CONCEPTUAL MODEL TO MEASURE USER SUCCESS IN THE DIGITAL GOVERNMENT ENVIRONMENT

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Contents

Abstract

The digital government is one of the most significant areas of study to emerge in information science in the past several years. The digital government is, in broad terms, a computerized system that allows a community of users to obtain a coherent means of access to an organized, electronically stored repository of information and knowledge. The information resources and technologies embodied by the World Wide Web are now accepted ad the primary example of the digital government. The need exists for a means to measure user success in the digital government. Because a digital government environment involves two broad functions ?1) information search and retrieval and 2) interactivity with and through the medium- this research posits that measures of both of these functions will show positive correlation with user success.

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I. Introduction

This extraordinary expansion of easily accessible digitized information has lead to a new concept in information resource development and use— the "digital government." The digital government is not a physical space; rather, it is a concept that links users and the Web in specific contexts, defined below. No means currently exists to measure user success in the digital library environment. The purpose of this research has been to test and develop new models for measuring that success.

This introductory paper provides a definition of the digital government and an assessment of user success indicators. It briefly reviews two recognized models for determining user success in more traditional (non-Web) information system environments, each of which has contributed to the creation of a "comprehensive model" for determining user success in a digital government environment. We then provide a brief introduction to this comprehensive model.

1.1. The Nature of the Digital Government Environment

The digital government has been seen as one component of the more traditional government setting. By comparing and contrasting the digital government with other government components, researchers have sought to identify features that characterize digital government information resources. Black (1995) explored the concept of digital government resources by classifying information in a government into three broad conceptual categories based on format and control:

- Physical items the government controls, such as books and periodicals.
- Digital information the government controls, such as CD-ROM and online databases.
- Digital information the government does not control, such as Internet resources.

Although Black (1995) did not take a position as to what resources might be classified as part of the digital government, the third category clearly includes resources that may be viewed as within its domain. The existence of this digital government component is having an impact on government services and government usage as a whole. According to Black's estimate, the share of government services related to usage of Internet resources not within the direct control of the traditional government will increase from a current 5% level to a 30% level in five years.

Thus, broadly stated, the digital government consists of all digitized resources available to users of a computing

environment (Levy and Marshall 1995). Nevertheless, the obviously heterogeneous nature of digitized information resources has led researchers to define the digital government variously, as one or another subset of information in digital format. Some writers have defined the digital government as an extension of resources accessed through traditional government (Levy and Marshall 1995), while other research has asserted that it consists of all resources available on the Internet, whether or not such resources are accessed within the traditional government (Adam, Halem, and Naqvi

1995). Adam, Halem, and Naqvi (1995) and Arms (1995) are the primary advocates of this narrowly bounded perspective, claiming the digital government consists exclusively of digitized information resources in the Internet.

Other researchers have objected to the definition of the digital government as only Web-based information resources, and have also tried to give digital government a theoretical existence separate from traditional government. (Levy and Marshall 1995; Fox, et al. 1995; Lynch and Garcia-Molina 1995). For example, Lynch and Garcia-Molina (1995) criticize the assumption of Adam, Halem, and Naqvi (1995) that the digital government is based exclusively on fully digitized Web-based sources. They suggest that the exclusive emphasis on resources in distributed hypermedia format (i.e., fully digitized resources) is too limiting, and propose that the objective of the digital government is to develop integrative systems "to fully exploit the opportunities that are offered by materials in digital format."

Thus, they suggest that the digital government may consist of self-contained digitized resources such as CD-ROM databases, not only resources available on the Web. In their view, the digital government is an interface system, a gateway, for accessing digitized information (Lynch and Garcia-Molina 1995; Drabenstott 1993).

While others focus on development of the digital government through creation of meta-data format language, index mechanisms, and organizational mechanisms (Levy and Marshall 1995; Arms 1995; Black 1995), the central role for the digital government in Lynch and Garcia-Molina's view is to provide coherent access to a very large collection of information. The information includes, for the foreseeable future, both print and digital materials. They suggest that comprehensive access to a very large collection of information can be strengthened by integrating materials in digital formats. A range of resources, such as multimedia, geographical resources, and numerical data sets, have not been well represented, easy to access, and effectively usable in traditional government, and those resources

need to be projected in an interoperable fashion for comprehensive access.

1.2. Information Retrieval as an Indicator of User Success

Despite the disagreement concerning which information resources characterize a digital government, the research consistently recognizes that the digital government performs information search and retrieval functions (Borgman, et al. 1996). Users of the digital government are concerned to a great extent simply with gaining access to information (Adam, Halem, and Naqvi 1995), and the environment functions as a gateway or interface providing access to information resources (i.e., video, audio, and printed information). The perception that access is a function of the environment has led some researchers to suggest that the digital government user may be studied using an information analyst model (Levy and Marshall 1995). According to the information analyst model (Levy and Marshall 1995), the digital government user performs information-intensive intellectual work and uses a broad range of materials (fluid and fixed, transitory and permanent, paper and digital) in a collaborative fashion. Therefore, it can be expected that part of the user's assessment of success in the digital government environment will be based on assessments of information content, accuracy, and format, as well as on assessments of ease of use and timeliness of the environment, all dimensions of the EUCS instrument. Accordingly, this research adopts the hypothesis that user success in the digital government environment is a function of satisfaction with the format and content of information accessed through the computing environment and that the dimensions outlined in Doll's (1994) EUCS instrument will show a positive correlation to user success.

User success measures in the digital government domain require new thinking, however, to the extent that use of the digital government has characteristics not assessed by Doll's measure of the end-user environment. Researchers have suggested that these differences lie in the functions of the digital government as a hypermedia computer-mediated environment, in its use of multi-media information objects, and in the interactive role of the digital government user (Hoffman and Novak 1996).

1.3. Subjective Experience as an Indicator of User Success

If the digital government is seen only as a resource providing information search and retrieval, user success would presumably be assessable through the constructs developed to measure UIS. Researchers studying the

digital government have recognized, however, that a user's subjective experience within the environment is clearly a part of the measure of user success (Hoffman and Novak 1996; Rheingold 1993).

Borgman, et al. (1996) asserted that a digital government should be defined not only in terms of information entities that can be collected and organized into digital government (tangible information resources), but also in terms of the communication process used in the creation and utilization of those information entities. Borgman et al. pointed out that by focusing on the digital government as a collection of tangible resources, Adam's definition disregards the communicative aspects of digital government. Thus, Borgman, et al. (1996) proposed a digital government concept that encompasses two complementary ideas, one emphasizing that a digital government extends and enhances existing information storage and retrieval systems, incorporating digital data and meta-data in any form, and the other emphasizing that a digital government is constructed, collected, and organized by a community of users through a form of communication.

Paepck (1996) criticized the notion that digital government users merely search a giant repository of on-line information and walk away happy with their information. The standard information retrieval success metrics of recall and precision are far too narrow in the digital government computing environment. To identify the information needs of actual digital government users, he conducted a series of semi-structured interviews with a variety of users in a large, diverse computer-producing company. He found five underlying dimensions of digital government use:

- Resource discovery and selection: combining use of online and human sources, meta-indexes, and source taxonomy.
- Retrieval of information: searching in query form.
- Interpretation: summarizing, ranking, visualizing, and statistical analysis.
- Local information management: structuring varying usage, indexing, copying.
- Sharing: communicating.

The first three factors (discovery, retrieval, and interpreting) are comparable to information retrieval functions, whereas the latter two factors (management and sharing) imply a communicative function. The results of this study indicated that digital government users move back and forth among five areas of activities and need both to re-organize information to use it in multiple contexts, and to manipulate it in collaboration with colleagues of different backgrounds and foci of interest. Paepck's (1996) study did not involve empirical tests

of any of the five dimensions of user success that he outlined, but his conclusions reflect the growing consensus that a user's experiential satisfaction within the environment is a measure of user success in the environment.

The nature of the information content of the digital government itself suggests that user success consists of more than simply the quality of the environment as an information search and retrieval device. Adam, Halem, and Naqvi (1995), for example, define the digital government as a "network-based information system" providing access to self-contained digitized resources with "dynamic" and "compound" characteristics. The terms "dynamic" and "compound" refer essentially to format characteristics unique to information within the digital government. A resource (a document, for example) is compound if it consists of distributed information objects, each of which can be located at a different physical location (Adam, Halem, and Naqvi 1995). Thus, in the digital government, a resource might exist in components spread between different homepages, all of which are connected by hyperlinks. Resources in the digital government are dynamic because any component of a resource may change at any time, or may exist only temporarily. For Adam, Halem, and Naqvi (1995) and Arms (1995), the digital government exists as a "distributed multimedia database system" designed specifically for such dynamic and compound resources. The digital government is distinct from any current database system designed to provide access to static and permanent resources, and such databases are not digital government because they are ineffective for handling dynamic and compound resources.

Likewise, Lynch and Garcia-Molina's (1995) focus on presenting data in an interoperable fashion suggests new roles for the user of the environment. Interoperability is not simply a matter of providing coherence among passive object repositories, but includes the broader range of interaction types, inter-repository protocols, distributed search protocols and technologies (including the ability to search across heterogeneous databases with some level of semantic consistency), and object interchange protocols. Hyper-Text Transfer Protocol (HTTP) emerges as a protocol providing interoperable access in distributed, heterogeneous environment.

In summary, despite the disagreements concerning the definition of the digital government, information retrieval and communication functions are recognized as common denominators of the digital government definition.

1.4. The Computer-Mediated Communication (CMC) Environment

Researchers have also focused on the World Wide Web as a computer mediated

communications (CMC) environment. (Lynch and Garcia-Molina 1995). A CMC environment involves use of a computer network to mediate communications between users, both in a search for information and simply for the pleasure of communication (Hoffman and Novak 1996; Arnold 1995). Thus, although digital government users engage in search and retrieval functions, they experience subjective reactions to the environment that must be measured in order to assess user success (Arnold 1995; Paepck 1996). As Arnold (1995) states, users of such environments do two things: "They search for information in thousands of government and databases, and they talk." Thus, researchers suggest that use of the CMC environment should be studied both in terms of its information retrieval function (Adam, Halem, and Naqvi 1995) and its function as a communication medium. (Hoffman and Novak 1996).

The nature of a user's communication activity in a CMC environment has been conceptualized in a variety of ways in the literature. Hoffman and Novak (1996) discuss the mediation of communication by the computing environment in which the user acts through the computer, which provides direct exposure to—and control of—navigational techniques utilized in order to locate desired information. In navigating through this environment, the dynamic between the user and information system is changed as the user becomes his/her own intermediary. As the user pursues a desired information result, he or she is able to refine the search process. The user may be in either search or browse mode, or may in fact blend search and browse techniques, trying various paths, placing bookmarks, retracing steps already traveled, and so on.

Researchers have applied theoretical approaches derived from media communications literature to discuss the communication attributes of the CMC environment, pointing out that traditional media communication theories, which are mainly based on a one-to-many model of communication (Rafaeli 1988), are inadequate to describe the new many-to-many communication environment of the Internet (Hoffman and Novak 1996). Traditional theories have dealt in large part with reactions among passive recipients of information disseminated through the medium. The user's role in such communication media as television is to receive and react to the content chosen by the distributing party. Users experience the new CMC environment, however, as a discretionary database (Connonly and Thorn 1991). A discretionary database is a shared pool of data to which several participants may, if they choose, separately contribute information. If no one contributes, the data base cannot exist. Participation in the database leads to 1) the perception of being part of a community that is not defined by

geography, race, ethnic origin, gender, economic or social status and 2) the expectation that personalized, candid information will flow directly from individuals on any subject, without concern for the formalities of rank, and with less self-censorship than other forums (Rheingold 1993). This user of a discretionary environment is thus both the recipient and the originator of information.

Perhaps the term most commonly used to describe the communication functions of the CMC environment is "interactivity." Rafaeli (1988) describes interactivity in a communication medium in terms of responsiveness to communication. He then identifies three levels of interactivity: two-way (non-interactive), reactive (quasi-interactive), and fully interactive communication. According to Rafeli, interactivity is an expression of the extent to which, in a given exchange, any transmission (message) beyond the second is related to the degree to which previous exchanges referred to even earlier transmission. By this definition, one-to-many communication is non-interactive since there is no way for a third party to respond; one-to-one communication is quasi-interactive because the receiver, at least, can reply to a previous message, although a third party can't join to the communication; and finally many-to-many communication is fully interactive, since any third party can join the communication process without limitation.

Interactivity is a variable of great concern to researchers in human-computer interaction (see Hoffman and Novak 1996). In the CMC environment, interactivity refers to communication that takes place because some people can respond to a previous communication in a limited way, or on a many-to-many basis, and can use the network environment to engage in a form of creative searching activity (Hoffman and Novak 1996). Hoffman and Novak characterize this behavior by using the metaphor of navigation, which they define as the process of self-directed movement through distributed hypermedia information resources. Users navigate the World Wide Web using a variety of searching techniques, communicating with other users at times and searching through hyperlinked information resources at other times. Sheridan (1992) identified the three major factors that contribute to interactivity: speed, range, and mapping of interactivity. Speed refers to the rate at which input can be assimilated into the mediated environment. Range refers to the number of possibilities for action at any given time, and mapping refers to the way in which human actions are connected to an action within a mediated environment. Sheridan (1992) argued that speed of interaction, or response time, is one important characteristic of an interactive system. Real-time interaction clearly represents the

highest possible value for speed of interaction.

Newhagen and Rafaeli (1996) outline several attributes of user communication within a CMC environment, among them conversational coherency, communication control, sense of place. Conversational coherency, for example, is perceived by the CMC user because the rapidity of communication in the World Wide Web allows conversation-like interaction, while the one-way nature of the communication experience allows the communicator to express full, coherent thoughts without interruption. At the same time, users may take advantage of the archival nature of the environment to reference previous communications, thus making conversation coherent over an extended period of time (Newhagen and Rafaeli 1996).

An additional attribute of CMC use is the user's reaction to the vividness of the media content of the Web. The CMC environment provides the user with forms of sensory experience not present in other computing environments (Steuer 1992). Communications literature identifies media in terms of their sensory impact on an audience, using terms such as "pleasurable medium" (Walther 1992), and "social presenced rich medim" (Walther 1995), to describe richness of sensory experience. Steuer (1992) hypothesizes that in the CMC environment sensory satisfaction is a function of two variables: telepresence and vividness. Telepresence is defined as the mediated perception of an environment other than the physical environment surrounding the user. This variable focuses on the capacity of an environment to surround, or engross, the user. Vividness, the representational richness of CMC, refers to the number of sensory dimensions presented by the environment and the resolution or quality of the presentation (which is highly correlated with media bandwidth) (Steuer 1992). In hypermedia CMC, both breadth and depth of sensory experience are, in general, high (Steuer 1992).

Thus, both the sensory intensity of the hypermedia information format and user's ability to navigate through the environment have an impact on the user's subjective experience. Bioca (1992) suggests that the user experiences "hyperfocus" as a result of the absorption into the process of information exchange and communication in a CMC environment. He suggests that hyperfocus is a type of focused attention in which users focus on their computer to the exclusion of their immediate environment. They lose track of time, don't hear when spoken to, and become irritable when outside stimuli require them to break off before they reach some kind of closure. It is not clear whether this is due to some physiological response, such as the alpha wave changes caused by CRT screen scan rates, or because keeping track of several

different conversational threads requires concentrated focus that results in a meditation-like state of consciousness, or because of some other element or combination of elements (Bioca 1992).

Bioca (1992) also stated this as a "tendency to become enchanted by information exchange and interaction with others to the exclusion of other activities and to the point of addiction for some." Others have discussed similar ideas of user "immersion" as a function of CMC use (Slater, Usoh and Steed 1996), although literature focuses primarily on this concept in connection with virtual environments. Bauwens (1994) conceptualizes the CMC environment as a partially virtualized environment that involves "telepresence and immersion technologies." Immersion is a description of the state of consciousness and psychological sense of being and corresponding behavior provided by any system (Slater 1996). It is a function of the vividness of the environment and the extent to which the environment provides a match with the perception of the viewer.

Empirical tests of immersion in virtual environments show a positive correlation to user success in those environments (Ackermann 1994). Slater (1996), for example, conducted an empirical study of correlation between immersion and task performance in a virtual environment. His study tested 29 subjects within both virtual and real environments and defined two levels of immersion: high and low. Subjects showed a positive correlation between high immersion and task performance, and those in virtual environments performed better than those in real environments. However, the external validity of Slater's study is doubtful since the test was conducted in a controlled environment. Moreover, Slater's sample size was too small to insure external validity. Nevertheless, he demonstrated at least the probability that immersion level correlates to task performance in the virtual environment.

II. Expanding the Concept of UIS in the Digital Government Environment

Researchers in both the information systems and communications fields have expressed the need for a model of user success in a CMC environment. Newhagen and Rafaeli (1996) indicate that traditional paradigms for study of user satisfaction will need alteration to take into account user reactions to active participation in the CMC environment. They recognize, however, the difficulty in understanding the current nature of the user relationship to that environment.

There is currently no dominant paradigm

for study of this interaction. Researchers have begun reaching for such a paradigm, however. Bishop, et al. (1995), for example, indicate that analysis of digital government environments may be conducted as a function of user, work group, institutional and occupational, and virtual community activities within the CMC environment. They suggest that the applicability of particular UIS scales in a digital government environment is dependent on effective triangulation of concerns that users and user groups encounter in accessing aspects of the environment. Hoffman and Novak (1996) indicate that a Flow-type instrument should be applied to the study of users within the hypermedia CME. They assert that "Flow" plays a central role in user navigation through the CMC, providing "the glue holding the consumer within the CMC environment." The congruence between challenge and ability characterized by Flow, they suggest, has particular explanatory power concerning navigational experiences, such as those within the CMC environment. The user's overall experience of the medium is heightened by the intensely interactive plane on which a successful CMC navigator operates, as well as the high levels of telepresence that can potentially affect users within the environment. Hoffman and Novak suggest using Flow analysis to develop marketing techniques designed specifically with the challenge-ability congruence of different users in mind.

A concept that is clearly gaining currency among researchers is that a strong presence of experiential satisfaction will be positively correlated with user success (Hoffman and Novak 1996). As Lynch (1996) points out, the advent of CMC environments create an "economics of attention." The user's attention becomes a commodity, and the utility of a CMC environment may be measured in terms of its ability to attract the user's attention. As with nearly all of the literature in this area, Hoffman and Novak's (1996) study suggests that from the observations of Lynch (1996) and others concerning the experiential attributes of the CMC environment, (i.e., hyperfocus and immersion) it should be possible to synthesize a coherent measure of user success, operationalized in variables which assess the experience of interactivity within the CMC. They suggest that the dimensions of experiential aspects of user success may be based on an application of Csikszentmihalyi's Flow Theory for testing behavioral satisfaction.

However, the Hoffman and Novak (1996) discussion points indirectly to the necessity for testing satisfaction as a function of success as well. They suggest use of a Flow instrument incorporating two parameters: goal-oriented Flow and experiential Flow. Their conception of goal-oriented Flow virtually restates the variables underlying the EUCS instrument (Doll 1988, 1994).

Typically, goal-oriented Flow is based on whether an output meets both user expectations and requirements. It is a hypothesis of this research that UIS, measured by the EUCS instrument (Doll 1994), should be employed together with the Flow instrument for assessing user success within the

digital government hypermedia CMC environment.

2.1. A Measure of Subjective Interaction-Oriented Experience: Flow

Measurement of user success related to subjective interaction-oriented experience requires a construct other than Doll's (1994) EUCS construct. Researchers in the human-computer interaction (HCI) field have hypothesized that measurement of subjective aspects of user success in CMC environments may be achieved by adopting the Flow construct (Hoffman and Novak 1996). A number of researchers have suggested that Flow is a useful construct for describing a user's interaction with computers (Ghani and Deshande 1994; Trevino and Webster 1992; Webster, Trevino, and Ryan 1993). Thus, this research builds on the concept of Flow to move toward a more comprehensive measurement of user satisfaction with information system in the digital government domain.

Csikszentmihalyi (1990) developed a concept he called "Flow." He defined it as "the process of optimal experience achieved when a sufficiently motivated user perceives a balance between his or her skills and the challenges of the interaction, together with focused attention." Based on this definition, Webster, Trevino, and Ryan (1993) developed a construct called "Flow" that measures the subjective human-computer interaction experience. Applying Flow to the hypermedia CMC environment, Hoffman and Novak (1996) note that users "1) perceive a sense of control over their interactions in the environment, 2) focus their attention on the interaction, and 3) find it cognitively

enjoyable. When in the Flow state, irrelevant thoughts and perceptions are screened out and the user's attention is focused entirely on the interaction."

Hoffman and Novak indicate that Flow can be divided into two sub-categories; goal-directed Flow and experiential Flow. Goal-directed Flow is "instrumental and utilitarian in nature, extrinsically motivated, characterized by situational involvement, and results in directed search and learning." In contrast, experiential Flow is "ritualistic and hedonic, intrinsically motivated, characterized by enduring involvement, and results in nondirected search and learning." They argue that goal-oriented Flow is a necessary, but not always a sufficient, condition to achieve user satisfaction in hypermedia CMC and that

overall satisfaction involves attaining experiential Flow as well. In the context of the digital government, goal-oriented Flow is the process that results in what the user is actually left with after the output is delivered. Typically, goal-oriented Flow is evaluated based on the assessment of whether that actual output meets both user expectation and requirement. Because human-computer interaction experiences play a significant role in the hypermedia CMC environment, the goal-oriented Flow dimension alone may not equate with a total assessment of user satisfaction, but rather may be influenced by the experiential Flow of the human-computer interaction. Experiential Flow corresponds with the subjective human-computer interaction experience.

2.2 Subjective Satisfaction and Flow Theory

Most research on user satisfaction in HCI has been based on Csikszentmihalyi's Flow theory (1990), which posits that the congruence between skill and challenge provides a frame of reference for the user's satisfaction. Accordingly, satisfaction judgments are based on the combined effect of skill and challenge. Hoffman and Novak (1996) describe the process by which satisfaction judgments are reached within the skill-challenge framework:

- Users form the level of skills prior to use. These skills may be based on personal need, or past experience.
- Users receive a level of challenge in their activities.
- Perceived satisfaction may be either confirmed or not confirmed based on skill-challenge congruence.

Congruence provides a baseline or anchor for the level of satisfaction. If incongruence is perceived to have occurred, then user satisfaction increases or decreases from the baseline level. Building on this conceptualization of satisfaction, the formal Flow construct has been defined by numerous HCI researchers as a comparison of a user's skill with perceived challenge. If skills exceed challenge, one can expect that a user would consider the service to be boring. If challenge exceeds skill, the user would feel anxiety and may view the system negatively. Generally, HCI literature has treated user satisfaction and service quality as related, but distinct, constructs. While debate continues on the causal relation between these two constructs, recent research (Trevino and Webster 1992) seems to indicate that Flow is an antecedent of user satisfaction.

2.3. The Development of the Flow Construct

In 1989, Webster developed a Flow instrument to measure the congruence

between user skill and the perceived challenge of a computing environment. Based on interviews and focus group meetings with users from a variety of organizations, determinants of Flow were identified. She found that, regardless of the type of activity, users used basically similar criteria in evaluating satisfaction and that these criteria span virtually all aspects of the activity. The scale was designed to be applied to a broad spectrum of activities, and as Csikszentmihalyi suggests "it provides a basic skeleton through its skill/challenge format encompassing statements for each of the four Flow dimensions. The skeleton, when necessary, can be adapted or supplemented to fit characteristics of specific research needs of a particular organization."

On the basis of data from four independent samples, Webster, Trevino, and Ryan (1993) present a 12-item scale consisting of four Flow dimensions, including:

- Control: the congruence between the skill and challenge
- Focused Attention: the ability to focus
- Curiosity: the desire to attain competence
- Intrinsic Interest: the desire to be involved in the activity for pleasure

Flow scales have been used in a variety of published HCI studies, and there is a growing literature in the HCI field critiquing its use. While not all of these studies have formally examined the scale's psychometric properties, several recent studies have done so (Ghani, Deshande 1994; Trevino and Webster 1992; Webster, Trevino, and Ryan 1993). In general, the collective results from the research provide consistent support for the reliability of the Flow instrument on the four dimensions. Support for convergent validity and discriminate validity are mixed because several studies showed items loading on different dimensions, and the number of factors retained has not been consistent across the studies. Some recent Flow research argues in favor of an output-only-based measure of Flow. In an empirical study, Webster, Trevino, and Ryan (1993) showed stronger predictive validity for a 1992 version of a Flow instrument using only three dimensions (Control, Focused Attention, Cognitive Enjoyment) as opposed to the Flow congruence between skill and challenge.

Arguing in favor of the congruence score-based instrument, Hoffman and Novak (1996) state that superior predictive power of the output-only measure must be balanced against its inferior diagnostic value to the practitioner. Additional improvement in the 1989 Flow scales, recommended by Webster (1989) and aimed at overcoming problems created by using negatively worded items, were made by

Webster and Trevino (1992). In sum, while versions of Flow continue to be critiqued and improved, Flow stands as the preeminent instrument within the HCI practice of and research for the assessment of subjective human-computer experiential quality.

Like the UIS instrument, Flow is being employed as a diagnostic tool for uncovering broad areas of UIS shortfalls and strengths. In this way, Flow dimensions and items represent core evaluation criteria that transcend specific domains. Flow researchers suggest that it can fruitfully supplement UIS assessment in a specific context. Specifically, Webster and Trevino (1992) and Hoffman and Novak (1996) note that Flow is most valuable when it is used periodically to track service quality trends and when it is used in conjunction with other forms of service quality measurement.

2.4. Use of Flow as a Measure of Digital Government User Success

Research on digital government may now look to the HCI experience in measuring user satisfaction. Parallels between the two fields indicate that both IS user satisfaction literature and past operationalizations of the UIS instrument possess evaluations of output (technical) attributes and experiential (interaction) attributes. In assessment of digital government user success (DLUS), UIS might pertain to the accuracy, ease of use, format, timeliness, and content of the information products delivered. In the UIS instrument, the output dimensions have tended to be measured in terms of those dimensions (Doll 1994). The interaction dimension, on the other hand, may be evaluated not only by what is done, but by how it is done. In the digital government context, this may be represented by control, focused attention, intrinsic interest, and curiosity, the dimensions of Flow identified by Webster, Trevino, and Ryan (1993). Flow offers the potential to contribute to development of a DLUS construct by providing this additional focus for measuring the subjective interaction dimension of DLUS. Since Flow has been shown to provide specificity in measuring interaction satisfaction in the transaction, this study will examine Flow's ability to improve existing measures of user satisfaction within digital government information systems.

III. Conclusion

Prior to this study, no empirical research had explored the linkage between output-based user success measures, and experience-based measures. At its most basic, this paper was an attempt to explore whether users perceive success in a given environment as a function of both types of measures. Thus, a key goal of this paper

was to determine whether dimensions that had been previously tested separately and in other environments could be combined to form a comprehensive model for success in the digital government environment.

Future research is needed on the impact of the relationships among the EUCS, Flow constructs. The present paper is the first study to evaluate systematically the relationships between outcome-based user success and interaction-based user success from a multifaceted approach. It is also the first to examine the differential impact of culture on those relationships. It suggests that a multifaceted approach, in which each construct examined is assessed by multiple measures, can be beneficial to understanding a complicated set of interrelationships among the constructs.

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