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Abstract

There has been much prior work into online service delivery in private firms, but little such work for governments. In particular, there has been little work into the value of online government self-service sites and how such value should be measured. This study seeks to identify and empirically test the potential value of web-based online Intelligent Support Systems (ISS) tools on government web sites. In the absence of prior practical work, this study uses a novel theory development process to develop a research model borne from literature theory, interview analysis and practitioner insight. The study finds that providing online ISS to citizens on government portal creates an empowerment effect and improves public perception of the government. Six constructs affecting effectiveness and impact are revealed, being decision making satisfaction, decision making transparency, perceived decision quality, government's service provider image, perceived power relationship and user's sense of control.

Keywords

Intelligent Support Systems (ISS), e-government, service delivery, decision making

Introduction

There has recently been heightened interest in the provision of services in online contexts. Online service delivery, which is becoming more sophisticated in an increasingly competitive global environment, should allow firms to improve customer satisfaction. Governments have seen the value that such online service provision can offer to citizens, and 'e-government' is becoming a popular and important research area. In contrast to the services in the private sector, it is said that the current status of public service is far from optimal for many citizens (Silcock 2001). Whereas a private firm is able to conduct surveys of its own customers in an organised fashion, governments may be unable to find and determine user requirements and satisfaction.

"Self-service" through web-based intelligent support systems (ISS) could be an effective way to improve the situation. ISS is a generic term for a variety of systems that are used in decision making processes, including Expert Systems (ES), Decision Support Systems (DSS), Knowledge Based Systems (KBS) and hybrids of these. Dayal and Johnson (2000:19), argue that the interaction of three enabling technologies - rule bases, decision support systems and the Internet - "provides 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". The value of having online ISS has, however, received little attention in the extant literature, especially with regard to their use on government portals. Consequently, there is a need for studies that systematically and empirically examine the value of utilizing web-based ISS on government websites. This study responds to this need and addresses the questions:

"Do online ISS provide value for the public when available on e-government portals? If so, what is the nature of this value?"

This study focuses not on the access and convenience of online advice-giving systems, although these are important topics, but rather on how online advice giving systems compare with other means of decision support that might be available, including human help by phone or in person and manuals or printed guidelines. The study limits its investigation to situations where alternative means of advice are freely available.

The study develops a research model based in practice, prior literature and initial empirical work to address these questions. The contribution of the study lies in several aspects. Practically, the study gives municipal and state level government meaningful insights on how to improve their e-government services especially with regard to approaches to and support for determinative processes. In addition, Dayal and Johnson (2000) propose a variety of benefits to online ISS, such as "convenience, confidence and a sense of control and the capacity for

hypothetical scenario testing"; governments should experience "vast reductions in unproductive data entry, vast reductions in staff time spent on mundane aspects of processing, fewer interruptions through phone calls and enquiries, and the capacity to apply more recourses more effectively on essential tasks of compliance auditing and verification" (Dayal and Johnson 2000). With these potential benefits quantified, the government might be more willing to adopt and prompt such services on their websites, which would eventually benefit both the government and the general public.

The study is theoretically significant at several levels. First, the study addresses an area that has been largely ignored in the literature: the value of online ISS. Historically, ISS are mostly designed for organizational users, especially those in managerial positions. Web-enabled technologies make it possible for more casual, infrequent users, such as customers and citizens to access ISS (Bhargava et al. 2005). While organisational users are well discussed in prior studies, citizen users are relatively overlooked in the literature. Second, the study develops a well-grounded theoretical model for this problem area that can be tested in subsequent work. Third, from an epistemological viewpoint, the paper provides insights into the practice of developing theoretical models in Information Systems (IS), through reflecting on the process of theoretical model building that in many studies remains opaque.

The paper proceeds as follows. First, the method used in developing the theoretical framework is outlined. Second, a practical understanding of the research problem is formed based on insights from practitioners and the current usage of ISS on government websites. Third, a literature review is conducted to inform the research model. Next, preliminary interview data are collected and analysed to populate the research framework. Following that, the paper presents the resultant Government ISS Service Delivery Model, which synthesizes the prior practical and theoretical analysis. Finally, concluding comments and areas for future work are given.

Developing The Theoretical Model

Many studies in IS rely on the "hypothetico-deductive" approach to developing theoretical models for subsequent testing in empirical work. Lee (1991) describes how, in this approach, propositions are deduced from a general theory and then operationalized so that they can be tested against observable phenomena. This approach is common in what is termed "positivist" work, which borrows methods from specific approaches advocated in the natural sciences (for example, Dubin 1978).

There are problems with this approach, however. Unfortunately, IS has bodies of theory that are not sufficiently developed to make the drawing of hypotheses from theory a straightforward matter. As an example, consider the Delone and Mclean (1992, 2003) model of IS success, a well-known and much used model. These authors themselves recommend that this model needs to be adjusted to fit particular contexts. But how should such models and methods be adjusted in research practice? This point receives little attention in the IS literature.

In this study we make explicit a process that can be used to develop such "context dependent" or mid-range theoretical models. Mid-range theory is theory that is moderately abstract, has limited scope, and can easily lead to testable hypotheses (Gregor 2006). Merton (1968) sees mid-range theory as particularly important for practice disciplines. The process involves the following activities, in a non-linear process of enquiry:

- Understanding of problem area from reports or experience in practice;

- Examination of relevant literature and theory;

- Preliminary data collection to ground understanding;

- Iterative development of theoretical model.

It is important to emphasise the non-linear nature of this process. Repeated passes through these phases of enquiry were performed in the current study, with each pass resulting in adjustment in thinking and understanding and refinement of the model. We believe that a process of this nature is not unusual in IS, but rarely is it explicitly reflected on in terms of the epistemological implications, as we do here. The following sections in the paper show the nature of each of these phases of activity.

Understandings Of Problem Area In Practice

An initial exploration on the practical aspects of the research problem is carried out to ensure that the proposed framework is relevant and grounded in issues of importance in practice. All of these practical understandings of the problem area ensure that the research is evidenced in practice.

First, papers and practitioner reports provided deep insight into the research questions. One important practical paper on public administration and decision-making by Dayal and Johnson (2000:3) reflected that most general public perceive themselves as powerless and intimidated in face of the government's determinative processes on

their entitlement, obligations and rights. Citizens also experience a "sinking loss of control", confusion, uncertainty and vulnerability in the situation. Dayal and Johnson (2000) claimed that the provision of online decision aid to citizen on government portals would generate benefits such as a better sense of control, and better perceptions on their power situation and more transparency in the decision making process. Dayal and Johnson are practitioners from Ruleburst (previously known as SoftLaw), a company that has many years of experience and success in building large online DSS for government.

Another notable practical paper by Zeleznikow (2002) on online decision support systems in UK uses case studies to show that the construction and provision of web-based legal support systems helps citizens, especially unrepresented vulnerable ones, to be able to negotiate legal disputes. This will improve people's access to justice and avoid potential havoc in the legal system.

Second, scrutinizing the nature and use of existing online ISS systems or practices on the government portals gives a deeper understanding of the overall problem. The systems that have been explored include ELMNet from the Department of Veterans' Affairs (DVA), the Eligibility Points Test and Requirements calculator from the Department of Immigration and Multicultural and Indigenous Affairs (DIMIA) and personal income tax calculators from the Australian Taxation Office (ATO).

In general, papers written by practitioners, reports from government/industries and inspections on the existing practices on government websites shed light on the following concepts:

- Online ISS is a valuable tool for the general public since it improves the data collection processes, reduces complexity to allow for more transparent and satisfactory decisions.

- At a higher level, the value of such systems is reflected by the fact that it enables self-service, creates a sense of ownership for citizens on the decision making process.

- The current ISS systems by government that are in use and some are very popular, to a certain extent show the value of having such systems

The research focuses on the impacts of providing online ISS on the general citizen's perceptions. Hence the prior three points became the focus feeding into other phases of the study.

Relevant Literature

In order to explore the value of having online ISS on government website, it is essential to understand how such systems will impact on the citizen's decision making process, the decision outcome and the impact on the individual and at a higher level, the society. DeLone and McLean's (1992, 2003) IS success model, which is critical to investigate the value of IS investments (DeLone and McLean 2003), fits the purpose of the study well. Based on the theory of communication (Shannon and Weaver 1949) and the pioneering studies by Mason (1978), DeLone and McLean (1992) proposed that IS success can be evaluated by six dimensions, namely System Quality, Information Quality, Use, User satisfaction, Individual impact and organizational impact. DeLone and McLean (2003) re-examined the framework, adding "service quality" as a new dimension and merging Individual Impact and organizational impact into "net benefits".
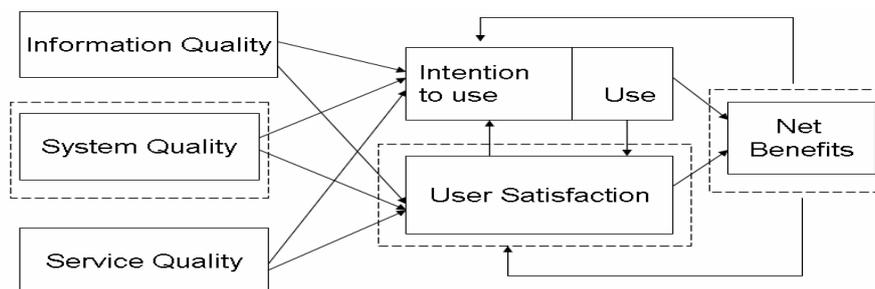
Figure 1: The DeLone and McLean success model (DeLone and McLean 2003)

This study adapts parts of the Delone and McLean model (indicated by dashed lines in Figure 1) on the basis that it has been widely featured in prior work and is flexible enough to be adapted to different circumstances (DeLone and McLean 2003).

Grounding Study In Preliminary Data Collection

In investigating the value of online ISS on government portals, semi-structured interviews were conducted. Purposeful sampling was utilized. Interviewees included six members of the general public who could use online government services in Australia and two government employees. The reason for including both general

citizens and government employees is to triangulate research findings. Respondents had diverse cultural backgrounds including Australian, Malaysian, Iranian and Singaporean, with ages ranging from 20 to 40 years old. Each interview took approximately 30 mins. Interviews were tape-recorded and then transcribed. Open, axial and selective coding methods were used to analyse the data. Then the various coding categories were screened, with data relevant to the online e-government ISS research context, selected through expert review. Appendix 1 shows the interview protocol.

Interviews indicated that a sense of "empowerment" (Zimmerman 1995) through the use of online ISS services provided by the government was a particularly important construct, as was the sense that using these systems gave more control and also that they gave better understanding (decision making transparency). Further, respondents reflected an increase in their perceived decision quality, decision making satisfaction and a better feeling towards the power relationship with the government. Table 1 presents example excerpts from transcripts illustrate these constructs. Codes for the interviewees are given in brackets.

Table 1: Research Constructs and Sample Indicator Responses

Construct	Sample Indicator Responses
Decision making satisfaction	*I also feel more comfortable. [I1].* *I also feel more comfortable. I can control the pace and feel more freedom while conducting self-assessment. [I3]* *I really prefer interactive testing, especially with sensitive, important things, because you don't feel afraid of making errors or mistakes [I3]*
Decision making transparency	*It also gives better understanding. [I1].* *I think the interactive system eliminates confusion. [I1]* *I've been given clear instructions [on the ATO website] and they guide you step by step. [I3]* *Sometimes [websites] can be informative...everything is there, the information is presented clearly [I4]* *[ISS] gives a clearer understanding [I6]*
Perceived decision quality	*I would be more confident about the self-assessment result. It [ISS assessment result] is more credible [I1]* *[ISS] Interactive interface is simple; it gives you confidence, more manageable [I3]* *Hence, it is more credible information on the website. [I4]*
Confidence/Sense of Control	*[The Centrelink system] gives a better sense of control over extracting the needed information quickly. [I1]* *[ISS] Interactive interface is simple...more manageable and make you want to continue [I3]* *[ISS] gives more control for individual.[I6].*
Perceived Power Relationship	*[ISS] doesn't give so much Power Distance [compared with text based rules], since it presents the rules and regulations for assessment simply and coherently. I feel like being treated in a respectful and professional manner. [I1]* *[With ISS, the government] is trying to understand us, they are not trying to keep a distance from us. The information given is also easier to digest. It shows that governments considered the feelings of citizens.[I3]* *I prefer web site also because I had experience of dealing with bad-attitude public servants. With web site I can feel more power over this, compared with facing a government official [I3]* *[ISS] seems nearer... it makes me feel the government is closer, easier to approach and they are more helpful to citizens. [I5]* *It[ISS] makes me feel more important, because government is empowering people to get access to the information. [I6]*
Government Service Provider Image	*Since [ISS] presents the rules and regulations for assessment simply and coherently. I feel like being treated in a respectful and professional manner.[I3]* *[ISS] are friendly...[The government] are trying to understand us...The information given is also easier to digest. It shows that governments considered the feelings of citizens.[I3]* *[Without ISS] It gives me the impression that they are less competent government; they don't know how to make use of technology. [I5]*

The Government ISS Service Delivery Model

The resultant Government ISS Service Delivery Model (Figure 2) synthesizes the feedback from practice, interview results and is underpinned by the D&M Success Model. The model constructs are discussed in detail below, linking the empirical interview data with theoretical constructs, in the context of Zimmerman's (1995) "Empowerment Processes" and "Empowerment Outcomes".
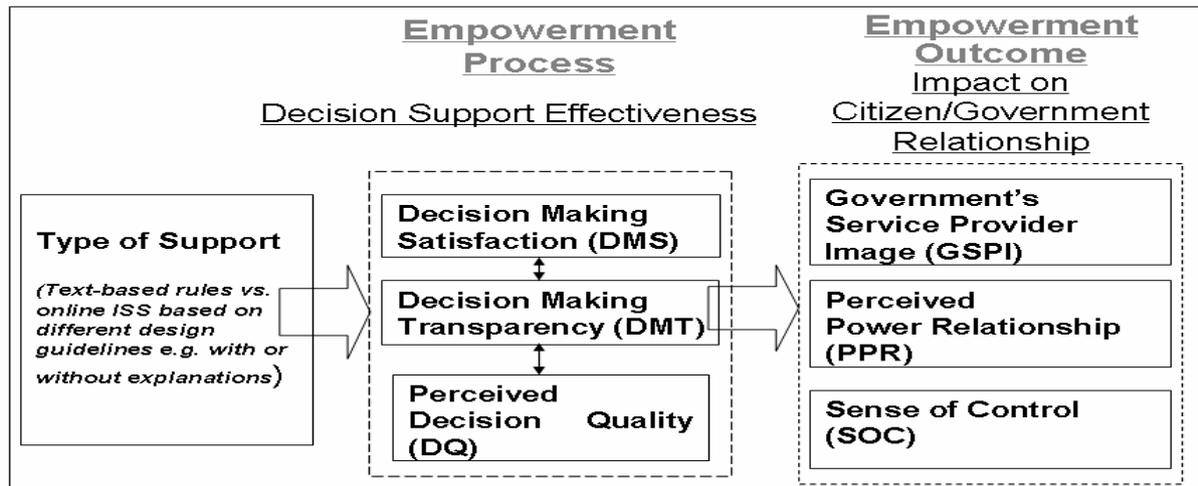
Figure 2: ISS Government Service Delivery Model

Decision Making Satisfaction

Baharati and Chaudhury (2004:189) identified latent benefits of DSS in improving people's decision making satisfaction (DMS), which is defined as "the ability of a system to support decision-making and problem-solving activities." Pereira's (1999) study of online DSS measures consumer satisfaction with the decision process, representing "the decision maker's subjective state of satisfaction with all aspects of the decision process soon after the decision has been made" (Pereira 1999:167). Following Pereira (1999), in this study, DMS is defined as the subjective state of satisfaction with all aspects of the decision making process after using decision support services on government website.

Examining this construct in the study is of great significance. First, one of the major success indicators of ISS systems is the public's satisfaction in using the system for self-service as a favourable alternative for self-service. Second, user satisfaction has been considered an important surrogate for IS success (Ives et al. 1983, DeLone and McLean 1992, Szajna and Scamell 1993, McKeen et al. 1994, Baharati and Chaudhury 2004).

Decision Making Transparency

Transparent decision-making process involves the ISS clearly presenting to the decision maker the premises (normative and factual) and explaining the reasoning leading it from the premises to a certain conclusion. Decision Making Transparency (DMT) refers to the extent to which the involved user understands the decision making process so that the reasoning of the ISS is perceived as transparent (comprehensible) to the user.

Support for this construct came from several sources. Interview results showed that citizens feel that online ISS gives "good cue and a better understanding…about the self-assessment result". Dayal and Johnson (2000) also support the idea that online ISS helps to improve citizen's understanding on the determinative process. In literature, DMT has been used as a key dimension in assessing ISS success (Ruhe 2003). Given the varying backgrounds of government portal users (such as education, level of ISS system familiarity, skill and expertise), a good understanding of the decision problem and process is a promising benefit that a suitably designed ISS could deliver to citizens. Likewise, ISS with high DMT should provide resource savings on the allocated to answering questions related to citizen's assessments.

Perceived Decision Quality

Decision performance is another construct of interest because quality decision making is an important goal of ISS (Ives et al. 1983). A literature example of low user perceived decision quality (Landsbergen et al. 1997) is that when the decision maker feels a considerable level of difficulty in the decision making process, the decision may be deemed low in quality. Prior studies have reported increases in the decision quality if the decision maker utilized ISS (Szajna and Scamell 1993, Landsbergen et al. 1997). Further, Gregor and Benbasat (1999) found that explanation use in ISS is positively correlated with better user performance/decision quality.

Government's Service Provider Image

This construct refers to the public's subjective perception of the image of the government as a service provider through using its online portals. GSPI is closely related to service quality, a dynamic construct that varies over

time (Zhang and von Dran 2001). In the field of service marketing, Parasuranman et al. (1985) extensively investigated service quality in a series of focus group interviews. There are many efforts in literature to measure service quality, including SERVQUAL (Parasuraman et al. 1985), Kano model (Revell 1998) and SERVPERF (Cronin and Taylor 1994), although with little consensus. Although SERVQUAL, SERVPERF and Kano's service quality model shed light on the construct for GSPI, they may not be suitable in the context of this study.

The initial impression on the service quality of the government is formed through the web portal, where there is no face-to-face contact. Hence, GSPI provides greater perception of symbolic aspects of the government service rather than the perception based on details (for instance, one SERVQUAL item is measuring how uniform the staff dress code is). The 'halo effect', where a person intends to make similar evaluations in all dimensions based on a general overall impression (King et al., 1980), could explain the relationship between the online ISS and GSPI. For example, Perrow (1961) reports that patients may choose to receive medical services at a particular hospital based on general hospital characteristics (such as building design) that are otherwise unrelated to their medical needs. Richard et al. (2004) found that organizational website design characteristics influence the choice of job applicants, at the expense of knowledge of the firm itself. Maddox and Gong (2005) found that including URLs in advertisements had significant halo effects on corporate image. They asserted that the symbolic effect of the corporate web presence image is considered more important than website functionality. Similarly, providing online ISS on the government portal to citizens is expected to lead to their perceptions that the government is having a well-developed focus on delivering quality service to the general public. As evidenced from field interviews, "[Online ISS makes the government] look a lot more professional, credible, more organized, more citizen-centric and more efficient". It is hypothesized that having ISS on government portals could enhance the citizens' perceptions on the government service quality and therefore boost government image.

Perceived Power Relationship

Perceived power relationship (PPR) with the government refers to a member of the public's perception on their power situation relative to another party (in this study context, the government body with the authority to make a decision that concerns the individual). Dayal and Johnson (2000:12) raised the idea that having self-services such as ISS on government portals can lead to potential impacts on general public's perceived power situation: "This fundamentally changes the power relationship between a member of the general public and the government body to whom they are beholden" and "Where 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, they are in a significantly weakened power situation". They further argue that if people can choose to work in way that makes them feel relaxed and comfortable, they are much more intended to believe that the process is for their own benefit. During our field interviews, respondents also reflected that "interactive self-services doesn't give too much distance [from the government], since it presents the rules and regulations for assessment simply and coherently. I feel like being treated in a respectful and professional manner"; "[Online ISS] gives close contact [with government]".

Interview and literature evidence suggests several theoretical foundations for this construct. First, online ISS government portals may remedy the public's "information divide", the gap between those who can access and benefit from information and those who can't. This inequality might be caused by various aspects including political, social or personal reasons. Fung (2006) argues that "when some groups can not 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". A well designed ISS makes transparent the decision making process of public officials and how the rules and policies are applied to their particular situation.

Second, the construct is closely tied to the concept of power distance, a key dimension in the work on culture by Mulder (1976, 1977, Mulder et al. 1971). Mulder defines power distance as "the degree of inequality in power between a less powerful Individual (I) and a more powerful Other (O), in which I and O belong to the same (loosely or tightly knit) social system" (Mulder, 1977:90). Hofstede (1991:28) defines power distance as "the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally". Lim's (2004:32) study on negotiation support systems found that subordinates defer to superiors and do not question their authority in cultures with large power distance. In such cultures, people tend to pay more attention to the advice given by the negotiation agents. Hence, it is reasonable to assume that these actors are more likely to use or trust the decisions made by ISS, since it represents the way an acknowledged, authoritative expert would decide.

Web-based ISS use could help to decrease the sense of high power distance in countries with highly bureaucratic governments and hence reduce the tension between the general public and the government. Most prior studies only focus on the impact of Power Distance as a dimension of culture that impacts the adoption or

utilization of information systems (Lim 2004). The proposed study takes a new angle to focus on the other aspect: the impact of ISS utilization's influence on the culture.

Sense of Control

In the study, SOC is defined as the degree to which an individual citizen believes his/her self-assessment activities enable him/her to have a subjective feeling of control over the assessment outcome by the government. Dayal and Johnson (2000:16) claimed that a "sense of control" is one of the compelling benefits that self-assessment could bring to clients. They further explained this is because people are worried about filling in the application and "be held to account for any mistakes they make on the forms" and this risk can be drastically reduced when all the questions are explained fully, and the consequences of the information being entered are made apparent through a decision aid such as an ISS. Field interviews support this argument: one respondent commented: "interactive [self-assessment] systems gives better understanding and better sense of control over extracting the needed information quickly".

Research in online marketing behaviour has demonstrated similar results. Koufaris (2002) studied recommendation agents (a type of ISS which supports the human agent negotiation process in bargaining) to locate, choose and purchase products online. Koufaris (2002:209) found that, "given the utilitarian nature of online consumers", they prefer sites that provide them with a SOC, and so they would be more likely to remain loyal and return to those sites. Following on from this line of thought, on government website, ISS with effective decision support capabilities, which increases the predictability of the assessment outcomes of citizen's application, is also expected to be positively related to SOC. At the same time, this increase in sense of control can lead to reduced stress and greater endurance (Geer and Maisel 1972). Roese (1999) provided empirical evidence that a citizen's sense of control over outcomes were significant predictors of trust in government.

Concluding Comments

This paper developed a model and understanding of government service delivery through Intelligent Support systems. There has been very little published prior work in this area and, accordingly, this paper used a novel iterative approach to developing understanding and direction, involving practical experience, literature analysis, and preliminary data collection.

Reflecting on the findings of the study, the analysis revealed six principal constructs guiding decision support effectiveness and outcomes, as follows. First, with respect to decision support effectiveness, the constructs were decision making satisfaction, decision making transparency and perceived decision quality. Second, with regard to impacts, the constructs were the government service provider's image, the perceived power relationship, and the sense of control. Interview findings revealed these constructs in principle, and additional literature analysis provided support for these findings.

Each of these constructs requires further analysis in order to develop understanding and implication. For example, there is a lack of consistent and systematic measurement for DMS in the literature (for example, Alavi and Henderson 1981 and Baharati and Chuadhury 2004). It is necessary to reexamine and synthesize these available constructs. Further, DMS has rarely been looked into in the ISS literature or the digital government context, especially when the decision maker themselves may affect the decision outcome. Notable studies on DMS include Sanders (1984), who used DMS as the surrogate for overall system success, and Baharati and Chaudhury (2004) also derive the DMS concept from user satisfaction summarized in the DeLone and McLean's (1992) IS success model.

Similarly, further work is still required to determine the degree of interrelationship between the constructs, and the implications of the model as a whole. For example, a properly designed online ISS provides a more transparent decision making process, the disclosure to the public the decision criteria and processes make it politically difficult to ignore or override legitimate decisions or assessments. This could also potentially lessen corruption in some countries. As Dayal and Johnson (2000:12) commented, "Some agencies are uncomfortable with this power shift. Inevitably it requires a greater focus on audit and checking that people have been providing the correct information. 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".

Reflecting on the procedure of the study, there are three points of interest. First, as part of an ongoing study, the iterative method used documented in this paper proved a useful starting position from which to begin work. The procedure allowed for a relatively expeditious and effective approach to gathering insight from multiple viewpoints and information sources. Second, the procedure allowed the researchers to effectively marry theory and practice. By using a variety of exploratory techniques, the researchers were able to develop a practical understanding of the phenomenon despite the dearth of existing published work. Third, the process produced a working model that can now be used as a basis for additional testing and empirical analysis. While the model

developed here cannot claim to be complete or exclusive, the procedure does allow the researchers to be more confident about applicability and relevance than conventional deductive approaches.

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Appendix 1

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Government Service Delivery Through Intelligent Support Systems

Interview Protocol

[Greet Respondent]. We are conducting a study into the use and effectiveness of government service websites. Today we are interested in your experience with and reactions to these websites. Participation in this study is optional, and no individual information will be collected. If you wish to have a copy of the final results of this study, please let me know and I will record your contact details on a separate paper.

Do you ever use government web sites? If not, why not? (Exit) If yes, for what tasks?

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How do you feel about using government websites [in general]?
How do you feel about getting information for decision making from websites (compared with alternatives such as human beings or printed material)?
Have you used an online advice giving system on a government website (e.g. ATO, DIMIA, Centrelink)? If yes, which ones? If not, why not? (Exit)
What do you think about its system?
Prompt further if interviewee has further insights or have any other comments.

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