Barriers and Benefits in the Adoption of E-Government.

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Barriers and benefits in the adoption of e-government

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Abstract *This article examines the reasons individuals would choose electronic self-service delivery methods over more traditional methods of service delivery for government services. The study investigated the factors related to decision making when people consider and evaluate the usage of an online e-government delivery mechanism. The approach taken was based on a combination of attitudinal technology adoption models and the service quality concept, with data gathered via a questionnaire. Trust, financial security, information quality (all adoption barriers), time and money (both adoption benefits) were found to predict potential usage. That is willingness to use the online delivery option will be present if organisations can develop trust relationships with individuals, assure them that their financial details are secure, provide information that is relevant, accurate and up-to-date, and save individuals time and money. The results are significant to the public service manager who needs to consider both the barriers to adoption and the benefits of adoption if they are to develop plans to increase the take-up of their electronic services.*

Introduction

In response to increasing consumer power many organisations have sought to move to a more customer-centric way of working where the structure, people and processes of the organisation are focused toward meeting customer needs and developing long-term customer relationships – termed customer relationship management (CRM).

The Internet has become an important component of the overall CRM approach in that it can be used as an extension to the traditional business model whereby the Internet has become an additional channel, rather than a separate operating entity (Gulati and Garino, 2000).

However, as discussed by Reichheld and Schefter (2000), while customer retention in e-services is particularly important because of the low switching costs, little is known about how consumers perceive and evaluate electronic service delivery. This is of particular managerial importance in the public sector where UK government organisations have to deliver their services electronically by 2005 (Cabinet Office, 1999). Without an understanding of why UK citizens would use electronic service delivery channels over more traditional service delivery methods, government organisations cannot take the necessary strategic actions to meet their citizen adoption targets for these channels and reduce costs. Therefore, this article attempts to investigate usage intentions and assess likely changes.

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Literature review

Previous research that has been carried out can be described as varying along a continuum from applying existing theories in a technology context to the development of specific technology adoption approaches. These dimensions are applicable since a

consumer choosing an electronic service delivery mechanism over more traditional means can be considered as an issue regarding technology adoption. The three main approaches that have sound theoretical and empirical bases for adoption are:

(1) *Diffusion of innovation* (*DOI*) (Rogers, 1995). In the DOI theory, the adoption of innovation is modelled as a process of information gathering and uncertainty reduction with a view to evaluate the technology (Rogers, 1995). The individual's decision on whether to use the technology is based on perceptions of the technology such as relative advantage, compatibility, complexity, trialability and observability, Agarwal and Prasad (1998) report that there are three main factors that are most supported by empirical studies. These are namely relative advantage, compatibility and complexity. However, these studies tend to apply to the adoption of technology regarding information systems for performing job roles and as such may not be as valid when applied to consumers. That is, the identified antecedents of technology usage may be different for a consumer adopting technology to receive a service and an employee who is using the technology to perform their work responsibilities.

(2) *Extension of existing theory to technology: Technology Acceptance Model* (TAM) (Davis, 1989). Applying the Theory of Reasoned Action (TRA), Davis (1989) developed the TAM and showed that beliefs influence attitudes about information technology, which lead to intentions and subsequently behaviours of actual technology usage. Davis (1989) asserted that perceived usefulness (in respect to enhancing job performance) and perceived ease of use of the technology characterised the beliefs that lead to system usage.

Acknowledging that the TRA is based on the individual's evaluation of the potential to perform a specific task (such as using technology) and is subject to contextual factors, O'Cass and Fenech (2003) demonstrated that the risk in using the technology was a significant factor in determining the intention to use. Extensions to the TAM have been thus proposed, predominantly in the area of subjective norms, which are a key part to the TRA, but were not included within the TAM. Karahanna *et al.* (1999) and Lucas and Spitler (1999) both achieved positive results with respect to social norms (such as the strength attached to the individual's beliefs towards the evaluations that a person held in high regard would have in using the technology). Venkatesh and Davis (2000) acknowledged this and updated the TAM (TAM2) by integrating subjective norms. This model accounted for 50 per cent of the variance in technology usage intention (Legris *et al.*, 2002), indicating that there are other significant factors not yet identified. Furthermore, the vast majority of TAM studies have been conducted with respect to employees, not consumers. Attitudes towards technology have been found to influence Internet usage (Eastlick, 1993; Shim and Drake, 1990), but the more formalised approach provided by TAM has not been widely adopted in Internet research.

While this research did use current Web users via an online survey, thus constraining the external validity, it does capture an important aspect that is lacking in many other research papers. That is, most research considers which attributes affect the individual's propensity to use the Internet in a positive manner, disregarding those that are not significant. O'Cass and Fenech (2003) began to study what factors affect this propensity in a negative manner i.e.

what discourages individuals from adopting the technology. In addition with a growing recognition of the importance of researching attitude with respect to Internet adoption the work of Bobbitt and Dabholkar (2001) has attempted to integrate the various attitude-based theories (TAR, Theory of Planned Behaviour, Theory of Trying) with external factors (such as the product/service category and perceived risks) to explain why individuals may choose technology-based self-service options.

(3) *Application of existing framework to technology: service quality* (for example, Dabholkar, 1996). The two previous models focused specifically on consumer perceptions of technology and their effect on the intention to use that technology. Recently, consumer intentions based on service quality have been applied to service delivery via technology. In the service quality literature, perceptions relate to post-consumption evaluation of service performance, whereas in the previous two models (DOI and TAM), perceptions are pre-determined beliefs that lead to attitudes about the product or service.

Higgins and Ferguson (1991) drawing on Grönroos' (1984) demonstrated that functional quality (how the service is provided to the customer) dominated when the consumer did not have the technical knowledge to make technical evaluations. However, while the concepts of technical and functional quality are easy to understand, it is less simple to test them through empirical means since consumers find it difficult to separate how the service is being delivered (functional) from what is delivered (technical) Lassar *et al.* (2000). This is of special importance in the present research as consumers may find it difficult to evaluate the service quality because of their unfamiliarity with an electronic delivery method.

Parasuraman *et al.* (1985) proposed the SERVQUAL model with five dimensions (tangibles, reliability, responsiveness, assurance and empathy) measuring the gap between consumer evaluations of expectations and perception (i.e. the disconfirmation model of service quality). These ignore the largely technical aspects of service quality, which are relevant to the research here. Cronin and Taylor (1992) proposed a model based solely on consumer perceptions (called SERVPERF), removing the considerations of pre-consumption expectations because they argued that customer evaluation of performance already included an internal mental comparison of perceptions again expectations. The major issues that are immediately apparent are that the delivery of service via electronic means is still a relatively new concept so that many consumers will not have experienced or interacted with it and therefore empirical studies have to take this into consideration.

In his study of consumer evaluation of self-service delivery through technology, Dabholkar (1996) proposed two models to capture the impact of service quality on intention to use: one based on quality attributes, the other on affective predispositions towards technology. The attribute model used dimensions consistent with the service quality literature, although the study did not use any single model, and may have omitted some important dimensions. A potential oversight within the study is that the author used a factor (ease of use) from the TAM work, but did not investigate the potential benefits of using the model itself. The results of the study demonstrated that speed of delivery, ease

of use, reliability, enjoyment and control were all significant factors in determining expected service quality. However, the implementation of these attributes can be questioned because the study was aiming to compare consumer decision making between traditional- and technology-based service delivery, whereas the instrument questions used these attributes in an absolute sense (about the technology), rather than a comparative sense. This is supported by the studies of Meuter *et al.* (2000) and Szymanski and Hyse (2000) who have shown that consumers compared the novel technology service delivery with the traditional alternatives.

Discussion

The literature review has highlighted areas where either the approach or the previous applications have limitations that may be reduced by combining all three approaches. The attitude-based methods are strong because they are supported by accepted behavioural theory linking perceptions to usage intentions. However, the primary drawback appears to be concerning the antecedents that affect the perceptions towards technology. As mentioned earlier, Legris *et al.* (2002) described how the initial list of factors that affect technology adoption were simplified under the TAM and accounted for only 50 per cent of the variance in technology usage intention.

Therefore, the proposition is that by combining the attitude-based and service quality-based approaches, the strong theory linking attitudes to behaviours can be exploited (DOI, TAM), with the service quality literature being used to help identify the antecedents that affect these attitudes (see Tables I and II for an abridged account of the literature sources that generated the study variables). This enables a grounded approach to measuring the variables associated with technology adoption, placing the onus on both the factors affecting consumer intentions to adopt an online service channel (considered in a comparative manner, i.e. relative benefits) and the factors representing a barrier to adopt.

A further dimension to the problem of the prediction of self-service technology adoption is the importance of including the variable of age. Age difference has an impact on the ability to use and subsequently the intention to adopt new technological advances (Sharit and Szaja, 1994; Milligan, 1997). However, there is not a representative distribution of age in the technology adoption studies. For example, the respondents for Liao and Cheung's (2002) study are all between 20 and 35, Dabholkar (1996) reports an average age of 25, and Shim *et al.* (2001) have the large majority of respondents in the 35-44 range.

The objective of this study is based on two stages of enquiry: the first as an exploratory study to identify the factors that may predict technology usage; the second to use the results of the exploratory stage to identify factors which do not predict intention to use the technology service delivery option.

Methodology

The factors impacting on the individual's intention to use the technology self-service option, both the relative benefits and the barriers, have been drawn from DOI studies, TAM studies and approaches to service quality and theory (see Tables I and II). While many of the principles from the reviewed studies can be used, the following reasons justify a modified approach taken in this research:

Factor	Definition	Source references	Notes
Avoid personal interaction	The ability to be able to receive public services without having to interact with members of the service provider's staff	Forman and Ven (1991) Hansen (1995) Meuter *et al.* (2000) Prendergast and Marr (1994)	
Control	The ability to exert more control over the delivery of the service than through another method	Cabinet Office (1998) Dabholkar (1996) Liao and Cheung (2002) Zhu *et al.* (2002)	This can be expressed as giving empowerment to the individual
Convenience	The ability to receive the service how and when the individual wants to	Cabinet Office (1998) Meuter *et al.* (2000) Szymanski and Hyse (2000) Zhu *et al.* (2002)	This factor relates to the electronic service being more accessible and available
Cost	The electronic delivery of public services saving money	Liao and Cheung (2002)	This includes savings to both the individual and the organisation providing the service
Personalisation	The ability to tailor the delivery of the service more towards the individual	Van Riel *et al.* (2001)	Includes the technical aspect of being able to customise a public sector Web site
Time	The time saved by obtaining the service electronically	Berkley and Gupta (1994) Dabholkar (1996) Hansen (1995) Liao and Cheung (2001, 2002)	This includes the time that is spent queuing at government offices or on the phone. It also includes the responsiveness of the service delivery
		Meuter *et al.* (2000)	Relates to the "responsiveness" SERVQUAL dimension

Table I.
Relative benefit factors sources

- The context here is a publicly available service, not one within the workplace.
- While people are aware of the Internet they are unlikely to have received training on how to use it or received direct marketing encouraging them to use it. This is in contrast with potential users in a work environment.
- The delivery of government services via the Internet is relatively new so there are few people who have actually used it.

Thus, rather than questioning individuals on their perceptions developed from actual system usage and relating this to whether they are actually intending to use it further, the study investigates the importance of the candidate benefit-barrier factors relating to potential willingness to use. That is, the study does not measure actual perceptions, but investigates the factors that individuals consider important in evaluating whether or not to use the service and whether this willingness varies with age. These factors are important to the service providers (government departments) because they contribute towards the development of attitudes in making the delivery of public services online more acceptable. This study is summarised by Figure 1.

Factor	Definition	Reference	Notes
Confidentiality	Personal data must be kept private and not used for other purposes	Cabinet Office (1998) Van Riel *et al.* (2001) Zhu *et al.* (2002)	Relates to "Assurance" SERVQUAL dimension
Easy to use	The delivery mechanism must be straightforward to use with minimum effort required	Agarwal and Prasad (1998) Dabholkar (1996) Lederer *et al.* (2000) Meuter *et al.* (2000)	
Enjoyable	Using the system must be an enjoyable experience	Dabholkar (1996) Davis *et al.* (1989) Liao and Cheung (2001)	
Reliable	The Web site must have services that are required, and individuals must trust that a requested service will be delivered	Berkley and Gupta (1994) Evans and Brown (1988) Hansen (1995) Zhu *et al.* (2002)	This factor also includes accuracy and currency (up-to-date) of the information on the Web site Direct relationship with "Reliability" SERVQUAL dimension
Safe	The Web site must be secure with respect to entering financial details	Cabinet Office (1998) Berkley and Gupta (1994) Evans and Brown (1988) Szymanski and Hyse (2000) Liao and Cheung (2001, 2002)	
Visual appeal	The Web site should look good	Lederer *et al.* (2000) O'Cass and Fenech (2003)	This is a technical attribute of the Web site itself, and can be considered as a technical service quality attribute (Grönroos, 1984)

Table II.
Barrier factors

Instrument development

A self-administered postal questionnaire incorporating five-point Likert scales was developed. The questionnaire contained three parts:

(1) Part A: factual questions (demographics and previous Internet experience).

(2) Part B: attitude questions relating to the candidate benefit and barrier factors.

(3) Part C: question for "willingness to use" online public service delivery.

Sample selection and pilot testing

Stratified random sampling was performed during 2002 in Guildford, which is a large city in the south of the UK, from which 50 streets and subsequent street addresses were selected at random from the list of all streets, using SPSS random selection facility.

A pilot study was carried out whereby an identification of the related factors and content of the research instrument (based on the literature) was first discussed with

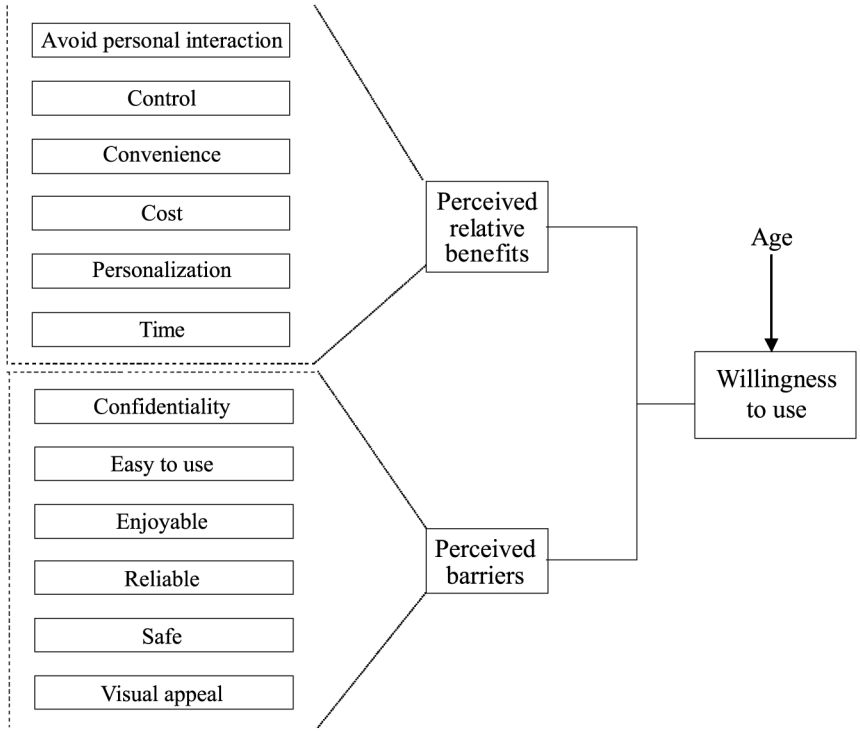

Figure 1.
Summary of operationalisation of research objective

Source: Adapted from factors in Tables 1 and 2

identified industry experts. The resultant questionnaire was then discussed in a focus group involving representative members of the "general public". Finally the improved questionnaires were distributed through postal services within ten streets randomly selected from the list developed.

The reliability of the scales was calculated using Cronbach alpha whereby the scale items in the pilot for benefits and barriers were 0.75 and 0.72 respectively and for the final survey these were 0.83 and 0.8 respectively. However, the reliability may indicate that together the questions measure benefits and barriers, but that they may not group under the 12 factors proposed. Therefore, factor analysis was used to identify the underlying constructs that do characterise the data response and to investigate the convergent and discriminant validity of the emerging factors.

Based on the response rate of 18 per cent from the pilot study, 555 questionnaires were distributed. A follow-up contact of non-respondents was performed to reduce bias and 111 completed questionnaires were returned providing a 20 per cent response rate.

Analysis and results

Compared to the UK total population (1991 census data), age range 25-34 and 55+, and people not working full time were respectively over-represented and under-represented in the sample (Table III).

Summary of responses to questions

Table IV contains the means and standard deviations (SDs) for each benefit and barrier construct.

The constructs with the largest means (5 = "Strongly agree" to 1 = "Strongly disagree") are those that the respondents have deemed to be the most important. Of the largest five means, only one of them is a construct from the "relative benefits" factors (relating to time), which provides an initial indication that, currently, people are more concerned about the risks than the potential benefits. This may be due to the current immaturity of the offering and the lack of exposure that the general public has to government services online.

The largest means are those relating to safety, confidentiality and reliability. This is a potentially important observation given that the only potential barrier included within the attitude based models is the "ease of use" of the technology option. It is interesting to note that one of the questions ("prepared to pay for the online service", 2.05) within the cost construct has the lowest mean for all questions across constructs,

Category	Response	Study response (%)	1991 census (%)
Age	18-24	14	13
	25-34	42	20
	35-54	35	33
	55+	9	34
Work status	Full-time	89	46
	Not full-time	11	54

Source: Fieldwork and LGA (2000)

Table III.
Comparison of demographic data

Construct	Mean	Standard deviation
Perceived benefits		
Avoid personal interaction	3.60	0.94
Control	4.20	0.76
Convenience	3.96	0.96
Cost	3.17	1.10
Personalisation	3.55	1.00
Time	4.15	0.80
Perceived barriers		
Confidential	4.80	0.54
Easy to use	4.34	0.64
Enjoyable	3.46	1.00
Reliable	4.55	0.62
Safe	4.57	0.61
Visual appeal	3.81	0.89

Note: $n = 111$
Source: Fieldwork

Table IV.
Descriptive statistics attributed to construct

indicating that people certainly would not expect to pay for electronic service delivery even if the level of service exceeded other methods.

Factor analysis

Exploratory factor analysis was used to identify the constructs that characterise the attitudes towards the online delivery of public services. To identify the number of key (also called principal) factors that explain the majority of the variance within the data and satisfying the assumptions of the test (Kline, 1997), the principal component method was used. Table V summarises the results.

Question	Candidate factor	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9
1	Easy	−0.104	−0.008	−0.065	−0.026	0.072	0.026	−0.109	0.419	−0.086
2	Time	0.131	0.150	−0.002	0.121	0.162	−0.190	0.170	0.592[a]	0.193
3	Safe	−0.006	−0.051	0.017	−0.258	0.072	−0.131	−0.027	0.016	−0.043
4	Convenience	0.215	−0.139	0.155	0.085	0.017	−0.218	−0.039	0.272	0.095
5	Visual	0.505[a]	0.120	0.011	0.033	0.003	0.081	−0.047	−0.026	−0.048
6	Easy	0.093	−0.021	0.030	−0.114	0.151	0.484[b]	−0.169	0.079	−0.084
7	Reliable	0.080	0.003	−0.001	0.162	0.257	0.352[b]	−0.046	0.103	0.070
8	Visual	0.994[a]	−0.102	−0.154	−0.046	0.073	−0.130	−0.008	−0.092	−0.133
9	Time	0.204	0.152	0.199	−0.016	0.236	0.111	0.253	0.168	−0.244
10	Control	0.235	0.095	0.198	−0.084	−0.041	0.180	−0.128	0.351[b]	−0.038
11	Personalise	0.098	0.321[b]	−0.007	0.091	−0.044	−0.054	0.191	0.277	−0.271
12	Convenience	0.287	0.088	0.037	−0.058	−0.230	−0.129	−0.060	0.395[b]	−0.108
13	Reliable	−0.057	−0.058	0.282	−0.110	0.108	0.567[a]	0.026	0.063	0.013
14	Avoid	−0.003	0.118	−0.001	0.667[a]	0.063	−0.145	−0.056	0.066	−0.167
15	Time	0.119	−0.049	0.309[b]	0.176	0.040	−0.095	−0.267	0.273	0.128
16	Cost	0.157	0.346[b]	0.062	0.252	0.196	0.020	0.042	−0.003	−0.131
17	Reliable	0.097	0.060	0.166	0.105	−0.065	−0.047	0.747[a]	−0.080	0.052
19	Easy	−0.050	−0.070	0.182	0.133	0.274	0.259	−0.099	0.248	0.322[b]
20	Time	0.096	−0.199	0.246	0.215	0.155	0.067	−0.170	0.126	0.338[b]
21	Control	0.064	0.458[b]	0.196	0.017	0.034	−0.031	−0.120	0.035	−0.085
22	Avoid	0.099	0.297	0.250	−0.284	0.109	−0.042	−0.132	0.178	0.022
23	Safe	−0.079	0.176	0.682[a]	−0.018	−0.141	−0.041	−0.060	−0.108	0.013
24	Cost	0.012	0.592[a]	0.029	0.090	0.023	0.042	−0.068	0.012	0.045
25	Person	0.033	0.168	0.114	−0.100	0.073	−0.012	−0.012	−0.072	−0.221
26	Easy	−0.107	0.130	0.129	−0.060	0.210	−0.211	−0.255	−0.008	−0.178
27	Safe	0.048	0.213	0.029	−0.256	0.234	0.033	−0.028	0.098	−0.176
28	Enjoyable	0.182	0.185	−0.115	0.080	0.042	−0.049	0.004	−0.096	0.772[a]
29	Person	−0.146	0.163	−0.106	−0.241	−0.048	−0.243	−0.240	0.222	−0.216
30	Confidential	0.042	−0.007	0.024	0.045	−0.120	0.540[a]	−0.094	0.002	−0.012
31	Enjoyable	0.165	−0.090	−0.030	0.052	−0.004	−0.044	0.065	0.073	0.823[a]
32	Reliable	0.180	0.100	0.327[b]	−0.142	0.204	−0.049	−0.175	0.024	0.103
33	Easy	−0.009	0.106	0.157	0.318[b]	0.254	0.080	−0.167	0.102	−0.278
34	Enjoyable	0.078	0.085	−0.076	−0.124	0.737[a]	0.090	−0.085	−0.015	−0.052
35	Reliable	0.006	0.030	−0.092	−0.048	0.067	−0.032	0.609[a]	0.048	0.028
36	Visual	0.020	0.085	−0.134	−0.005	0.400[b]	0.109	−0.024	0.089	−0.251

Table V.
Results of factor analysis for nine extracted factors

Notes: $n = 111$; [a] Higher factor loadings (> 0.5); [b] Moderate factor loadings (> 0.3)
Source: Fieldwork

From Table V, nine factors were identified (high factor loadings (> 0.5) have been highlighted by a superscript "a", while moderate loadings (> 0.3) have been highlighted by a superscript "b"), four of which are original factors, and five are new factors. While the relative benefit factors of avoid interaction, cost and time remained, the individual factors for convenience, control and personalisation no longer existed. This result does not agree with the studies that have identified these very factors. Potentially this is thought to be due to the different application in that this is government service over the Internet.

Within the barrier factors easy to use, security, confidential, reliable and enjoyable have all been replaced with factors that are a combination of the items within the original factors. This is a significant result since the attitude-based models (such as the TAM) all have "easy to use" as the single barrier to adoption. Here, easy to use was not found to be a factor used in evaluating such technology options but there were five other barrier factors: experience, financial security, information quality, low stress and trust.

An important observation is that the reduction in factors has come from the relative benefits side rather than the barriers, indicating again that the barriers to use are especially important in determining whether people will adopt public sector online service delivery.

Hypotheses testing

While the nature of the data is ordinal (use of Likert scale for each statement considered on their own) the use of parametric tests is warranted in line with previous research reviewed earlier in this article as the underlying scale is continuous for each construct (Tabachnick and Fidell, 2001). The assumptions of the tests used, namely linearity, homoscedasticity (the latter two assumptions were checked after generating scatterplots), random sample, normality and independence of observations are here all satisfied.

Pearson linear correlation and multiple linear regression were performed below to test whether each identified factor does not predict the intention to use the technology service delivery option. Actual dependency between the nine factors and willingness to use was investigated as to whether there is any potential relationship by considering the correlation between each of the factors and that of "willingness to use" (see Table VI).

All results were statistically significant at the 95 per cent confidence level except for the "avoid interaction" factor. Therefore, it indicates that there is a relationship between willingness to use and each of the factors identified except for the 'avoid interaction' factor. More specifically there is a strong correlation ($r \geq 0.5$) between time, financial security, trust, information quality and willingness to use the government online service; and a medium correlation between cost, experience, visual appeal, low stress and willingness to use the government online service. This is reflected in the variance shared by the variables (r^2), with time helping to explain 58 per cent of the variance in respondents' scores on the willingness to use scale, with financial security at 42 per cent, trust at 38 per cent, information quality at 28 per cent and cost at 23 per cent. The other factors only have an explained variance of 15 per cent or lower.

Factor	r	r^2	Sig. (two-tailed)
Avoid interaction	0.182	0.033	0.061
Cost	0.478	0.229	0.014
Time	0.763	0.582	0.000
Visual appeal	0.328	0.108	0.042
Experience	0.363	0.132	0.002
Financial security	0.651	0.424	0.001
Information quality	0.525	0.276	0.021
Low stress	0.307	0.094	0.033
Trust	0.614	0.377	0.000

Note: $n = 111$
Source: Fieldwork

Table VI.
Correlation between new factors and "willingness to use"

Since the correlation analysis demonstrated a relationship between some of the constructs, a multiple linear regression analysis was performed to investigate whether any of the factors actually predict willingness to use the technology and see which variables have the greatest effect. Tables VII and VIII show the results obtained.

The interpretation of the results in Tables VII and VIII is that the linear combination of the factors was significantly related to the willingness to use the

	Sum of squares	df	Mean square	F	Sig.
Regression	53.377	9	5.931	40.923	0.015
Residual	18.695	101	0.145		
Total	72.072	110			
	R	R^2			
	0.566	0.320			

Note: $n = 111$
Source: Fieldwork

Table VII.
Results of multiple linear regression

	Unstandardised coefficients		Standardised coefficients		
	B	Std error	Beta	t	Sig.
(Constant)	−2.293	0.429		−5.348	0.000
Avoid interaction	0.040	0.032	0.061	−1.243	0.216
Cost	0.039	0.014	0.160	2.772	0.006
Time	0.168	0.019	0.519	8.958	0.000
Visual appeal	0.030	0.025	0.065	−1.212	0.228
Experience	0.001	0.016	0.002	0.037	0.970
Financial security	0.097	0.027	0.233	3.525	0.001
Information quality	0.038	0.044	0.191	3.085	0.004
Low stress	0.013	0.027	0.026	0.462	0.645
Trust	0.072	0.023	0.200	3.181	0.002

Note: $n = 111$
Source: Fieldwork

Table VIII.
Results of multiple linear regression

technology self-service option, accounting for approximately 32 per cent of the variance ($F(9, 101) = 40.923$, $p < 0.05$).

It can be seen that the strongest significant predictors of willingness to use the technology at the 95 per cent confidence level, are: time, financial security, trust, information quality and cost. However, it was found by means of an analysis of variance (ANOVA) test that the over 55s are less likely to adopt the services than younger respondents.

Discussion and conclusion

The present research identified nine factors that are shown to be reliable measures for characterising the attitudes towards online public service delivery. These nine factors were either slight modifications of the original factors ensued from previous studies, or totally new factors; three of which were relative benefits (less time, cost and avoiding interaction) and six of which were barriers to adoption (experience, information quality, financial security, low stress, trust and visual appeal). These results offer a more detailed understanding than previous approaches. In the majority of other studies (such as Venkatesh, 2000, Agarwal and Prasad, 1998) ease of use as a single factor is considered based on factors such as experience and low stress, indicating that the ease of use is previously dealt with as too generic a factor. The three relative benefit factors identified of time, cost and avoiding interaction can be compared to other study approaches. Of these three, time is richer in content than other studies, in that it relates to activities that save time, such as easy to complete forms and access from a number of locations. The cost factor is identified in other studies, such as Liao and Cheung (2001) and Zhu *et al.* (2002), whereas the avoiding interaction factor is not. It was raised in Meuter *et al.* (2000) because some respondents were asked to consider negative service experiences, rather than just positive ones. This provides some support to a general conclusion of this study that the previous focus on the positive benefits may not take into account negative aspects that may actually prevent usage. In addition, it may be that government sector employees who deal directly with the public are perceived as particularly inefficient in comparison to commercial sector workers.

The test results showed that all factors except avoid interaction correlated with a willingness to use electronic government services; where time, cost, financial security, trust and information quality were the significant predictors of usage. This result indicates that the previous models are restricted in that they do not consider the barriers to adoption and that the benefits of usage will never be realised if these concerns are not addressed. This supports the results obtained for the attitude models in previous research that only capture 50 per cent of the usage intention (Venkatesh and Davis, 2000), and that success modifications have only increased this percentage incrementally (Lassar *et al.*, 2000). It is proposed here that those models already capture the majority of the usage intention from the benefits perspective, but that significant advances will not be achieved unless the barriers to adoption are fully understood.

Furthermore, the results differ from some of the published literature in that ease of use and some of the perceived usefulness aspects did not emerge as important from the results. This may be because previous applications (Davis, 1989; Agarwal and Prasad, 1998) were predominantly applied in the work environment to technologies introduced for employees, rather than to the Internet.

There are management implications of the results. Strategically, a public organisation could initially focus on the barriers to adoption in order to encourage individuals to use the Internet channel. Two-thirds of the factors identified were barriers, indicating that there are major areas of concern for this relatively new approach to delivering public services. The strategic aim could be to develop a trust relationship with the public, giving assurances that their data (both personal and financial) will be secure, and that the information contained on the Web site would be both current and accurate. Operationally, each department within a government organisation that provides services through an electronic channel will need to ensure that the information they display on the Web site is relevant, accurate and up-to-date, in order to provide a high level of information quality. There need to be the organisational processes to ensure that the level of information quality is maintained, and that there is consistency across the whole organisation.

In addition, each department should concentrate on how the delivery of their services online could save citizens time and money. For some services that traditionally take a long time it should be ensured that applications are straightforward to make and that they are processed quickly. For example, applying for a passport can be a time-consuming procedure. Delivery online could involve providing responses to a set of questions that are asked individually rather than as part of a complicated form. Providing the ability to track the progress of the application could also save time in terms of removing the need to telephone the passport office. For the money saving perspective, discounts could be offered for obtaining services online rather than in person. For example, discounts could be offered for council tax or leisure centre tickets paid online. However, care would have to be taken that these do not exclude citizens who cannot access the Internet, since this would contradict the government's social inclusion mandate i.e. that all citizens must have access to the same level of services.

The results indicated a significant difference in the willingness to use the technology according to the age of the respondents. However, apart from Dabholkar (1996) few demographic considerations have been applied within the technology adoption literature, which may provide further areas where the previous models can be improved. Overall, by considering the factors identified in this research, the potential take-up rate will be increased, avoiding the risk of actually spending more resources on running an underused dual channel service, rather than saving resources and directing this to the citizens with the most need. By making better use of resources in this way, the government agencies will not only be able to better meet the electronic service delivery targets, but will also be making better use of their overall resources i.e. targeting them where they are really needed. This is a key aspect of delivering value for money for the taxpaying public, a fundamental component that is always reviewed by the National Audit Office.

Finally, there are aspects of the research that may limit the interpretation of the results. First, the data were collected solely in Guildford, which may not be representative of the UK population. Second, due to the small number of respondents aged over 55, the significance of the results for the variance of "willingness to use" relative to age requires validation from further study – although the test used is robust. Further study is also recommended to both validate the current scales identified in this research and to investigate whether other factors emerge.

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