

2010

Online Government Advice: How to Succeed

Manning Li

Macquarie University, manning.li@mq.edu.au

Shirley Gregor

Australian National University, shirley.gregor@anu.edu.au

Follow this and additional works at: <http://aisel.aisnet.org/ecis2010>

Recommended Citation

Li, Manning and Gregor, Shirley, "Online Government Advice: How to Succeed" (2010). *ECIS 2010 Proceedings*. 110.
<http://aisel.aisnet.org/ecis2010/110>

This material is brought to you by the European Conference on Information Systems (ECIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ECIS 2010 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.



Online Government Advice: How to Succeed

Journal:	<i>18th European Conference on Information Systems</i>
Manuscript ID:	ECIS2010-0159.R1
Submission Type:	Research Paper
Keyword:	IT to empower, IT services, Intelligent systems, Electronic government



ONLINE GOVERNMENT ADVICE: HOW TO SUCCEED

Manning, Li, Department of Computing, Faculty of Science, Macquarie University, NSW 2109, Australia, manning.li@mq.edu.au

Shirley, Gregor, School of Accounting and Business Information Systems, Australian National University, Canberra ACT 0200, Australia, Shirley.gregor@anu.edu.au

Abstract

Online advisory services have become ubiquitous and are playing a more vital role in people's lives. From online loan terms exploration to health care eligibility self-assessment, various services are delivered to clients through online advisory tools. Government agencies in particular are offering such services to the public. Due to increased awareness that government service delivery should be "citizen-centric", this study assesses the impact of providing online advisory systems to assist the public. Building on insights from practice and literature, the study utilizes an experiment to empirically examine the key role that effective online advisory tools play in generating a sense of empowerment for the general public. The results of the study reveal that optimized explanation features that suit the cognitive processes of users and the resultant process transparency are pivotal in differentiating the winners from the losers in the online government advisory services arena. Furthermore, having effective online advisory tools empowers individuals, giving them a better sense of control over their future assessment outcome and better perceived power relationships with the government agency to which they are beholden. Finally, this service process leads to improved perceptions of the government agencies' service provider image.

Keywords: Empowerment, Online Advisory Service, Online Advisory Systems, E-government, Transparency, Government Service Provider Image

1 INTRODUCTION

Over the last two decades, service sectors that are characterized by increased knowledge intensity and innovation have become the biggest contributor to economies in most industrialized nations in the world. At the same time, online service delivery has become an important phenomenon as it “transforms the service economy in much the same way that mass production transformed manufacturing, by allowing services to be delivered at low cost in large volumes” (Economist 2004). As modern technologies revolutionize the global service economy, online service delivery opens up new opportunities for organizations to establish or enhance their service provider image, which is vital for the survival and success of modern organizations, especially service-driven ones like government agencies.

This paper is interested in online government advisory services through which advice or decision support is provided to the general public to help them form a better understanding of their personal situation and give them the option to explore different decision scenarios. Contemporary enabling technologies including decision support systems (DSS), Expert Systems (ES), Knowledge-based Systems (KBS), and various data mining and hybrid tools are spurring the growth of such online services on government agency portals. These advisory services embrace a wide variety of application areas, ranging from relatively simple ‘smart calculators’ (e.g., various calculators provided by the Australian Taxation Office to assist the public in conducting tax returns) to complex systems that incorporate compound rule-bases (e.g., ELMNet provided by the Department of Veteran’s Affairs to assist veterans in assessing their pension eligibility).

Despite the hype and huge investment in this area and increasing adoption of such tools by government agencies, the effectiveness of various advisory systems available on government portals is in doubt. There is still a huge capacity for improvement. Besides, although claimed by practitioners (Dayal and Johnson 2000), the value of having online advisory systems on government portals for public use has not been systematically examined, nor has the impact of such services on the government’s image as a service provider. Furthermore, in studying online advisory systems in the e-government context and its impacts on the general public, government agencies and their relationships, we intend to address a gap in the *service science* area through contributing to the scarcity of studies on “the integration of technological research and social science, management and policy research” (US National Academy of Sciences 2003, p.8).

Therefore, this study seeks to explore and examine the value of online advisory systems for public use in an e-government context and sets out to answer the following questions:

- (1) *Can online advisory systems supplied by government agencies lead to potential benefits for the public?*
- (2) *What are the potential benefits (e.g., a better service provider image)?*
- (3) At the current stage of the study, we are interested in exploring a feature of ultimate importance for online advisory systems – the provision of explanations (Gregor and Benbasat, 1999). *Can optimized explanation features of online advisory systems boost the above benefits?*

In terms of scope, this study does not focus on the *access issues* of online advisory systems. Rather, it focuses on how online advisory systems compare with other means of decision support that might be available. Benefits that are not specific to online advisory systems but are relevant to information systems in general, such as increase in efficiency and convenience of access, are beyond the scope of the study.

2 RESEARCH FRAMEWORK AND HYPOTHESIS DEVELOPMENT

2.1 Government Online Advisory Service and Empowerment

Given the dearth of studies in this area and to ensure our research address a significant real-life issue, we

started with examining papers and reports from industry and government. This aroused our initial research motivation and provided solid insights into the value of having online advisory tools for the general public (*e.g.*, see reflections in Dayal and Johnson (2000), who are practitioners from Haley, a company that has many years of experience in building large online DSS for the government; and the feedback in Zeleznikow (2002), who is both a practitioner and researcher in the online legal DSS field). Second, we conducted unstructured interviews with government agency staff (Centrelink, Australian Taxation Office and Department of Health and Aging), who have been regularly interacting with and getting feedback from citizens using online services. They highlighted citizens' sense of '*empowerment*' through using online advisory services on government agency websites. Third, scrutiny of existing online advisory systems on government portals (*e.g.*, ELMNet from the Department of Veterans' Affairs (DVA), Eligibility Points Test and Requirements calculator from the Department of Immigration and Citizenship (DIAC), eligibility testing tools from Centrelink and eTax calculators from the Australian Taxation Office (ATO)) showed that such systems have been in operation and used over a period of time. Among these, eTax and Centrelink tools are well-accepted and highly regarded by the public (AGIMO 2004; Commissioner of Taxation 2007; Levett 2005). These systems exhibited a high level of usability and sophistication in design, especially in the *provision of explanations*. Discussions on the value of online advisory tools with some users of government websites showed that these explanations boosted the value of online advisory tools, increasing users' satisfaction with the self-assessment process.

Finally, to triangulate the above findings, we carried out "applicability checks" (recommended by Rosemann and Vessey 2008) through initial field interviews with the public who use such services (reference suppressed for review). Interviews indicated that a sense of '*empowerment*' through the use of online advisory services provided by the government is a particularly important concept, as is the sense that using these systems give more control and also that they give the user a better understanding. Further, respondents reflected an increase in their satisfaction and a better feeling in their power relationship with the government. To sum up, a synthesis of findings from the above various sources led to the following observations:

1) Online advisory systems are valuable tools for the general public as they improve data collection processes, reduce complexity to allow for more *transparent decisions*, enable true self-service, increase the public's *decision making satisfaction* and potentially create *a sense of ownership* for citizens of the decision making process; 2) Self-service enabled by online advisory systems is likely to create a sense of '*empowerment*' for the general public, allowing for increase in the public's *sense of control* and *perceived power relationship* in the decision making process and thereby helping to *boost the government's image as a service provider*; 3) *Optimized explanation features* of online advisory tools have the potential to enhance the above-mentioned value; and 4) On government websites the current online advisory systems that are in use and remain popular evidence the value of having such systems.

The above findings on the value of online advisory tools in practice provided interesting and solid insights for the next stage of the study. Enlightened by the above insights, we take the contemporary *citizen-empowerment* view (Chu et al. 2008) to examine the value of such systems. Consequently, "empowerment" becomes the core theme of interest guiding the further exploration of the research problem in the extant literature.

2.2 Empowerment Theory

Empowerment means "to give power to" (Thomas and Velthouse 1990, p. 666) and more specifically the "process through which people, organizations and communities gain mastery over issues of concern to them" (Zimmerman, 1995:581; Rapport, 1987). The *empowerment* theory has drawn considerable interest and attention in the fields of psychology, management and medical science (Burke 1986; Conger and Kanungo 1988; Thomas and Velthouse 1990; Zimmerman 1995; Brennan and Safran 2003). However, there is insufficient understanding about the theory in the information systems field. Therefore, we borrow the '*empowerment*' theoretical lens from the above fields in examining the implications of providing effective online advisory tools for the general public.

Empowerment theory has its significance in improving our understanding of how to minimize the gap between various power groups and balance their power relationships. The empowerment construct has been widely used by researchers to examine the powerlessness of minority groups such as women, blacks or the handicapped (Conger and Kanungo 1988). Conger and Kanungo (1988, p.472) suggested that “organizational actors who have power are more likely to achieve their desired outcomes and actors who lack power are more likely to have their desired outcomes thwarted or redirected by those with power.” Similarly, in the public-sector administrative decision making context, the general public is less likely to perceive themselves as in a good position to impact the decision outcomes compared with people inside the bureaucratic wall (Dayal and Johnson 2000). This disparity in power can stem from multiple sources, with the most notable one being the *right to access relevant information*. In the information-based economy, information is power. As Fung (2006, p. 27) pointed out “when some groups cannot influence the political agenda, affect decision making, or gain information relevant to assessing how well policy alternatives serve their interests because they are excluded, unorganized, or too weak, they are likely to be ill-served by laws and policies”. With the capacity to systematically guide non-expert users in understanding complex rules and regulations related to their applications of concern, web-based advisory services are an effective way to empower the public to realize their *right to know* and become *informed citizens*. In this way, these services can be a valuable tool with the potential to increase the power or at least perceived power of people in weak-end power situations and reduce the power of the more powerful parties. It is critical for a society to prevent this power gap getting too big otherwise conflict may arise and negatively impact the stability of the society.

Empowerment can also be treated as a relational dynamic (Conger and Kanungo 1988). In this context, it refers to the process through which the government shares its power with the general public. The decentralization of decision-making power is key to this notion of empowerment (Burke 1986). However, this decentralizing process is not easily achievable since it involves the “delegation of authority” (Burke 1986). Further, the empowerment construct is also said to be derived from the construct of power and control (Conger and Kanungo 1988). This supported our interests in examining key concepts including *perceived power relationships* and *sense of control*, as is congruent with findings in the practical exploration stage.

Finally, Zimmerman's (1995) theory on empowerment suggests that researchers should analyze the concept by differentiating the “*Empowering Processes*” and “*Empowerment Outcomes*”.

2.2.1 *Public Empowering Process: Decision Support Effectiveness*

Empowering processes are “those where people create or are given opportunities to control their own destiny and influence the decisions that affect their lives” (Zimmerman 1995, p.583). *Satisfactory access to resources* and a “*critical understanding of one’s sociopolitical context*” are key aspects of the empowering process (Zimmerman 1995, p.583). In this study, we are interested in studying the empowering process that are reflected by any changes in the public’s *affective* and *cognitive* memory as a result of information processing (Suh and Lee 2005) after using online advisory tools. Therefore, following Suh and Lee (2005), we identify two key dimensions for the online advisory tool empowering process: public’s attitude towards the decision advice (affective dimension) and public’s perceived knowledge/understanding of the decision process (cognitive dimension). Consequently, the research examines *Decision Advice Satisfaction* and *Decision Process Comprehension* as key empowering enablers of interest (also cf. key constructs raised in the exploratory stage in Section 2.1).

2.2.2 *Public Empowerment Outcomes: The Public’s Perceptions of the Government-Citizen Relationship*

Empowerment outcomes refer to specific constructs that might be used to assess the effects of the empowering process (Zimmerman, 1995). The empowering process, namely the government agency’s provision of effective online advisory tools to the public, is expected to lead to empowerment outcomes along two key dimensions: power and control. Citizens should perceive better power relationships with the government agency and a better sense of control over their own destiny. Therefore, *perceived power*

relationship and *sense of control* are examined as relevant empowerment outcomes of effective online advisory tools.

2.3 Research Hypotheses and Model

Enlightened by *Empowerment Theory*, in this section we formulate a model of *Online Government Advisory Service Delivery*. The empowerment theory is adapted to our research context by identifying key constructs of interest raised from insights from the literature and practice as discussed above. First, research constructs of interest, along with related hypotheses are given below:

1) Types of Support

The study examines three types of online advisory systems on government websites: 1) Online AS (advisory system, an intelligent decision support software program) with optimized explanations. 2) Online AS with limited explanations and 3) non-intelligent tool (textual descriptions only and manual calculation needed). This variable was manipulated in the experiment. To differentiate optimized vs. limited explanations, we follow Gregor and Benbasat's (1999) systematic design principals. For instance, justification type explanations (optimized version) can provide more value for users than terminology type explanations (limited version); Optimized explanations allow hierarchical decomposition that requires less cognitive effort to assimilate for users (Gregor and Benbasat, 1999; further details on the design of optimized explanations can be obtained through emailing the corresponding author).

2) Decision Advice Satisfaction (DAS) (Affective Dimension of Empowering Process)

Decision Advice Satisfaction (DAS) reflects users' subjective attitude towards the online advisory service (Pereira 1999) particularly that gained from the decision making process after using it on a government website. Dayal and Johnson (2000) claimed that self-services, such as online AS, can improve the confidence of citizens when they utilize e-government services. Other research has demonstrated an increase in effectiveness due to AS use (Turban et al. 2005). Confidence and effectiveness were regarded as key dimensions in reflecting DAS (Baharati and Chuadhury 2004). Hence compared non-intelligent tool, online AS is expected to improve DAS of the public. Further, optimized explanation features in AS are shown to be positively correlated with higher user perceptions (Gregor and Benbasat 1999). Therefore, a AS with optimized explanations is expected to outperform a AS with limited explanations in terms of DAS.

H1a: Online AS leads to higher DAS on government portals than non-intelligent tools.

H1b: Online AS with optimized explanations leads to better DAS on government portals than AS with limited explanations.

3) Decision Process Comprehension (DPC) (Cognitive Dimension of Empowering Process)

Decision Process Comprehension (DPC) refers to the extent to which the involved users perceive the underlying reasoning of the decision-making process as comprehensible to them. It involves the AS clearly presenting to the decision maker the premises (normative and factual) and explaining the reasoning leading it from the premises to a certain conclusion so that the user is given sufficient information to understand the decision-making process. Apart from DAS, the maturity of the user as reflected by a better understanding of the decision problem should also be counted as a major outcome improvement from the use of the AS systems (Forgionne 1999). Compared with non-intelligent tools, ASs can absorb the complexity of rules and regulations (Dayal and Jhonson 2000) and therefore improve comprehension and transparency. Further, many researchers found that the provision of optimized explanations on AS contributes to learning, understanding and informed decision making (Eining and Dorr 1991; Gregor and Benbasat 1999; Moffit 1994). Since "understanding and explanations are inextricably tied together" (Moffit, 1994, p.447), AS with optimized explanation facilities are expected to improve users' understanding of the decision-making process and enhance DPC compared with AS with limited explanations.

H2a: Online AS leads to higher DPC on government portals than non-intelligent tools.

H2b: Online AS with optimized explanations leads to higher DPC on government portals than AS with limited explanations.

4) Sense of Control (SoC) over their destiny

SoC over their application destiny refers to the degree to which an individual believes his/her voluntary activity can change the probability that an application outcome will occur (Permuter and Monty 1979). It is one of the key outcomes of the empowerment effect (Zimmerman 1995). Many government administrative decision-making areas are closely related to the fundamental needs of applicants, such as income, health, education, shelter and residency. The more fundamental the need that the applications are concerned with, the more critical it is for people to obtain a sense of control over their destiny in related applications. One of the compelling benefits that effective online advisory systems could bring to the public is a SoC over their destiny (Dayal and Johnson 2000). This is because all the questions can be explained fully and the consequences of the information being entered become immediately apparent through online decision aid. Public users are satisfied with the timely and accurate feedback to them as a result of using such tools. Moreover, research into online marketing behaviour showed that satisfactory and transparent site features as a result of the sites providing recommendation agents were demonstrated to result in online consumers enjoying high levels of control and convenience (Koufaris 2002). Likewise, on government portals, the transparent and satisfactory advisory process that is brought about by online AS, increases the predictability of the assessment outcomes, ensures timely and relevant feedback, and is therefore expected to be positively related to SoC.

H3a: Higher DAS of online advisory systems leads to higher SoC for the public using it on a government portal.

H3b: Higher DPC of online advisory systems leads to higher SoC for the public using it on a government portal.

5) PPR (Perceived Power Relationships) relative to the government agency

Perceived Power Relationship (PPR), the other key empowerment outcome (Zimmerman 1995), refers to a member of the public's perception of his/her power situation as relative to the government agency which has the authority to make a decision that concerns the individual. Dayal and Johnson (2000, p.12) suggested that having online advisory services such as decision aids on government portals can "fundamentally change the power relationship between a member of the general public and the government body to whom they are beholden". This is because when "a person must come into an organization with very little knowledge of their own and present to someone who is keying information in about them behind the bureaucratic wall", the person usually perceives him/herself in a weak-end power situation. On the other hand, an effective online advisory system provides a more transparent and satisfactory decision making process, and the disclosure to the public of the decision criteria and processes make it politically difficult for a public servant to ignore or override the legitimate decisions or try to cover their mistakes on assessments. Such systems are expected to improve the public's perceived power relationships with the government agency. The above discussion leads to the hypotheses that effective online decision support (i.e., high DAS and high DPC) can lead to improved perceived power relationships for the public with the government agency.

H4a: Higher DAS of online advisory systems leads to better PPR (smaller power gap) for the public using it on a government portal.

H4b: Higher DPC of online advisory systems leads to better PPR for the public using it on a government portal.

6) Government Agency's Service Provider Image (SPI)

SPI refers to the public's subjective perception of the image of the government agency as a service provider, formed through using its online portals. There are many attempts in the literature to measure service quality, including SERVQUAL (Parasuraman et al. 1985), the Kano model (Kano 1984) and SERVPERF (Cronin and Taylor 1994), but with little consensus. Although these constructs shed light on SPI, they are not suitable for describing the initial public impression of the service quality of the government through its web portal, where there is no face-to-face contact. Furthermore, SPI focus on

symbolic aspects of the government service image rather than perceptions based on details (e.g., one SERVQUAL item measures how uniform the staff dress code is). The spillover of online advisory systems to SPI can be accounted for by the “halo effect”, a psychological phenomena in which a person tends to make similar evaluations in all dimensions based on a general overall impression (King et al. 1980). Such phenomena are frequently observed in our life. For example, it is found that organizational website design characteristics influence the choice of job applicants who might not have much knowledge of the organization itself (Cober et al. 2004). It has also been discovered that including URLs in the advertisement have significant halo effects on perceived corporate image (Tong and Hayward 2006). Similarly, the public’s experiences of DPC and DAS of advisory systems on government portals can lead to their perceptions that the government endeavors to deliver quality services to the general public and therefore boost the government service provider image.

H5a: Higher DAS of online advisory systems leads to better SPI for the public using it on a government portal.

H5b: Higher DPC of online advisory systems leads to better SPI for the public using it on a government portal.

Moreover, prior research demonstrated that SoC is a significant predictor of the client’s loyalty or trust in the organization (Koufaris 2002; Roesse 1999). Similarly, it is reasonable to assume that an increase in SoC can lead to constructive impacts on the public’s perception of SPI. Likewise, through using a government agency’s online advisory services, citizens who perceive themselves to be in a better power situation as relative to the government agency are more likely to have better perceptions of the government agency as a service provider.

H6a: Higher SoC of online advisory systems leads to improved SPI for the public using it on a government portal.

H6b: Better PPR of online advisory systems leads to better SPI for the public using it on a government portal.

Based on the above discussions, Figure 1 presents the resultant Government Advisory Service Delivery Model that synthesizes feedback from practice and literature and is underpinned by Zimmerman’s (1995) theory of empowerment.

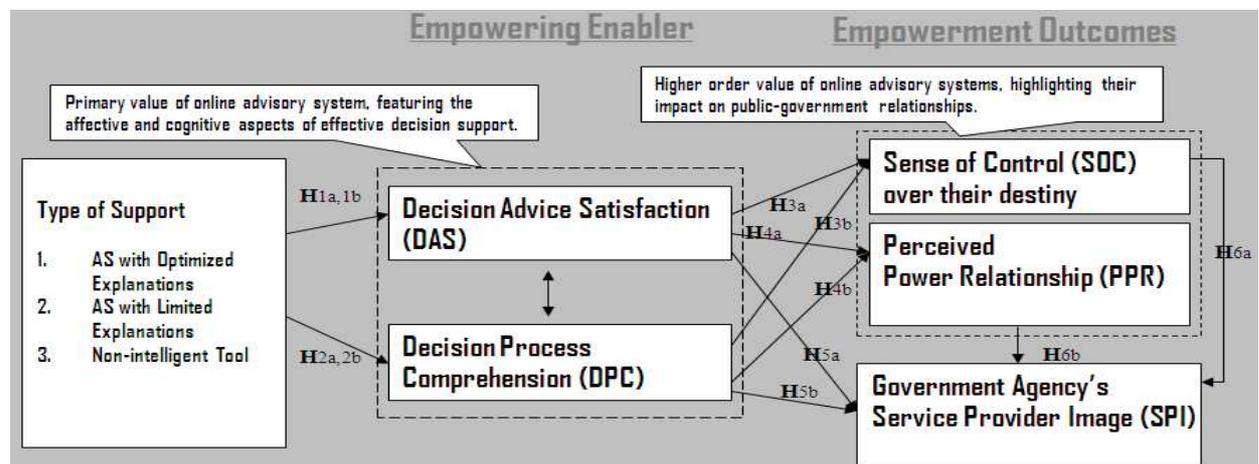


Figure 1. The Full Online Government Advisory Service Empowerment Model

3 RESEARCH METHOD

3.1 Participants, Design, Procedures and Materials¹

As discussed in *scope* of the study, accessibility issues are out of our focus. The study restricts its sample to people who have access to Internet services and have Internet literacy (Hofstetter 1998), to be able to use e-government services. The sample for this experiment consisted of 128 students and staff of a large university in Canberra, Australia across a wide range of academic disciplines and education levels. Participants were *invited* from various campus locations (e.g., staff office areas, tea room and library) to participate in the experiment conducted in *computer labs*. Each participant was promised a free lunch voucher as incentive. After data screening, the remaining 120 valid cases consist of 75 Asian (63.3%) and 45 Australian (36.7%); 71 (60%) males and 49 (40%) females; 40 younger than 20 (33.3%), 66 in their 20s (55.6%) and 14 in their 30s (9.2%) or 40s (2.5%). These demographic data represent general internet users reasonably well, since it shares many common characteristics of the general internet users across different countries. For instance, there is no apparent bias in gender among internet users; most adult internet users have relatively high education levels and the ages of internet users mostly fall within the 18-24 range (ABS 2008; U.S. Census Bureau 2005; CNNIC 2006).

The study adopted between-subject design to avoid sensitizing the participants. Experiment participants were randomly divided into three groups and directed to one of three versions of a simulated government website to conduct self-assessment: the first group used AS with optimized explanations; the second group used AS with limited explanations; the third group used non-intelligent tools (textual descriptions only and manual calculation needed). The experimental procedures were as follows: In computer labs, experiment subjects were given hypothetical case scenarios by the experiment supervisor, containing information such as their age, marital status, education background, language capacity and country of origin, which participants were going to use during self-assessment. After reading the case scenarios, participants were asked to utilize the assigned online advisory tools on the simulated government website to complete the tasks. Finally, participants completed a questionnaire to report their experience. The measures for the constructs utilized in the questionnaires were all derived from existing scales, which exhibited good psychometric properties in the literature. DAS was assessed using an established scale from Pereira (1999); DPC adopted 4-item scale Milne and Culnan (2004); SoC utilized 5-item scale from Koufaris (2002); SPI was assessed using a 10-item scale (Li and Gregor 2009); PPR adopted 6-item scale from Earley and Erez (1997) (item 1,2,4,5,6,8) and reworded it to fit our research context. All these were in the form of 7-point Likert scales ranging from “Strongly Disagree” to “Strongly Agree”.

The experiment websites simulated advisory tools provided by the Department of Migration and Citizenship (DIAC) of a country named STA (hypothetical)². Participants were briefed by the experiment supervisors at the beginning of the experiment that “apparently this is a government agency that you know nothing about before and all your evaluations should be based on this online self-assessment experience.” These same instructions were stressed on the first page of the experiment sheet.

The first tool, online AS with optimized explanations was designed primarily based on the principals given in Gregor and Benbasat (1999) as discussed in the *Type of Support* part above. The background of this online advisory tool automatically refreshes to show corresponding explanations that matches the self-assessment component that the participant clicks on. The explanations are presented in a well-structured way so that complexities are hidden until the user requests it through hierarchical decomposition (Simon 1997, Gönül 2006). Discussions with pilot participants also showed that the explanations were easily understandable and helpful. The second website, online AS with limited explanations, differs from the first by removing justification-type explanations (Gregor and Benbasat

¹ Due to page limitations, more details on the experiment can be obtained by contacting the corresponding author.

² The advisory tools were designed based on the migration self-assessment tools provided by the Department of Immigration and Citizenship of Australia (DIAC), URL: immi.gov.au.

1999). This low level of transparency presents an obstacle for applicants to smoothly carry out self-assessment tasks and understand the reasons for the final assessment outcome. The non-intelligent tool utilized a ten page electronic document, which contains all relevant rules and regulations for self-assessment. With this tool, it takes “lots of patience and energy to find out your eligibility”, as commented by a pilot test respondent. All three tools incorporated identical rule-bases.

Pilot tests were carried out beforehand to ensure that the difficulty level of the case scenarios and the design of the websites were appropriate. Six people from the targeted sample participated in the pilot test and provided valuable feedback. The time to complete the whole task was about 40 minutes, and deemed reasonable. Different case scenarios with varying levels of assessment difficulty had been incorporated into the pilot to examine the impact of ‘*task complexity*’ and ‘*time for self-assessment*’ (controlled variables in the experiment). Other controlled variables in the experiment include *user expertise with task*, *user expertise with computer and Internet* and other demographic variables (*age, gender*).

4 DATA ANALYSIS AND RESULTS

Several aspects of the data screening process were first carried out. Checking for incompleteness or failure to pass the consistency checking questions removed 8 out of 128 cases collected. Further, ANOVA tests on *demographics data* against different treatment groups showed no bias in group assignment (Salkind 2006). After data screening, hypotheses H1 and H2 were tested with ANOVA to examine the impact of different ‘type of support’ on DAS and DPC. After checking the two assumptions for ANOVA (normal distribution and homogeneity of variances, see Malhotra 2003) are met, ANOVA analysis showed that there exist significant differences among the means of DAS ($F(2,117) = 31.068, p < 0.01$) and DPC ($F(2,117) = 14.799, p < 0.01$), for all three groups (each group $N=40$). Post-hoc tests using least significant difference (LSD) showed that for DAS, the group using online AS with optimized explanations ($M=5.43, \text{std.} = 0.56$) had a significant higher mean than the group using AS with limited explanations ($M=4.75, \text{std.} = 1.01$), which in turn had a significant higher mean than the group using non-intelligent tools ($M=3.74, \text{std.} = 1.20$), supporting H1a&b. For DPC, the group using online AS with optimized explanations ($M=4.97, \text{std.} = 0.61$) had a significant higher mean than the group using AS with limited explanations ($M=4.32, \text{std.} = 1.20$), which in turn had a significant higher mean than the group using non-intelligent tools ($M=3.81, \text{std.} = 1.15$), supporting H2a&b.

Next, hypotheses H3 to H6, which involve complex relationships between multiple dependent variables, namely DAS, DPC, SoC, PPR and SPI, were analyzed with the Partial Least Squares (PLS) method. PLS is suitable for analyses under a wide variety of situations, such as complex models or low case-to-parameters ratios (Hulland 1999) and 120 case in the study were deemed sufficient (Chin 1998). The model was assessed in two aspects: 1) the measurement model, which reflects whether the instrument has acceptable measurement properties; 2) the structural model, which examines the relationships between different variables (Gefen et al. 2000, p. 37). The measurement model was examined through internal consistency, convergent validity and discriminant validity (Barclay et al. 1995). Internal consistency was evaluated by Cronbach’s α (Table 1), which exceeded 0.7 for every construct, demonstrating high internal consistency (Barclay et al. 1995). Convergent validity of the constructs were evaluated through AVE values, which all exceeded 0.5, meaning at least 50% of the construct variance is due to its indicators (Chin 1998). Lastly, comparing item loadings on the original construct (highlighted diagonal values in Table 1), which were all greater than inter-construct correlations (off-diagonal values), indicating good discriminant validity. Overall, all statistical results indicated good psychometric properties for this measurement model.

Construct	R ²	ρ_c	Cronbach’s α	AVE	Inter-construct correlations				
					DAS	DPC	SoC	PPR	SPI
DAS	0.0000	0.9258	0.8997	0.7141	0.8450				
DPC	0.0000	0.8942	0.8512	0.6295	0.5110	0.7934			
SoC	0.4699	0.9200	0.8844	0.7422	0.5470	0.6198	0.8615		

PPR	0.2204	0.9154	0.8898	0.6460	-0.3304	-0.4481	-0.3513	0.8037	
SPI	0.4114	0.9154	0.9122	0.5603	0.5686	0.5363	0.4547	-0.3991	0.7485

Table 1. *R Square, Composite Reliability, Cronbach's α , AVE and Redundancy and Inter-construct Correlations*

Then, the structural model was assessed with PLS bootstrapping methods (with 600 samples). The relationships between latent variables were interpreted by looking at the path co-efficients and T-value (elaborated in Table 2). To highlight some interesting points, for SoC over their destiny, DPC had a stronger effect ($\beta = 0.47$; $p < 0.01$) than DAS ($\beta=0.34$; $p<0.01$). Moreover, DPC also had the strongest predictive power on PPR ($\beta=-0.38$; $p<0.01$). For SPI, both DPC ($\beta=0.33$, $p<0.01$) and DAS ($\beta=0.24$, $p<0.01$) had similar substantive impacts. In addition, the reason why the co-efficients related to PPR are negative is because the *smaller* the PPR value, the *better* the power relationships between the government and public (*cf.* hypotheses section on PPR).

	Paths	PathCoef.	<i>t</i>	Interpretation (S: Supported; NS: Not Supported)
H3a	DAS-> SoC	0.3446	4.1363**	S: DAS had a positive impact on general citizen's SoC over their destiny ($p<0.01$).
H3b	DPC -> SoC	0.4659	5.5833**	S: DPC had a positive impact on the general public's SoC over their destiny ($p<0.01$).
H4a	DAS -> PPR	-0.1152	1.0955	NS: DAS had no significant impact on PPR ($p>0.05$).
H4b	DPC -> PPR	-0.3769	4.4598**	S: DPC was shown to be significantly impacting the public's PPR($p<0.01$).
H5a	DAS -> SPI	0.3326	3.1009**	S: DAS was shown to have a significant positive effect on SPI ($p<0.05$)
H5b	DPC -> SPI	0.2425	2.7158**	S: DPC had a significant positive effect on SPI ($p<0.01$)
H6a	SoC -> SPI	0.0618	0.6182	NS:SoC had no significant impact on SPI ($p>0.05$)
H6b	PPR -> SPI	-0.1555	2.0601 *	S: PPR had significant impact on SPI ($p<0.01$).

Table 1. *Path Coefficients, T-statistics and P-value (Note: * $p<=0.05$; ** $p<=0.01$)*

5 CONCLUSIONS AND DISCUSSIONS

Through the lens of *empowerment* theory, the study empirically examined the value of online advisory services for the general public and the impact of these services on the government's service provider image. The results showed that online decision aids, especially those with optimized explanation features, empower the public, leading to higher decision advice satisfaction and cognitive transparency as the primary outcome. Higher order outcomes for the public include a better sense of control over their destiny, better perceived power relative to the government agency and finally improved government service provider image. Interestingly, compared with the public's affective experience of the decision making (DAS), cognitive aspects (improved assessment-related knowledge: DPC) is shown to be a more significant predictor of the public's sense of control over their destiny in application and attitudes towards their power relationship and the perceived government service provider image.

One limitation of the research relates to the classification of different types of decision support. At this stage, we focused on comparing (1) Non-intelligent tool (textual descriptions only, manual calculations needed e.g. PDF), (2) online AS (intelligent software programs) with limited explanations and (3) online AS with optimized explanations. We do realize that more systematic and subtle categorizations are needed in future work and hope that this piece of work can be a useful point of reference for future research in this direction. Moreover, this experiment serves as a first endeavour to empirically test the proposed research model in well-controlled laboratory environments. We acknowledge another limitation lies in the participants being university staff and students. However, as discussed in the experiment section, the demographics of the participants exhibit similar patterns to the characteristics of general Internet users, which is the population of interest in the study, leading to no major impact on the external validity of the study.

Theoretically, the study has implications for the applications of empowerment theory in the IS field. We utilized experiments with control over potential extraneous variables to empirically show that optimized

online advisory tools with good decision process transparency leads to maturity and learning of the users. This cognitive process enables them to develop their own knowledge and empowers community members to have a high sense of control and power over their own destiny so as to not rely on public officials behind the bureaucratic walls. Prior to this, *How Information Systems empower the general public* is a topic that has rarely been looked into in literature. Further, the research also has implications for the impact of information systems use on social and community change. Psychological empowerment rooted firmly in the social action framework, involving community change, capacity building and collectively (Zimmerman1995, p.582). Similarly, it is expected that the transparent nature and empowerment effect of effective online advisory tools can be a good starting point for determining the long-term impact of social change. As supported by West (2004, p.15):“the virtue of studying short term change is that it provides hints about longer term shifts and gives policy makers benchmarks for evaluating how close they are to achieving particular goals and outcomes”. In this sense, this study serves as an enlightening reference for future work in empirically linking online information system use and how relevant usage outcomes alter a citizen’s mindset with respect to traditional bureaucracy.

Practically, our findings provide insights that benefit both the public and the government agencies. Explanation and cognitive transparency is the key to the design of online advisory systems. The disclosure to the public of decision criteria and processes empowers the public and reshapes governance, making it politically difficult to ignore or override legitimate decisions or assessments. Therefore, this approach could also potentially lessen corruption in some countries. As Dayal and Johnson (2000, p.12) commented, “Some agencies are uncomfortable with this power shift. Inevitably it requires a greater focus on audit... However, much legislation is targeted for the benefit of people in the community, not for the convenience of the organization administering the legislation. So the new relationship is a more accurate reflection of the way things should be”. Furthermore, a more relevant success indicator of the government, whether at municipal or state level, is increased appreciations by the general public rather than its good performance in various sectors alone. Having effective online self-assessment tools is a good starting point to improve the current status of public service delivery and responsiveness to citizens, which in the long term would generate greater public satisfaction and confidence in the government. As noted by Dayal and Johnson (2000), online advisory tools “provide the opportunity to deliver a level of electronic service delivery that profoundly and productively changes the nature of government and its relationship with the community”. In addition, the practical design guidelines discussed in the paper also serve as a useful point of reference for practitioners in designing government websites.

Future research could consider examining the implications of the research model in private sector such as the finance and insurance industry where online advisory tools are becoming predominating practices.

References

- Australian Bureau of Statistics (ABS) (2008). Household Use of Information Technology, Australia [Online], Available: <http://www.abs.gov.au/Ausstats/abs@.nsf/mf/8146.0> [Accessed 10-12-2008].
- Australian Government Information Management Office (AGIMO) (2004) Better Services, Better Government –The Task Ahead, [Online] Available: http://www.agimo.gov.au/archive/publications_noie/2002/11/bsbg/task, [Assessed on 10-12-2007].
- Barclay D., Higgins C., and Thompson, R. (1995). The partial least squares approach to casual modelling: personal computer adoption and use as an illustration, *Technology studies* (2), 285-309.
- Burke, W. *Leadership as empowering others*, Jossey-Bass, San Francisco, 1986.
- Chin, W.W.(1998) Issues and opinion on Structural Equation Modeling, *MIS Quarterly*, 22 (1), 7-17.
- Chu, Y. H., Bratton, M., Lagos, M., Shastri, S. and Tessler, M. (2008). Public Opinion and democratic legitimacy”, *Journal of Democracy* 19(2), Apr. 2008.
- CNNIC (2006).The seventeenth report on China Internet Development statistics, 17 Jan, [Online], Available: <http://cnnic.cn/images/2006/download/2006011701.pdf> [Accessed on 09-09-2006].
- Cronin, J.J., and Taylor, S.A. (1994). SERVPERF versus SERVQUAL: Reconciling Performance-Based and Perceptions-Minus-Expectations Measurement of Service Quality, *Journal of Marketing* (58:1), 125-131.

- Cober R.T., Brown, D.J., Keeping, L.M., Levy, P.E. (2004), Recruitment on the Net: How Do Organizational Web Site Characteristics Influence Applicant Attraction?, *Journal of Management* 30(5), Oct., 623-646.
- Commissioner of Taxation “e-Tax” (2007), [Online] Available: <http://www.ato.gov.au/corporate/content.asp?doc=/content/83847.htm&pc=001/001/001/005&mnu=&mfpr=&st=&cy=1> , [Assessed on 10-12-2007].
- Conger, J.A. and Kanungo, R.N. (1998). The Empowerment Process: Integrating Theory and Practice, *The Academy of Management Review* (13: 3), 471-482.
- Dayal, S., and Johnson, P. (2000). A web-based revolution in Australian public administration?, *Journal of Information. Law and Technology* (1).
- Earley, P.C., and Erez, M. (1997). *The Transplanted Executive*, Oxford University Press, New York.
- Economist (2004). “You're Hired”, *The Economist*.
- Eining, M.M., and Dorr, P.B. (1991).The impact of expert system usage on experimental learning in an auditing setting, *Journal of Information Systems* (5:1), Spring, 1–16.
- Forgionne G.A. (1999). An AHP model of DSS effectiveness, *European Journal of Information Systems* 8(2), 1 June, 95-106.
- Gefen, D., Straub, D.W. and Boudreau, M. C. (2000). Structural equation modeling and regression, *Communication of AIS* (4:7).
- Gregor, S. and Benbasat I. (1999). Explanations from Intelligent Systems: Theoretical Foundations and Implications for Practice, *MIS Quarterly* 23 (4), Dec., 497-530.
- Gönül, M. S., Önkald. and Lawrence M. (2006) “The effects of structural characteristics of explanations on use of a DSS, *Decision Support Systems* 42 (3), Dec.,1481-1493.
- Hofstetter, F. T. (1998). *Internet Literacy*, Irwin/McGraw-Hill, Boston, US.
- Hulland, J. (1999). Use of Partial Least Squares (PLS) in Strategic Management Research: A Review of Four Recent Studies”, *Strategic Management Journal* 20(2), 195–204.
- Kano, N., Seraku, N., Takahashi, F. and Tsuji, S. (1984). Attractive and Normal Quality, *Quality* 14 (2).
- King, L.M., Hunter J.E. and Schmidt F.L.(1980). Halo in a multidimensional forced-choice performance evaluation scale, *Journal of Applied Psychology* (65), 507-516.
- Koufaris, M. (2002). Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior, *Information Systems Research* 13 (2), June, 205-223.
- Levett, B. (2005). Centrelink Online Services, *7th Australian Computer Seminar*, 13-14 Sep.
- Lewis, B.R., Templeton, G.F. and Byrd, T.A. (2005) A methodology for construct development in MIS research, *European Journal of Information Systems* (14), 388–400.
- Milne, G.R. and Culnan, M.J. (2004). Strategies for reducing online privacy risks: why consumers read (or don't read) online privacy notices”, *Journal of Interactive Marketing* 18 (3), 15-29.
- Moffit, K.E. (1994). “An Analysis of the Pedagogical Effects of Expert System Use in the Classroom”, *Decision Sciences* 25(3), May, 445.
- Parasuranman, A., Zeithaml, V.A. and Berry, L.L. (1985). A conceptual model of service quality and its implications for future research, *Journal of Marketing* (49), 41-45.
- Pereira, R.E. (1999). Factors influencing consumer perceptions of Web-based decision support systems, *Logistics Information Management* 12(1/2), 157-181.
- Roese, N. (1999). Canadians Shrinking Trust in Government: Causes and Consequences, *National Trends Conference*, Ottawa, Nov.
- Rosemann, M. and Vessey, I. (2008). Toward improving the relevance of Information Systems research to practice: The role of applicability checks, *MIS Quarterly* 32 (1), Mar., 1-22.
- Salkind, N.J. (2006). *Exploring Research*, 6th Edition, Pearson Education, New Jersey.
- Shneiderman, B. (1998). *Designing the User Interface: Strategies for Effective Human Computer Interaction*, 3rd Edition, Addison Wesley.
- Simon, H.A. (1997). *The new sciences of management decision*, Prentice Hall, New York.
- Suh, K.S. and Lee, Y.E. (2005). The effects of virtual reality on consumer learning: an empirical investigation, *MIS Quarterly*, 29(4), 673-697.
- Thomas, K.W. and Velthouse, B.A. (1990) Cognitive elements of empowerment”, *Academy of management review* (15), 666-681.

- Turban, E., Aronson, J.E. and Liang, T.P. (2005). *Decision Support Systems and Intelligent Systems*, Prentice-Hall, New Jersey.
- US Census Bureau (2005). Computer and Internet Use in the United States: 2003, Current population Reports", U.S. Census Bureau, Washington, DC.
- US National Academy of Engineering (2003). The Impact of Academic Research on Industrial Performance.
- West, D.M. (2004). E-Government and the Transformation of Service Delivery and Citizen Attitudes", *Public Administration Review* 64 (1), 15-27.
- Zimmerman, M.A. (1995). Psychological empowerment: Issues and illustrations, *American Journal of Community Psychology* 23(5), 581-599