcomes of e-government. For example, some authors refer to the potential for e-government to provide more efficiencies and accountability for public sector organisations (Heeks, 2003; Kraemer & King, 2006) while others cite greater citizen participation in democracy (Lenihan, 2002). However, no matter what the philosophy behind their introduction, e-government have been the focus of significant investments across all levels of government institutions over the last decade or more (Foley & Alfonso, 2009).

The impact of the introduction of e-government systems were the subject of a systematic review of research on its costs, benefits, and risks (Weerakkody, Irani, Lee, Hindi, & Osman, 2014). The authors identified a host of benefits of e-government, including improved efficiency and communication with citizens. But, the research also showed that low levels of adoption and use are the largest risk facing e-government implementation. Furthermore, given the potential benefits owing to e-government, it is important that marginalised groups in society are given equal opportunity of access to these new services (Każemikaitiene & Bilevičiene, 2008). Put simply, if citizens don’t engage with e-government, any presumed benefits will be unrealised.

1.1 An overview of the main theoretical approaches appearing in the literature

1.1.1. Technology Acceptance Model

Questions of why citizens do or do not use e-government services have been subject to a number of theoretical viewpoints (see Weerakkody et al., 2014 for a review). One popular account has been the Technology Acceptance Model (TAM) (Davis, 1989) which considers an individual's acceptance of new technology to be a function of the extent to which he/she believes that using a particular system would enhance his or her performance (i.e., perceived usefulness) together with perceptions of how easy it would be to use the technology (i.e., perceived ease). In addition to these two antecedents of actual technology acceptance and use, Davis (1989)) included two concepts from the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977) namely, attitude toward using the technology and intentions to use the technology. A later version of the model (TAM2) incorporated the TRA concept of subjective norms among other variables which further improved the predictive validity of the theory albeit with sometimes inconsistent results (Legris, Ingham, & Colletette, 2003).

1.1.2. The Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) itself an extension of the Theory of Reasoned Action, has been employed to make sense of technology adoption (Jeyaraj, Rottman, & Lacity, 2006). The TPB's constructs include attitude toward using technology, subjective norms, perceived behavioural control (i.e., the perceived difficulty or easy of using the technology), actual control and behavioural intention. The reader can appreciate that the TPB shares some constructs with the TAM2 given both are influenced by the TRA. In fact, variables such as intention, subjective norm, attitude (which is conceptually related to the TAM concept of perceived usefulness) and perceived behavioural control (similar to perceived ease of use in the TAM) frequently feature in studies of technology adoption and are often associated empirically (Rana, Dwivedi, & Williams, 2015).

1.1.3. The Information System (IS) Success Model

Like the TAM2 and the TPB, the IS Success Model (DeLone & McLean, 1992, 2003) has been updated over the years since it was first developed. In its latest form, the model has three endogenous variables: intentions to use the technology, overall satisfaction with the technology, and the net benefits from use. The former two constructs are theorised as forming the basis from which user judgements of net benefits are derived. Moreover, intentions and satisfaction are theorised to have reciprocal effects on one another and to be subject to feedback from users' weighing of the benefits accruing from using the technology. The key predictors of intention and satisfaction are three exogenous variables: system quality (i.e., performance of the IS in terms of reliability, convenience, ease of use, functionality, and other system metrics), information quality (i.e., the output offered by the IS, for example, accuracy, timeliness, and completeness), and user satisfaction (i.e., positive or negative evaluation of the IS and its output).

1.1.4. Diffusion of Innovation

Diffusion of Innovation (DI) theory (Rogers Everett, 1995) is another framework that researchers have employed to explain user uptake of new technology. According to this approach, the adoption of an innovation is a function of three factors. First, are characteristics of the innovation itself (i.e., its relative advantage over existing systems; complexity or easy/difficult of use; its compatibility with the values, past experiences and needs of the potential user; the extent to which it can be trialled and tested; and its observed effects on key outcomes). Individual differences constitute a second category of variables that influence innovation uptake and diffusion such as motivations and personality traits. The characteristics of organisations is the third factor and recognises that individuals are imbedded in an organisational culture that has its own imperatives, constraints and characteristics. Historically, relative advantage, compatibility and complexity were considered the most important aspects of the DI model in adoption research (Tornatzky & Klein, 1982).

1.1.5. Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT (Venkatesh, Morris, Davis, & Davis, 2003) represents the integration of other theories of technology adoption such as the TAM, TRA, TPB and DI. Therefore, its main constructs bear some resemblance to those already discussed. The UTAUT poses five main influences on adoption including individual beliefs about the benefits of using the technology; how easy the individual expects the technology is to use; the perceived social influence to use the technology arising from important referents; beliefs about how an organisation and its technical infrastructure supports the use of the new technology; and behavioural intentions to use the technology. Based on results from a longitudinal validation of the UTAUT, it explained approximately 50% of actual use (Venkatesh et al., 2003).

1.1.6. Other variables of interest

Rana et al. (2015)) have noted that a range of variables, not integrated in the approaches described above, have been examined for their potential to explain technology adoption. For these authors and others (see for example Carter & Bélanger, 2005) there are opportunities to further expand the list of determinants of adoption with more systematic study of variables such as potential users' trust in the technology and the perceived risks associated with its use:

...the relationships of various constructs such as trust, risk, and privacy and security with the variables including behavioural intention, use behavior, and attitude, and between themselves (such as trust with risk) represent a new dimension in this research. (Rana et al., 2015, p. 549).

1.2 Research objectives

The objectives of this research are to contribute to current understanding of the predictors of citizen uptake of e-government services. First, we offer a comprehensive explanatory

theoretical framework based on the key predictors of intentions to use e-government services identified in previous research. Second, we provide researchers in the field an overview of the main themes and methodological approaches present in the literature. This objective is achieved by conducting a “systematic review of reviews” (or “rapid review”) which serves to render an expansive collection of primary studies accessible for the purpose of analysis and synthesis. In so doing, we highlight opportunities for further research to address existing gaps in the knowledge base.

2. Material and methods

We used a rapid review (aka ‘review of reviews’, Smith, Devane, Begley, & Clarke, 2011) approach to identify and synthesise evidence on the predictors of citizens’ use of e-government. Rapid reviews are an emerging technique to efficiently and transparently synthesise research, and are commonly used and highly cited in other fields (particularly medicine and public health). Rapid reviews bring together ‘a summary of all reviews in one place’, and serve as a useful resource for practitioners and researchers to appraise reviews systematically, and use their findings to inform evidence-based practice (Smith et al., 2011). Like systematic reviews, rapid reviews use transparent methods for searching, extracting, synthesising, and reporting (Khangura, Konnyu, Cushman, Grimshaw, & Moher, 2012). However, unlike systematic reviews, rapid reviews use reviews rather than individual studies as their key unit of analysis. As such, they are particularly useful when there are multiple reviews on an important topic (Smith et al., 2011). We report our review in accordance with the widely-used PRISMA guidelines, which ensure full and transparent reporting of methods and results (Moher, Liberati, Tetzlaff, Altman, & Group, 2009).

2.1 Search strategy

To identify reviews of research on citizen adoption of e-government, we searched three academic databases (Proquest, Web of Science, and PsycINFO) and Google Scholar (first 100 results/10 pages) using search terms associated with e-government adoption ("e-government adoption" OR "e-government us*" OR "e-gov adoption" OR "e-gov use" OR "online government adoption" OR "online government us*") and terms associated with literature reviews ("literature review" OR "systematic review" OR "meta analysis" OR review). Given the fast pace of e-government technology, searches were restricted to include only papers published since 2006).

2.2 Inclusion criteria

Reviews were included if they met all the following inclusion criteria:

1. The article must review evidence of the causes or correlates of adoption of e-government by citizens.
2. The article must be a systematic review or meta-analysis.
3. Date: 2006 onwards. Given the fast-changing nature of this topic area, the last ten years only were included.
4. Research methods of studies included in reviews: All.
5. Language: English only
6. Publication type: Peer-reviewed journal articles and published conference papers.

2.3 Screening and data extraction

The search and screening process is shown in Figure 1. We initially screened the titles and abstracts all records identified in our searches (n=350), and identified 39 records that potentially met inclusion criteria. We then screened the full text of these records, ten of which met all inclusion criteria and were included in the review. These screening processes were conducted independently by two referees. Any disagreements about inclusion were settled

collaboratively by the two referees. Data was then extracted from each review. The data extracted from each review included: review type; topic; number of studies; number of participants; study designs; and key findings.

Figure 1: Search and screening process

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184 2.4 Review protocol

Publishing review protocols that detail the conduct of the review prior to the review being conducted is important for avoiding bias and maximising transparency (Shea et al., 2007). Publishing review protocols ensures that authors cannot make unreasonable post-hoc

adjustments to the method to alter the conclusions of the review. A protocol for this review was preregistered and published online before full-text screening and data extraction occurred¹. We made two substantive changes to the review procedure after the protocol was published. First, the original protocol included not only systematic reviews, but also traditional literature reviews. When we drafted the original protocol, we expected to find very few systematic reviews in this area. However, we found substantially more systematic reviews than we had originally anticipated. We decided to limit the inclusion criteria to systematic reviews only because such reviews are generally considered to be higher quality, have less risk of bias than traditional reviews, and are the preferred unit of analysis in the rapid review methodology we have utilised here (Khangura et al., 2012). Second, we searched an additional database (PsycINFO) that was not listed on our original protocol to reduce our likelihood of missing important reviews. This decision, however, did not impact the findings, as no additional records meeting inclusion criteria were identified via this source.

2.5 Assessment of methodological quality

We used the AMSTAR checklist to assess the methodological quality of all reviews that met inclusion criteria (Shea et al., 2007). This checklist uses a set of eleven items with well-established validity and reliability, and is commonly used to assess the methodological quality of systematic reviews (Bragge et al., 2015; Monasta et al., 2010). Critical appraisal of each review was carried out by one of the authors.

2.6 Synthesis approach

We used thematic synthesis (Thomas & Harden, 2008) to summarise themes in research on citizen adoption of e-government. Thematic synthesis is a method used to identify qualitative

¹ <https://osf.io/cnjm5/>

themes in research articles. We employed the approach by, first, extracting the predictors of citizen uptake of e-government identified in each of the included reviews. We then identified overarching categories of predictors that included or described all the predictors extracted from included reviews.

3. Results

3.1 Background characteristics

Seven of the ten included reviews were narrative systematic reviews (i.e. reviews that sought to systematically search for relevant literature, and synthesise it qualitatively), two were meta-analyses (i.e. reviews that statistically combined the results of available quantitative studies) and one was a network review (i.e. a novel type of review that systematically combines concepts into a network map that illustrates hypothesised linkages between those concepts).

The studies reviewed by the included articles used a variety of methods, including conceptual approaches, qualitative methods, quantitative methods, and case studies. In Hassan, Shehab, and Peppard (2011) systematic review of 224 studies, 44% of those studies were conceptual, a further 30% were qualitative, and just 12% were quantitative. In the largest meta-analysis (Weerakkody et al., 2014), 86% of all studies were surveys. None of the included reviews reported finding studies that used experimental or quasi-experimental techniques to test whether variables had a causal effect on citizens' adoption of e-government. Similarly, no review reported finding studies that tested interventions to increase citizens' adoption of e-government using randomised control trials.

230 *Table 1: Characteristics of included reviews*

Reference	Review type	Topic	Types of participants	Number of studies included	Total number of participants/ units	Study designs of included studies
Akkaya, Wolf, and Krcmar (2010)	Narrative systematic	The role of trust in influencing e-Government acceptance	Citizens	24 studies	Not reported	‘Conceptual’ and ‘empirical’. Numbers of each type not specified
Hassan et al. (2011)	Narrative systematic	E-service in the public sector	Not specified	224 studies	Not reported	98 conceptual studies; 68 qualitative studies; 26 quantitative studies; 32 combination studies. Note: Exact numbers were not reported, but were illustrated in a graph
Hofmann, Räckers, and Becker (2012)	Narrative systematic	Factors that influence acceptance of e-Government services	Citizens, businesses, governments, government employees	22 studies	17612 participants	12 ‘empirical surveys’ ; 3 ‘empirical analysis’; 2 used a combination of ‘empirical analysis’ and ‘content analysis’; 1 mixture of empirical survey and qualitative analysis; 1 qualitative analysis; 1 content analysis; 1 mixture approach of cards technique and qualitative analysis
Mäntymäki, (2008)	Narrative systematic	Trust in e-commerce and e-government	Citizens	10 e-government studies	Not reported	Not reported

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Reference	Review type	Topic	Types of participants	Number of studies included	Total number of participants/ units	Study designs of included studies
Mahmood, Osmani, and Sivarajah (2014)	Narrative systematic	Trust in e-government	Citizens (implied)	20 studies	Approx 11600 participants	14 quantitative surveys; 4 mixed-methods; 1 qualitative
Patel and Jacobson (2008)	Narrative systematic	Factors that influence government-to-citizen electronic service adoption	Citizens	13 studies about citizen e-government adoption	Not reported	Not reported
Rana et al. (2015) ^σ	Meta-analysis	Factors that influence e-government adoption	Citizens	63 studies	47474 participants	Not reported
Titah and Barki (2006)	Narrative systematic	E-government adoption and acceptance	Citizens, governments, businesses, employees	75 studies	Over 13 000 individuals; 44 cases; and, 235 documents or websites.	25 case studies; 18 surveys; 16 conceptual; 5 content analysis; 3 action research; 10 other
van de Wijngaert, Bouwman, and	Network review	Adoption of e-government services	Not specified	15 studies	Not reported	Not reported

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Reference	Review type	Topic	Types of participants	Number of studies included	Total number of participants/ units	Study designs of included studies
Contractor (2014)						
Weerakkody et al. (2014)	Meta-analysis	Adoption of e-government services	Not specified	147 studies	Not reported	126 surveys; 16 interviews; 5 secondary data analysis; 4 case studies; 4 focus groups; 4 other

Note: ° This review was published across several publications (Rana, Dwivedi, & Williams, 2013; Rana, Dwivedi, & Williams, 2014; Rana, Williams, & Dwivedi, 2012; Rana, Williams, Dwivedi, & Williams, 2011; Rana, Williams, Dwivedi, & Williams, 2012). All these publications reviewed almost identical literature. As such, we included only the most recent of these publications in our review.

3.2 Quality appraisal

The methodological quality of included reviews varied from low to moderate, with scores ranging between 1 and 5 out of 11 (see Table 2). The most consistent weaknesses in the included reviews were: failing to provide ‘a-priori’ designs, failing to assess the quality of included studies, and failing to assess the possibility of publication bias.

Table 2: AMSTAR quality appraisal of included reviews

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	Akkaya et al. (2010)	Hassan et al. (2011)	Hofmann et al. (2012)	Mäntymäki (2008)	Mahmood et al. (2014)	Patel and Jacobson (2008)	Rana et al. (2015)	Titah and Barki (2006)	van de Wijngaert et al. (2014)	Weerakkody et al. (2014)
1. Was 'a priori' design provided?	No	No	No	No	No	No	No	No	No	No
2. Was there duplicate study selection and data extraction?	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure	Unsure
3. Was a comprehensive literature search performed?	No	No	No	No	No	Unsure	No	Yes	No	No
4. Was the status of publication (i.e., grey literature) used as an inclusion criterion?	No	No	No	No	No	Unsure	No	Yes	No	No
5. Was a list of studies provided?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
6. Were the characteristics of the included studies provided?	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No
7. Was the scientific quality of the included studies assessed and documented?	No	No	No	No	No	No	No	No	No	No
8. Was the scientific quality of the included studies used	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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appropriately in formulating conclusions?										
9. Were the methods used to combine the findings of studies appropriate?	Yes	Yes	Yes	Unsure	Yes	Unsure	Yes	Yes	Yes	Yes
10. Was the likelihood of publication bias assessed?	No	No	No	No	No	No	No	No	No	No
11. Was the conflict of interest included?	No	Yes	No	No	No	No	No	No	No	No
Total score (out of 11)	3	2	3	1	3	2	3	5	2	1
Quality rating	Low	Low	Low	Low	Low	Low	Low	Moderate	Low	Low

3.3 Predictors of e-government use

After extracting the key findings of each review (shown in Table 3), we used thematic synthesis to identify common categories of variables that the reviewed literature indicated were associated with e-government uptake. In doing so, we developed a comprehensive model of predictors of citizens' use of e-government (see Table 4). The model includes 18 predictors across four categories: (1) user perceptions; (2) user background; (3) environmental characteristics; and, (4) service characteristics. There were different amounts of evidence available for the eighteen predictors. *Trust* had the most evidence, with 10 reviews addressing the effect of *trust*. Conversely, less evidence was available for *demographics*, *civic mindedness*, and the *authority level* of the agency providing service, with just one review addressing each of these concepts. The highest quality review (Titah & Barki, 2006) suggested that perceived *ease of use*, *perceived usefulness*, *trust*, *awareness of service*, *privacy and security*, and *mobility and accessibility* influenced e-government uptake.

Table 3: Key findings of included systematic reviews

Reference	Key findings
Akkaya et al. (2010)	<ul style="list-style-type: none"> 24 out of 164 papers on e-government investigated the role of trust. 4 of those 24 papers also investigated culture. No conclusions about the direction or strength of trust- or culture- effects were provided.
Hassan et al. (2011)	<p>Factors influencing citizen adoption of e-government:</p> <ul style="list-style-type: none"> Privacy and security risk barriers (e.g. concern about misuse of personal information) Technological barriers (e.g. access to the internet) Cultural barriers (e.g. low interest and awareness)
Hofmann et al. (2012)	<p>Factors influencing citizen adoption of e-government:</p> <ul style="list-style-type: none"> Technology characteristics <ul style="list-style-type: none"> Perceived ease of use/ effort expectancy Perceived usefulness/ performance expectancy Perceived compatibility

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Reference	Key findings
	<ul style="list-style-type: none"> • Environmental characteristics <ul style="list-style-type: none"> • facilitating conditions (“organizational and technical infrastructure exists to support use of the system”) • perceived access barriers to e-Government services • Service characteristics <ul style="list-style-type: none"> • Level of satisfaction • Information quality (“accurate, valid, and timely”) • Privacy • Mobility (“degree of flexibility a user can achieve by ‘eliminating location and time or schedule restrictions’”) • User characteristics <ul style="list-style-type: none"> • Self-efficacy (“the ability of a technology user to master a new technology”) • Trust (in the internet and in government) • Confidence in structural assurance of the internet (e.g. technical and legal safeguards) • Confidence in the e-Government agency’s internet competence • Other constructs <ul style="list-style-type: none"> • Disposition to trust (“user’s ‘general propensity to trust others’”) • Task complexity (“the degree of ambiguity and uncertainty involved”) • Service quality (“perception of the reliability of the offered services”) • System or website quality (perceived “technical performance of the website for information retrieval and delivery”) • Authority level of an agency (state or federal) • Convenience (perceived “time and effort required”) • Flexibility (ability to “adapt to the changing demands of citizens”) • Assistance (“perception that help can be easily obtained”) • Socioeconomic variables.
Mäntymäki (2008)	<ul style="list-style-type: none"> • Trust influences adoption of e-government • Trust is typically conceptualized and measured in e-government literature as two constructs: (1) trust in e-government technology; and (2) trust in government.
Mahmood et al. (2014)	<ul style="list-style-type: none"> • Studies examining the effect of trust on e-government have mostly used quantitative survey methods. • The average effect of trust on e-government adoption was not calculated.

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Reference	Key findings
	<ul style="list-style-type: none"> Authors concluded that trust influences e-government adoption.
Patel and Jacobson (2008)	<p>Factors that influence citizen adoption of e-government:</p> <ul style="list-style-type: none"> Perceived risks Perceived barriers Perceived uncertainty Civic-mindedness Trust in government Demographic factors (Gender, education) Experience and skill Perceived usefulness Perceived ease of use
Rana et al. (2015)	<p>Variables significantly correlated with intention to use e-government, in descending order of effect size:</p> <ul style="list-style-type: none"> performance expectancy attitude perceived usefulness perceived behavioural control subjective norms facilitating conditions resources compatibility primary influence trust relative advantage social influence perceived ease of use effort expectancy <p>Variables not significantly correlated with intention to use:</p> <ul style="list-style-type: none"> facilitating conditions self-efficacy image perceived risk

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Reference	Key findings
Titah and Barki (2006)	<p>Citizen-relevant factors influencing e-government adoption (factors irrelevant to citizen adoption are excluded from list):</p> <ul style="list-style-type: none"> • Perceived usefulness • Perceived ease of use • Trust • Data security • Accessibility • Perceived confidentiality
van de Wijngaert et al. (2014)	<p>Predictors investigated:</p> <ul style="list-style-type: none"> • Time • Completeness • Image • Information quality • Rejection • Compatibility • Experience • Offline quality • Social influence • Self efficacy • Ease of use • Access • Usefulness • Trust in technology • Content • Implementation • Trust in government • Future developments • Satisfaction • Cost • Awareness

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Reference	Key findings
Weerakkody et al. (2014)	<p>Predictors of behavioural intention:</p> <ul style="list-style-type: none"> • Perceived usefulness • Perceived ease of use • Trust • Attitude • Satisfaction • Perceived risk • Service quality • Perceived behavioural control • Subjective norm • Relative advantage • Compatibility • Image • Social influence • Complexity • Information quality • System quality • Effort expectancy • Performance expectancy

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256 *Table 4: A comprehensive model of the predictors of citizen e-government uptake*

Category	Predictor	Description
User perceptions	Perceived ease of use	The extent to which users think the e-government service is simple, straightforward, and quick to use. Also known as “effort expectancy”
	Perceived usefulness	The extent to which users think the e-government service will allow them to perform a desired task. Also known as “performance expectancy”, or “perceived benefit”.
	Trust	The extent which users have confidence in the service, the technology, and the government offering the service.

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	Perceived ability	The extent which users perceive themselves to have the skills necessary to use the e-government service. Also known as “self-efficacy”.
	Attitude	The extent to which using an e-government services is evaluated by the user as being generally positive or negative.
	Satisfaction with service quality	The extent to which the user is satisfied with the reliability of the e-government service.
	Awareness of service	Knowledge that an e-government service exists.
	Social influence	Beliefs about whether other people are using, and approve of using, the e-government service. Also known as “subjective norms”.
	Perceived compatibility	Degree to which an e-government service is seen to be consistent with citizens’ existing values, beliefs, experiences and needs.
User background	Demographics	Characteristics such as age, education, income, and ethnicity.
	Culture	Common values and norms within a society.
	Civic mindedness	Individuals’ general tendency to engage in public and political life (e.g. through previous civic engagement, political action, or interactions with government).
Environmental characteristics	Facilitating conditions	Availability of assistance to help citizens use an e-government service.
	Access barriers	Lack of access to an internet-connected device.
Service characteristics	Information quality	The accuracy, timeliness, and completeness of the information in an e-government service
	Privacy and security	Extent to which an e-government service properly manages and protects personal information.
	Mobility and accessibility	Extent to which an e-government service offers a degree of flexibility, especially for users with a disability.
	Authority level of agency providing service	Indicator of whether the government is located at the state or federal level.

258 *Table 5: Concepts covered in included reviews*

Category	Predictor	Review											Total number of reviews	Evidence quality indicator ^σ
		Akkaya et al. (2010)	Hassan et al. (2011)	Hofmann et al. (2012)	Mäntymäki (2008)	Mahmood et al. (2014)	Patel and Jacobson (2008)	Rana et al. (2015)	Titah and Barki (2006)	van de Wijngaert et al. (2014)	Weerakkody et al. (2014)			
User perceptions	Perceived ease of use			1			1	1	1	1	1	6	Moderate	
	Perceived usefulness			1			1	1	1	1	1	6	Moderate	
	Trust	1	1	1	1	1	1	1	1	1	1	10	Moderate	
	Perceived ability			1			1	1		1	1	5	Low	
	Attitude							1			1	2	Low	
	Satisfaction with service quality			1						1	1	3	Low	
	Awareness of service								1	1		2	Moderate	
	Social influence							1		1	1	3	Low	

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	Perceived compatibility	1		1		1		3	Low
User backgrounds	Demographics	1						1	Low
	Culture	1	1					2	Low
	Civic mindedness			1				1	Low
Environmental characteristics	Facilitating conditions	1		1				2	Low
	Access barriers	1	1		1		1	4	Low
Service characteristics	Information quality	1				1	1	3	Low
	Privacy and security	1	1			1		3	Moderate
	Mobility and accessibility	1				1	1	3	Moderate
	Authority level	1						1	Low

Note: ^o Evidence quality ratings are assigned based on the highest quality review available. For example, evidence for 'perceived ease of use' was deemed 'moderate' because it was addressed in Titah & Barki (2006), which was assessed as being of moderate quality according to AMSTAR criteria (see Table 2).

4 DISCUSSION

This rapid review of research on citizen uptake of e-government services has highlighted several important results. An important contribution of this review is to synthesise the range of factors theorised to influence citizen engagement with e-government into a single comprehensive conceptual model. There were eighteen predictors of e-government use across four categories: users' personal characteristics (e.g., socio-economic status), environmental conditions (e.g., barriers and facilitators to service access), service attributes (e.g., quality and privacy), and user perceptions (attitudes, social norms, trust). Taken together, these theorised explanatory variables extend the theoretical positions described earlier in this article and can serve as an integrated conceptual model to guide future research on citizens' engagement with e-government.

The model proposed in this review serves to unify existing theoretical approaches to citizen uptake of e-government services by incorporating predictors from existing theories including TAM, TPB, DI, and UTAT. The model also extends existing theories by including additional predictors which have been identified in research but not yet incorporated into any existing models. This is most notable in the case of *trust* which is not explicitly included in any of the discussed theories. The comprehensive nature of the model provides a holistic framework which can be used by academics and government employees wishing to increase citizen uptake of e-government.

4.1 Trust, barriers and expectations

This review reveals that user perceptions of trust has been the most discussed concept in previous e-government research. This is perhaps unsurprising given that much research on new technologies and supporting government initiatives have been scrutinised for their apparent trustworthiness (Cigdem Akkaya, Obermeier, Wolf, & Krcmar, 2011; Carter &

Bélanger, 2005; Mahmood et al., 2014). Although the concept of trust has not been clearly articulated in the main frameworks that have been utilised by researchers in the field (Rana et al., 2015), issues of trustworthiness featured prominently in the reviewed literature. The focus of trust perceptions, however, has shown significant variation in the literature, including trust in the technology of e-government (van de Wijngaert et al., 2014), trust in the government (Patel & Jacobson, 2008) and trust as a personality attribute of the user (Hofmann et al., 2012). This might reflect differences in the context of past research studies or, more likely that, when applied to understanding citizen engagement with e-commerce, the concept of trust has a broad application. While it is possible to argue that trust in e-government technology conceived as “reliability” might constitute an aspect of “system performance” or “information quality” in some theoretical prescriptions (e.g., the Information Systems Success Model), and that trust in government and the dispositional tendency to be trusting might fall within the category of “background factors” in the TRA and the TPB, trust concepts are not formal, explicit features of the TRA, TPB, TAM, IS, Diffusion of Innovation or the UTAUT.

Other concepts that present in the literature, such as perceived usefulness and attitude toward the technology, share a common evaluative character with their emphasis on the value of the outcomes that e-government can deliver. Likewise, perceptions of the ease of using e-government services (i.e., perceived behavioural control) and perceptions about one’s ability to engage with e-government (i.e., self-efficacy) share a concern with potential intrinsic and extrinsic barriers to behaviour. This too might be expected given that these concepts, in one form or another, appear in nearly all the behavioural theories presented in the introduction of this article.² Future tests of our integrated model will likely identify redundancies among predictors to the extent that conceptually similar variables are empirically identical. Nevertheless, our review suggests that much can be understood about the public’s likely

² One exception is the Theory of Reasoned Action which does not include a concept of control or self-efficacy.

engagement with e-government by attending to issues of trust, perceived barriers to action, and the expected consequences individuals associate with using e-government services.

4.2 Limitations & future research

Few of the reviews included in this research attended to non-linear relationships in the behavioural models despite moderator variables theorised to operate on the important intention-behaviour relationship (Fishbein & Ajzen, 2011). In one exception, it was found that ease of use was a stronger predictor of behavioural intentions for general users than for either students or professionals (King & He, 2006). Additional boundary conditions might be identified, for example, by comparing studies of different types of user behaviours such as downloading a form and conducting an online transaction. It is evident that further research is needed to test whether the relationships identified in existing research are causal, and to develop and test interventions that effectively increase citizens' adoption of e-government. Weerakkody et al. (2014) noted that the field is overly reliant on cross-sectional and correlational research designs, and that methodological biases (e.g. non-random selection of research participants) may lead to misleading research results and place limits on their generalisability.

It was also evident that the existing systematic reviews in this field were methodological weak. Most notable was that none of the reviews included in this research examined publication bias (Rothstein, Sutton, & Borenstein, 2006) despite several articles explicitly stating a singular focus on published studies. Furthermore, a general absence among the reviews of significant critical reflection on the scientific quality of individual studies, and whether apparent threats to validity support alternative conclusions to those reported in the original studies. Readers should note that this leads to a weakness of our review, given that the theoretically integrated model we present is based on a number of systematic reviews that are almost uniformly low quality according to AMSTAR quality assessment tool.

5 CONCLUSIONS

In conclusion, e-government can provide significant benefits to citizens if individuals are willing and able to engage with it. Understanding user intentions and behaviour can assist in the design and delivery of e-government services to increase their adoption. Systematic reviews help the study of e-government behaviours by enabling the synthesis and analysis of a large body of research on the causes of behaviour and interventions designed to influence it. Our synthesis of systematic reviews has provided researchers in the field with a theoretically and empirically defensible conceptual framework that can be further refined with future research. Our review also identifies gaps in our current understanding of e-government behaviours and recommends that future research does more to identify key causal factors and test behavioural interventions that are informed by these causal relationships in applied efforts to increase citizens' adoption of e-government.

CONFLICTS OF INTEREST

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