The Information Satisfaction and Use Model: A comprehensive framework that includes perceived value, disconfirmation, and response to feedback

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Abstract

User information satisfaction (UIS) and system usage have been two important variables in MIS research because they are used to indicate system effectiveness, a factor that is hard to measure directly. This study presents the Information Satisfaction and Use Model (ISUM), a new framework that develops a comprehensive view of how UIS is formed and how it is determines system usage. This study draws from prior UIS measurement instruments, especially from those of Ives, Olson and Baroudi (1983) and Doll and Torkzadeh (1988). It also borrows heavily from Shirani, Aiken and Reithel's (1994) UIS model and from the American Customer Satisfaction Index model (Fornell, Johnson, Anderson, Cha and Bryant 1996).

In addition to incorporating several UIS-related factors familiar in the literature, the ISUM develops and explicitly incorporates some less studied variables. The perceived value of an information system is a user's judgment of whether the system is worthwhile to learn and use, and is important in determining satisfaction. The confirmation or disconfirmation of expectations is a major direct determinant of UIS. This study clarifies the nature of user expectations in determining UIS, relating them to user and organizational characteristics. Also, when users complain about system deficiencies, the response to this feedback should significantly affect their satisfaction, which in turn determines sustained voluntary system usage. Thus the ISUM both consolidates and extends prior research in UIS.

Introduction

One of the continually important goals of research in management information systems (MIS) has been to determine what makes an information system effective (Brancheau, Janz and Wetherbe 1996). The conceptualization and direct measurement of system effectiveness has proved challenging, and so various proxies have been used to represent this construct. Among them, user information satisfaction (UIS) has been one of the more popular. Various instruments and theoretical models have been developed to conceptualize and understand this important construct, and have incrementally contributed to this research stream. In general, UIS research has recognized different aspects of user attributes, user expectations, and system attributes as the primary contributors to a user's information satisfaction. However, while the varied research has answered many questions, it has created a patchwork understanding of UIS without much explanation of how all the pieces fit together. There are few models that try to integrate and relate the various factors that affect UIS (see (Doll and Torkzadeh 1988) and (Shirani, Aiken and Reithel 1994) for a couple exceptions), but those that do are not sufficiently comprehensive; they leave out many important factors that have been identified in both mainstream and in newer, more tangential UIS research (for example, the Technology Acceptance Model and pertinent extensions (Davis 1989; Davis, Bagozzi and Warshaw 1989; Gefen and Keil 1998)). To better understand the place of user information satisfaction in MIS research, we will briefly discuss its development as a research variable, explaining its relationship to system effectiveness and system usage.

System effectiveness, system usage, and user information satisfaction

An effective information system is one that helps an organization fulfill its goals. This simple but abstract definition reflects the difficulty of measuring system effectiveness. Brancheau and Wetherbe describe the challenge thus:

> Measurement has long been a problem for IS executives. While measurement of performance is crucial for sound management, few concrete measures exist for assessing the health of the IS organization. While costs are relatively straightforward to establish, benefits continue to be difficult to quantify. Underlying the problem is the IS profession's inability to establish and quantify the value of information. Meanwhile, measurement continues to be a critical problem as organizations invest more and more money in information systems. (Brancheau and Wetherbe 1987 p. 28)

Most IS failures are not because the system failed technically to do what it was supposed to, but rather because users did not use it (Nelson and Cheney 1987). Because it is much easier to measure, usage has become a widely accepted proxy for information system effectiveness (see Yoon, Guimaraes and O'Neal 1995 for a brief survey). System usage can be measured either directly, by actual observations of usage or usage logs; or by asking users about their intention to use a system. While there is often a significant disparity between intended and actual usage (Szajna 1996), intentions are often easier to measure.

However, we must ask whether system usage is an appropriate proxy for effectiveness when users are forced to use a system. Burkman (2000) argues that when usage is mandatory, it is more appropriate to assess the success of a system by measuring how satisfied users are with it. Moreover, when usage is optional, satisfaction is also a key predictor of whether or not users

will actually use it (Gatian 1994). Thus, in either case, user information satisfaction is a valuable predictor or estimate of the effectiveness of an information system (see Melone 1990).

User information satisfaction (UIS) refers to a user's judgment of how well the attributes of an information system match his or her needs and expectations. In this study, UIS will mostly apply to an entire information system (a set of interrelated computer applications), but it should be understood that the construct also applies to satisfaction with individual applications. The difference is not so much in the high-level theoretical factors related to UIS, but rather in the specific measurement for an information system versus for a specific application. We will touch again on this difference when briefly discussing the historical background of UIS measurement. However, it should be understood that in this study we are generally referring to all levels of information system that a user might have to interact with. After all, a user who says, "My computer isn't working," could be referring specifically to a word processor application error, a web portal being unavailable, or the office network being down. What is important to the user is that the "computer" or system is not satisfying their needs at that moment.

This study has three purposes. First, it explores in detail various factors that contribute to user information satisfaction and system usage. Second, it introduces some important factors that affect UIS that have been neglected in the mainstream UIS literature. The perceived value of an information system is a user's judgment of whether the system is worthwhile to learn and use, and is important in determining satisfaction. Also, when users complain about system deficiencies, the response to this feedback should significantly affect their satisfaction. The confirmation or disconfirmation of expectations is a major direct determinant of UIS. This study also clarifies the nature of user expectations in determining UIS, relating them to user and organizational characteristics. The final purpose of this study is to lay out all these factors, both

traditional and new ones, in a comprehensive theoretical framework with propositions that explain their relationships with one another.

We continue this paper by presenting two important instruments that measure UIS, and two important models that explain UIS-related factors. Based on these and many other theories in literature both within and outside the UIS stream, we present the Information Satisfaction and Use Model (ISUM), a new comprehensive model that hypothesizes the relationships of various factors that affect UIS, including its determination of system usage. We conclude the paper by noting some limitations, and summarizing our key findings.

Measurements and models of user information satisfaction

There have been several models over the years that have tried to represent the effects of and interaction between various factors in determining user information satisfaction (Chen, Soliman, Mao and Frolick 2000; Doll and Torkzadeh 1988; Galletta and Lederer 1989; Ives, Olson and Baroudi 1983; Joshi 1990; Kim and McHaney 2000; Palvia 1996; Ryker, Nath and Henson 1997; Shirani, Aiken and Reithel 1994; Suh, Kim and Lee 1994). Most of these models have taken the form of measurement instruments for UIS, where the underlying models have only been implicitly represented. These models have cumulatively built upon their antecedents, resulting in increasingly refined representations of UIS. Out of this large body of literature, we have chosen three works—two UIS instruments (Doll and Torkzadeh 1988; Ives, Olson and Baroudi 1983) and one explicit model (Shirani, Aiken and Reithel 1994)—that among them capture the bulk of the UIS findings to date. In addition, we include one comprehensive model of customer satisfaction (Fornell et al 1996) that represents the most important findings from the

marketing literature. In particular, this fourth model includes a couple important factors, Perceived Value and Response to Feedback, that are rarely found in the MIS literature.

Ives, Olson and Baroudi (1983) instrument

One of the most foundational measurement instruments for user information satisfaction has been the instrument developed by Ives, Olson and Baroudi (1983). Surveying the UIS research that had preceded them, they identified four rigorous attempts to develop an accurate tool to measure UIS (Bailey and Pearson 1983; Gallagher 1974; Jenkins and Ricketts Unpublished; Larcker and Lessig 1980; Pearson 1977). Based primarily on the 39-item instrument developed by Pearson (1977), Ives et al produced an instrument of 33 items that they further simplified to a 13-item "short form". Both instruments were composed of three factors: the support provided by the electronic data processing staff; the actual information system product delivered; and the users' knowledge of or involvement in the information system. The Ives et al short form has been for many years a key tool for measuring UIS (for example, see Galletta and Lederer 1989; Joshi 1990).

By consolidating prior UIS research, the Ives et al instrument richly captures many of the important elements that determine user information satisfaction (see Table 2, which evaluates the long form of the instrument). However, it has some important shortcomings in its representation of UIS. While it represents user and organization characteristics, it does not attempt to directly measure user expectations, which is an important factor in determining UIS. Although it has an item to measure expectation confirmation/disconfirmation, this simple representation does not sufficiently capture the complexity of this important factor. Furthermore, while the Ives et al instrument has many complex items, there is no attempt to explicitly group them into factors that can meaningfully represent the effects of perceived value and feedback.

End-user computing satisfaction

Doll and Torkzadeh (1988) argued that the Ives et al (1983) instrument is that it is not general enough to apply to a wide variety of information system typologies. They pointed out that this instrument was developed based on the then-current infrastructure of an electronic data processing (EDP) department that directly controlled an organization's information systems and provided reports to users on requests. With the onset of the end-user paradigm where users not only used the computer applications but also usually have a lot of control over their customization, they developed a very different instrument for measuring user information satisfaction.

Doll and Torkzadeh defined end-user computing satisfaction as "the affective attitude towards a specific computer application by someone who interacts with the application directly" (1988 p. 261). This tool consists of five factors that contribute toward UIS: content of the information delivered by the application, information accuracy, the effectiveness of the data formatting, the application's ease of use, and the timeliness of the information. With its focus on the more current end-user IS typology, and on the satisfaction of specific applications, the Doll and Torkzadeh instrument has proven to be quite popular in IS research (for recent examples, see Chen et al 2000; Kim and McHaney 2000; McHaney and Cronan 1998). This instrument is important for its departure from the pattern set by Ives et al (1983).

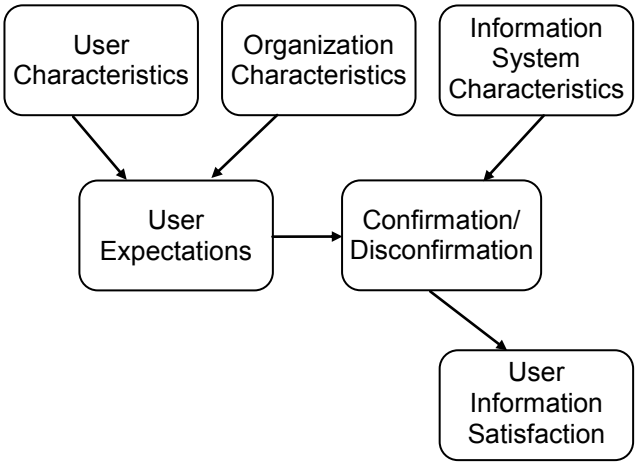
The primary benefit of its new approach is that several of the questions it poses present different facets of inquiring to what extent users' expectations are met. Whereas Ives et al instrument asks a single "Expectation" question, Doll and Torkzadeh's inquires about disconfirmation in the areas of information precision, content, accuracy, sufficiency and timeliness (see Table 2). However, it loses some of the Ives et al's effectiveness in that it fails to

ask about user or organization characteristics that might have an impact on UIS. Moreover, like the Ives et al instrument, Doll and Torkzadeh's fails to directly measure users' expectations.

Shirani, Aiken and Reithel's (1994) UIS model

Shirani, Aiken and Reithel (1994) criticized the Ives et al (1983) instrument and related works based on it (Bailey and Pearson 1983; Gallagher 1974; Galletta and Lederer 1989; Jenkins and Ricketts Unpublished; Larcker and Lessig 1980; Pearson 1977) on a number of points, ranging from the allegedly poor theoretical basis for selecting items to an exclusive "focus on system products and services" (p. 19) that ignored users' organizational contexts. The strongest criticism levied was that the instruments in the Ives et al tradition completely ignore the substantial research on satisfaction in "many disciplines including economics, sociology, psychology, social-psychology, public policy, marketing and management" (Shirani, Aiken and Reithel 1994 p. 20). A key feature of these research streams is that satisfaction is expressed as the extent to which a person's expectations are met, disappointed, or exceeded. Shirani et al complained that none of these instruments captures this element of user information satisfaction, and argued that UIS is best expressed as the extent to which the information system matches the user's expectations. This "match" is called confirmation/ disconfirmation, or just "disconfirmation" (figure 1). As a matter of fact, contrary to Shirani et al's claims, there *is* ample support for these concepts in the existing UIS literature, including that in the Ives et al (1983) tradition. They usually have not been addressed as explicitly as Shirani et al might like, but we will discuss them in detail in our later examination of each factor.

Figure 1. A conceptual model for User Information Satisfaction
Taken from Shirani et al (1994)



In Shirani et al's conceptualization,

> User characteristics include the user's expertise in computer-based technology and in the functional area for which he expects system support ….
>
> Organizational characteristics include the structure, culture, and politics of the firm, and are essential to understanding satisfaction in context…. (Shirani, Aiken and Reithel 1994 p. 20)

The User Expectations are relevant before the user actually tries out the system. Thus when the user actually sees the actual Information System Characteristics, there will be Confirmation or Disconfirmation of expectations.

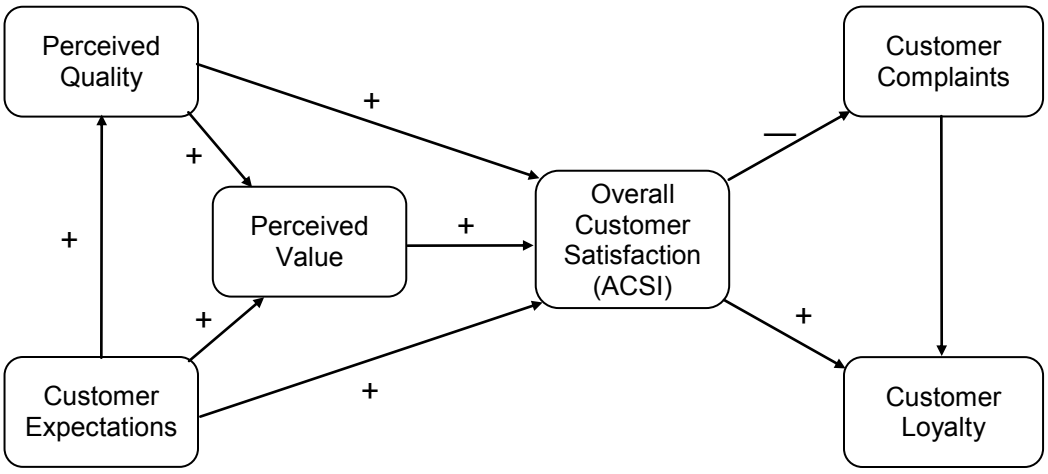
By explicitly recognizing the importance of user and organizational characteristics, and especially by emphasizing the disconfirmation component to UIS, Shirani et al's (1994) work is a valuable contribution to the UIS literature. However, they do not attempt to model any concept of the influence of users' perceived value of an information system, nor do they include any concept of feedback. These important elements need to be represented to give a fuller picture of

how UIS is formed. Moreover, although Shirani et al (1994) lay an invaluable theoretical foundation to better understand UIS, there has been no subsequent empirical work to more explicitly conceptualize their contributions. One reason for this is that their paper did not offer any clear propositions that could guide future empirical work. In this study, we attempt to build on Shirani et al's work, and lay a firmer basis for subsequent empirical work on these extensions to UIS theory.

American Customer Satisfaction Index model

Claes Fornell, Michael D Johnson, Eugene W Anderson, Jaesung Cha and Barbara E Bryant (1996) of the National Quality Research Center at the University of Michigan developed an instrument for measuring customer satisfaction for products and services of American businesses and government organizations. This instrument yields what is called the American Customer Satisfaction Index (ACSI), a single number that can be used to compare customer satisfaction with specific companies and products both across and within industries. The theoretical model within which the ACSI is couched (figure 2) identifies factors that determine and result from customer satisfaction; a number of these variables are unfamiliar in the bulk of user information satisfaction.

Figure 2.
The American Customer Satisfaction Index (ACSI) Model
From Fornell et al (1996)



Customer Expectations is the root factor in the ACSI model (figure 2) that primarily represents a customer's expectations of product quality before it is actually used. **Perceived Quality** is a customer's assessment of the quality of the product after trying it out. This is essentially the post-purchase version of the Customer Expectations construct. **Perceived Value** is a cost-benefit tradeoff between the perceived quality of the product and its price; it assesses whether the quality justifies the price, and if the price justifies the quality. Customer Expectations, Perceived Quality and Perceived Value together determine a customer's satisfaction, which is measured as the **American Customer Satisfaction Index**. Customer satisfaction (ACSI) is the primary predictor of **Customer Loyalty** to the product, the terminal variable in the ACSI model.

Fornell et al (1996) argue that dissatisfied customers will complain, and if their complaints are attended to they will become more loyal to the product. However, if their

complaints are ignored, customers will be even more disloyal than before. The **Customer Complaints** construct is an interesting perspective largely unfamiliar to UIS research. However, it is very similar to the concept of feedback where IS users voice their dissatisfaction to the IT department. With careful examination, we find that this new angle provides further insight into the relationship between UIS and system usage.

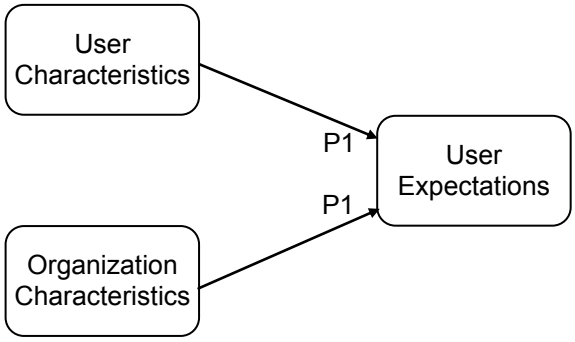
Although the ACSI model applies to consumer relationships, it has many valuable concepts that can be adapted and transferred to the IS arena. Although it does not consider the customer's context, as is represented by User and Organization Characteristics in Shirani et al's (1994) model, the ACSI has well-developed conceptualizations of the effects of users' expectations and the perceived value of the product, unlike most UIS research. It also introduces the concept of complaints (which we represent in this study as feedback) that presents a new variable in explaining UIS. Finally, the ACSI model explicitly models the impact of satisfaction on usage, which the UIS literature typically stops short of.

The ACSI model is well grounded in customer behavior theory (see Fornell et al (1996) for references), which is very similar in some ways to the behavior of IS users. Although this is probably the first application of the ACSI model to MIS research, it has frequently been applied to areas only indirectly related to customer behavior, including studies of the satisfaction of employees (Fosam, Grimsley and Wisher 1998; Hays and Hill 2001), hospital patients (de Ruyter and Wetzels 1998), library patrons (Cooper, Dempsey, Menon and Millson-Martula 1998), and users of police services (Gorst, Kanji and Wallace 1998). With appropriate adaptations, the ACSI is also helpful in extending our understanding of user information satisfaction.

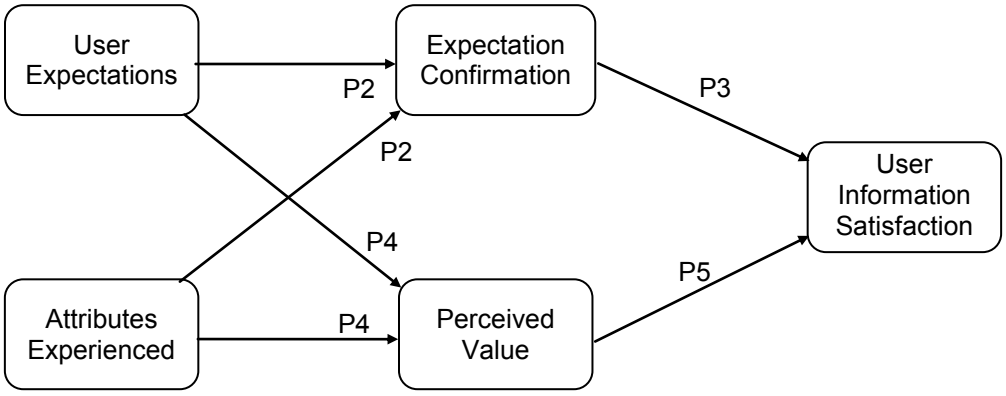
The Information Satisfaction and Use Model

User information satisfaction has a long, cumulative history in MIS research; Ives et al (1983) claim it goes back as far as 1963 (p. 785). We have surveyed a few carefully selected works that comprehensively capture the key findings from UIS research (Doll and Torkzadeh 1988; Ives, Olson and Baroudi 1983; Shirani, Aiken and Reithel 1994). However, none of these models comprehensively expresses all of the key factors that affect UIS. Moreover, when we consult the most important knowledge from customer satisfaction theory, represented in the ACSI model (Fornell et al 1996), we find that the important factors of perceived value and response to feedback are not adequately represented in the UIS literature. Based on these important pieces of research, and borrowing heavily from several other theories related to satisfaction and system usage, we present here a comprehensive model that attempts to consolidate the scattered theoretical findings of UIS literature and fill in some of the holes in current theory. Shown in figure 3, this is the Information Satisfaction and Use Model (the ISUM, pronounced “EYE-syoom”).

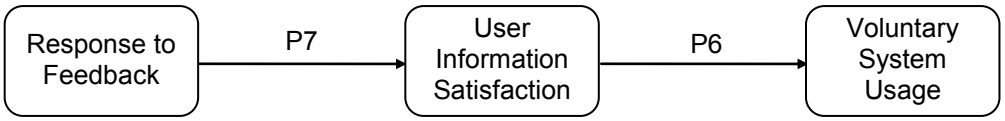
Figure 3. The Information Satisfaction and Use Model



(a) ISUM at Time 1: Pre-trial user expectations



(b) ISUM at Time 2: Initial "taste-test" trial(s)



(c) ISUM at Time 3: Decision for sustained system usage

The ISUM has three stages, depending on what time measurements are taken. In the Time-1 stage, User and Organization Characteristics contribute to form User Expectations; this stage represents expectations formed before the system is actually tried. In the Time-2 stage, the user tries the system. This might involve more than one actual trial, but it involves enough first-hand experience of the system for the user to form an opinion. The User Expectations and information system Attributes Experienced interact to form both an Expectation Confirmation and a Perceived Value of the information system. The Expectation Confirmation and Perceived Value together determine the User Information Satisfaction. In the Time-3 stage, the User Information Satisfaction determines the Voluntary System Usage. This stage has the implicit understanding that users might be initially dissatisfied with some aspect of the system, and have given their negative feedback to the system developers or maintainers. Their UIS in this stage is moderated by the Response to Feedback, which affects the User Information Satisfaction and ultimately the Voluntary System Usage.

In the rest of this section of this study, we will examine each individual variable in detail at each stage of the ISUM. We explain the theoretical foundations for each variable, and its relationship with other variables in the model. Table 1 shows how the factors in the ISUM map to those in Ives et al's (1983), Shirani et al's (1994) and the ACSI (Fornell et al 1996) models. Table 2 lists the specific question items used in the Ives et al (1983), Doll and Torkzadeh (1988) and ACSI (Fornell et al 1996) instruments, as well as further suggested questions that would capture the theoretical scope of the ISUM.

The Ives et al (1983) factors were determined by empirical factor analysis: the support provided by the electronic data processing staff; the actual information system product delivered; and the users' knowledge of or involvement in the information system. None of these map

directly to the ISUM factors, but based on careful observation of the 33-item version of the instrument, many of the items correspond to factors identified in the ISUM. Similarly, none of the factors in Doll and Torkzadeh's (1988) model maps directly to those in the ISUM, but there is considerable overlap. In fact, most of Doll and Torkzadeh's items can be recast to fit the Attributes Experienced and Expectation Confirmation factors of the ISUM. The ACSI (Fornell et al 1996) provides a much closer mapping to the ISUM, where all factors map directly, except for User and Organization Characteristics, which are not measured, and Expectation Confirmation, which is represented by a single item in the Satisfaction factor. Shirani et al (1994) is a high-level model that does not provide specific items. Like with the ACSI model, most of the factors map directly; the exceptions in this case are Perceived Value, Voluntary System Usage, and Response to Feedback, none of which is represented.

Table 1. Mappings between factors in the ISUM and in pertinent UIS models

ISUM	Ives et al	Doll and Torkzadeh	ACSI	Shirani et al
User Characteristics	User Knowledge or Involvement	None	None	User Characteristics
Organization Characteristics	EDP Staff and Services	None	None	Organization Characteristics
User Expectations	None	None	Customer Expectations	User Expectations
Attributes Experienced	Information Product	Accuracy, Format, and Timeliness	Perceived Quality	IS Characteristics
Perceived Value	Information Product	Ease of Use	Perceived Value	None
Expectation Confirmation	Single item (factor did not load)	Content, Accuracy, and Timeliness	Included in Overall Customer Satisfaction	Confirmation/ Disconfirmation
User Information Satisfaction	N/A: Composite index	N/A: Composite index	Overall Customer Satisfaction	User Information Satisfaction
Voluntary System Usage	None	None	Customer Loyalty	None
Response to Feedback	EDP Staff and Services	None	Customer Complaints	None

Table 2. Mappings between items in the ISUM and in pertinent UIS models

ISUM Factors	Ives, Olson and Baroudi	Doll and Torkzadeh	ACSI	Further suggestions for ISUM
User Character-istics	• Degree of EDP training provided to users • Users' understanding of systems • Users' feelings of participation	None	None	• Prior experience using computer systems in general • Prior experience using similar computer systems • Computer self-efficacy (Marakas, Yi and Johnson 1998)
Organization Character-istics	• Relationship with the EDP staff • Attitude of the EDP staff • Top management involvement in EDP activities • Determination of priorities for allocation of EDP resources • Organizational position of the EDP function • Personal control of EDP service received • Schedule of recurring output products and services • Technical competence of the EDP staff	None	N/A	• Organizational flexibility in providing customized versus generic computer solutions • Equity in IS resource allocation (Joshi 1990)
User Expectations	None	None	• Overall expectation of quality (prepurchase) • Expectation regarding customization, or how well the product fits the customer's personal requirements (prepurchase) • Expectation regarding reliability, or how often things would go wrong (prepurchase)	• What users individually and specifically need from the system • Percentage of needs expected to actually be met

ISUM Factors	Ives, Olson and Baroudi	Doll and Torkzadeh	ACSI	Further suggestions for ISUM
Attributes Experienced	• Means of input/output with the EDP center • Confidence in systems • Currency (up-to-dateness) of the output information • Reliability of output information • Response/turnaround time • Volume of output information • Accuracy of output information • Precision of output information • Documentation • Completeness of the output information • Integration (automated sharing of information) of system database	• Is the system accurate? • Do you think the output is presented in a useful format? • Is the information clear? • Does the system provide up-to-date information?	• Overall evaluation of quality experience (postpurchase) • Evaluation of customization experience, or how well the product fit the customer's personal requirements (postpurchase) • Evaluation of reliability experience, or how often things have gone wrong (postpurchase)	Adds nothing else
Perceived Value	• Perceived utility (worth versus cost) • Timeliness of output information • Relevancy of output information (to intended function) • Convenience of access (to utilize the computer capability) • Flexibility of systems • Personal job effects resulting from the computer-based support	• Is the system user friendly? • Is the system easy to use?	• Rating of quality given price • Rating of price given quality	• Perceived usefulness and perceived ease-of-use items, based on the TAM and related models

ISUM Factors	Ives, Olson and Baroudi	Doll and Torkzadeh	ACSI	Further suggestions for ISUM
Expectation Confirmation	• Expectation (expected versus actual level of computer-based support)	• Does the system provide the precise information you need? • Does the information content meet your needs? • Does the system provide reports that seem to be just about exactly what you need? • Does the system provide sufficient information? • Are you satisfied with the accuracy of the system? • Do you get the information you need in time?	• Expectancy disconfirmation (performance that falls short of or exceeds expectations)	• For each of the pre-trial needs and expectations, measure the extent to which expectations were confirmed or disconfirmed • Kind of disconfirmation (Shirani, Aiken and Reithel 1994): confirmed satisfaction, confirmed dissatisfaction, unexpected satisfaction, or unexpected dissatisfaction.
User Information Satisfaction	N/A: Composite index	N/A: Composite index	• Overall satisfaction • Performance versus the customer's ideal product or service in the category	• Overall User Information Satisfaction • Galletta and Lederer 1989: Satisfaction with user involvement, system support, and information product
Voluntary System Usage	None	None	• Repurchase likelihood rating • Price tolerance (increase) given repurchase • Price tolerance (decrease) to induce repurchase	• Expected future usage of the system • Actual system usage • Self-reported usage

ISUM Factors	Ives, Olson and Baroudi	Doll and Torkzadeh	ACSI	Further suggestions for ISUM
Response to Feedback	• Processing of requests for changes to existing systems • Correction of errors • Attitude of the EDP staff • Communication with the EDP staff • Time required for new systems development	None	• Has the customer complained either formally or informally about the product or service?	• How easy it is to give feedback • Amount of negative feedback users give (suggestions, criticism and complaints) • Responsiveness of system developers to negative feedback (Gefen and Keil 1998)

Time 1: Pretrial user expectations

In the Time-1 stage of the ISUM, we examine how user expectations are formed before the system is actually tried. While User Expectations are formed mostly independently of other factors, they are heavily influenced by User and Organization Characteristics, which represent the environmental context in which users form their expectations.

Factors that represent context: User and Organization Characteristics

One of the foundational theories of Shirani et al's (1994) UIS model is the idea that a user's expectations are primarily determined by both the individual characteristics of the user, and by the characteristics of the organization in which the user operates. Although Shirani et al assert the importance of these factors, they admit:

> The issue of how expectations are formed is more complex and less understood than the disconfirmation concept. We believe that besides other determinants (such as emotional stability, physical health, etc.), the work-related expectations of a corporate employee are most closely linked to his organizational work environment and his personal work experience. … A user's personal attributes most relevant to work-related expectation formation, confirmation/ disconfirmation, and UIS may include his computer-related and functional area expertise. (p. 21)

User Characteristics

Depending on their individual aptitude and skills, and on the task at hand, users have differing needs and differing degrees of need for features in an information system. In an empirical experiment of the effect of prior user characteristics, Nelson and Cheney (1987)

demonstrated that users with greater computer ability tend to be more accepting of computer technology. This result may reflect a connection between expectations and acceptance. This possibility is supported by a study by Yoon, Guimaraes and O'Neal (1995), who found that end user characteristics of expectations, computer knowledge, and positive attitude had a significant effect on expert system success. Interestingly, they operationalized user expectations as one of the items that make up user characteristics, and this factor was positively associated with user satisfaction, their proxy for success.

In Ives et al's (1983) UIS instrument, a few of the items they measured under the EDP staff and services factor actually pertain to user characteristics (user training, understanding of systems, and participation). Neither Doll and Torkzadeh's (1988) nor the ACSI (Fornell et al 1996) instruments have any user-characteristic items. Computer self-efficacy is a significant body of literature that brings much to bear in this area (see Marakas, Yi and Johnson 1998 for an in-depth review). "Self-efficacy" refers to users' perceptions of their ability to effectively use computers. Marakas et al (1998) distinguish between "general computer self-efficacy … an individual's judgment of efficacy across multiple computer application domains" (p. 129), and "task-specific computer self-efficacy … an individual's perception of efficacy in performing specific computer-related tasks" (p. 128). Both of these dimensions are relevant in assessing the user characteristics that contribute to expectations for an information system.

Organization characteristics

Other than the experience that individual users bring with them when they consider new information systems and applications, user expectations will vary according to their organizational context. Organizational characteristics, such as its structure, culture, historical experiences, and politics, will affect what users expect from an information system (Shirani,

Aiken and Reithel 1994). In a study that directly related the organizational characteristics of small businesses to user information satisfaction, Raymond (1985) found that users tend to be more satisfied when IS is operated in-house, there are more administrative applications, and the MIS function is higher up in the organizational hierarchy. In a related work, Leifer (1988) developed a classification for different organizational structures based on the hierarchy and control of management, and he mapped these to four typologies of IS infrastructure based on the degree and nature of data centralization. He argued that certain types of organizational structures fit certain IS typologies better. This is an indication that the structure determines, to a large degree, the needs of IS users and thus their expectations.

As with the user characteristics, Ives et al's (1983) UIS instrument has several items related to organization characteristics that are measured under the EDP staff and services factor (see Table 2). Neither Doll and Torkzadeh's (1988) nor the ACSI (Fornell et al 1996) instruments have any organization-characteristic items. The ISUM could extend the scope of the Ives et al instrument by asking about how flexible the organization is in providing customized solutions to users' computing needs. While such flexibility would generally make users more satisfied, an organization might be prefer to deploy one-size-fits-all solutions that are easier to develop and maintain. Another relevant item is suggested by Joshi (1990), who studied users' perceptions of how equitably the IS resources were distributed to them within their organizations; he found that the perception of equity had a significant effect on their satisfaction. Thus equity of resource distribution should be included as in item in the ISUM.

User Expectations

Shirani et al's (1994) primary criticism of the UIS instruments in the Ives et al tradition is that none of them adequately identified user expectations and the user and organizational

characteristics that form it. They admit that the specific interactions of contributing factors that lead to expectations are not well understood, but they believe that a comprehensive model for UIS must at least include the users' expectations as a primary determining variable. The ACSI model reflects Fornell et al's (1996) belief that customers' expectations are critical in determining their satisfaction. In fact, Customer Expectations in the ACSI model are conceptualized as being formed independently of the context in which they are confirmed or disconfirmed. While Shirani et al assert that user and organizational characteristics are important determinants of user expectations, Fornell et al offer no theoretical suggestions for what determines customer expectations. Although Customer Expectations in the ACSI model is pre-purchase, Fornell et al explain that in addition to indicating future expectations, the Customer Expectations factor reflects past experience with the product, including customers' past satisfaction and loyalty history. "Experience" in this case includes both first-hand trials of the product in the past, and non-experiential influence, such as by hearing other customers' comments and reviews (Anderson, Fornell and Lehmann 1994).

The importance of user expectations in determining satisfaction is supported by a significant amount of MIS research (Counte, Kjerulff, Salloway and Campbell 1984; DeFiore and Gorewitz 1991; Iivari and Karjalainen 1989; Miller 2000; Ryker, Nath and Henson 1997). Lyytinen (1988) defined an "expectation failure" as a situation where an information system fails to meet the expectations of a significant body of stakeholders. Szajna and Scamell (1993) found that users' perception of their performance with an information system depended largely on the disconfirmation between their expected and their actual performance. Ryker et al (1997) found that when user expectations are set based on the more realistic information from their internal IS

department, they tend to be more satisfied than when their expectations come from less accurate sources outside their organization.

Suh et al (1994) note that "user expectations" can mean one of two possible ideas: A user might "expect" a system to improve his or her productivity in the sense that the user is fairly confident, and takes it for granted, that this is what the system will actually do—and would be very disappointed if it does not. Alternatively, a user could also "expect" a certain level of performance in the sense that he or she wants the system to do what is needed, and would be dissatisfied otherwise, regardless of any realistic anticipation of the system's capabilities. Suh et al warn that this is an important distinction. They found that when "expectation" is measured as what users realistically "expect" a system to do, the disconfirmation from what it actually does is not very relevant to their degree of satisfaction. What is important is what they "expect" in the sense of what they *want* the system to do for them.

This finding highlights the importance of focusing on users' needs in measuring their expectations that contribute to UIS. There is almost no practical way to develop a quantitative survey instrument that would capture the full range of possible user needs. For one thing, it is likely that users' perceived needs might not be the same needs what they actually need. It would be unnecessarily complicating to try to determine which kind of need should be measured here, and how to measure it. Probably the best approach to solving this problem would be to measure in the User Expectations factors what users realistically "expect" the system would do. Survey respondents could be asked to list some of their needs before they actually try the system, and then they can be asked to estimate what percentage of their needs they realistically expect that would actually be met; this would be a measure of literal "expectation". Next, in the Expectation Confirmation factor (after the user has tried the system) users could be asked to what extent the

system has met their needs. This kind of question occurs in Doll and Torkzadeh's (1988) instrument (see Table 2), though they did not express them as Expectation Confirmation items.

Although the items that constitute User Expectations are mostly independent of other factors, the ISUM recognizes that they are heavily influenced by the users' peculiar characteristics and by the organizational context in which the user encounters the system. This brings us to our first proposition:

> ***Proposition 1.*** *The specific characteristics of individual users and the environmental context of the organization will significantly influence users' expectations from an information system, even when their needs are similar.*

It is important to note that the User Expectations in both the Time-1 and Time-2 stages of the ISUM are identical. Even in Time-2, Expectations should be understood to be *pretrial expectations*. Thus, we would refrain from an operationalization of the ISUM that asked users after they had tried the system what their prior expectations were. Such an approach would have to depend on users' memories of past events. Moreover, their responses would likely be biased by their present assessment of the system.

Time 2: Initial "taste-test" trial(s)

In the Time-2 stage, the user actually tries the system. This could involve either a single trial where they make a "taste-test" of the system, or it might involve more than one use of the system. In either case, they try it enough times to form an opinion of their satisfaction, without actually committing to sustained usage of the system. In this stage, the User Expectations and Attributes Experienced interact to form both an Expectation Confirmation and a Perceived Value

of the information system. The Expectation Confirmation and Perceived Value together determine the User Information Satisfaction.

Attributes Experienced

Attributes Experienced is the user's subjective judgment of the quality and sufficiency of the information system attributes or content. It is equivalent to the Perceived Quality factor in the ACSI model (Fornell et al 1996). The actual system attributes, or quality, could be the primary factor that determines user satisfaction; there is certainly empirical evidence that the quality or attribute items typically measured for UIS do indeed increase UIS (Gluck 1996). In the ISUM, both Expectation Confirmation and Perceived Value mediate this relationship. One on hand, the disconfirmation between the Attributes Experienced and the User Expectations determines user information satisfaction. On the other hand, User Expectations and the system attributes they experience determine their value judgment of the system, and hence their satisfaction. The specific question items for Attributes Experienced in the ISUM can be drawn from Ives et al (1983), Doll and Torkzadeh (1988), and the ACSI (Fornell et al 1996). Each of these instruments has a rich representation of items that capture Attributes Experienced.

The IS Characteristics factor in the Shirani et al (1994) model is supposed to represent the objective reality of the information systems that the user is responding to. In other words, the confirmation or disconfirmation of users' expectations is based on the actual attributes of the information system. This perspective seems to assume that users respond to an information system based on its objective attributes. However, it is debatable that user evaluations accurately reflect the quality of an information system (Goodhue, Klein and March 2000).

All the same, in this case it is not the objective reality of the system that matters, but rather how the users perceive it (see Davis 1989). After all, if an information system were

phenomenally successful in generating extra revenue for a company, but users were unaware of this and had trouble using the system, they would evaluate it poorly and would report that they were dissatisfied with it. It is the users' subjective perception of the system that determines their satisfaction, not any objective facts that they may not perceive. Thus, a user-reported measure of the system attributes experienced is appropriate here, indeed more appropriate than any other objective measure.

In the ACSI model (Fornell et al 1996), Customer Expectations are hypothesized to positively affect the Perceived Value of the product. This is because Fornell et al argue that customers should have fairly accurate knowledge of the product attributes, and so should have reasonable accurate expectations. However, as we pointed out when discussing User Expectations, what users expect is often different from what the system developers have in mind. Thus, we make no similar proposition of the effect of User Expectations on Attributes Experienced, or vice versa. However, we do hypothesize that these two factors will interact to determine Expectation Confirmation and Perceived Value, as we will discuss in the following sections.

Expectation Confirmation

In the ISUM, Expectation Confirmation is the degree to which the system Attributes Experienced confirms User Expectations. Along with user expectations, Shirani et al (1994) assert that disconfirmation is the other critical determinant of satisfaction that is found in the non-MIS literature (for example, Swan and Trawick 1981; Tse and Wilton 1990), but is conspicuously missing from the Ives et al (1983) UIS instrument. As a matter of fact, although Ives et al do not express disconfirmation as a distinct factor in and of itself, they do include a single "expectation" item in the long form of their survey, which they describe as the "expected

versus actual level of computer-based support" (p. 793). Similarly, Doll and Torkzadeh (1988) do not represent such a factor, but their phrasing of several questions as, "Does such and such criteria of the system meet your needs," is actually a disconfirmation measure (see Table 2). Apart from the Ives et al tradition, there is quite a bit of MIS research that uses disconfirmation theory to explain its UIS results (Lyytinen 1988; Miller 2000; Ryker, Nath and Henson 1997; Shirani, Aiken and Reithel 1994; Suh, Kim and Lee 1994; Szajna and Scamell 1993). Thus, contrary to Shirani et al's (1994) assertions, disconfirmation is widely recognized as an important factor in UIS literature (it is likely, though, that much of this research was not available when Shirani et al wrote their paper, published in 1994).

One important finding in disconfirmation research is Ryker et al's (1997) observation that users tend to be more satisfied with their systems when their expectations are formed by information from their own IS department, rather than from sources outside their organization. This suggests that disconfirmation can be minimized when the IS department accurately communicates what the capabilities of the system will be, which they should be able to do better than any outside source. This finding reinforces the theoretical relationship between consistency of expectations with perceived system attributes and the users' resultant satisfaction with a system. However, coupled with Suh et al's (1994) findings, systems designers must be aware that it is not enough to simply tell users what they are going to get in a system, but that they must listen carefully and give users what they really want if they want to boost their satisfaction. As with Attributes Experienced, what matters is not any objective, "realistic" or accurate projection of what to the system should be expected to do, but rather the users' subjective desire for what they want from it.

Like Ives et al (1983) and Doll and Torkzadeh (1988), the ACSI model (Fornell et al 1996), does not express disconfirmation as a separate variable, but rather has a disconfirmation item as one of three questions that form the overall satisfaction factor itself (see Table 2). However, following the precedent set by Shirani et al (1994), the ISUM recognizes disconfirmation as a distinct construct mediating between User Expectations and Attributes Experienced in their effect on UIS. The best approach to measuring this item would probably be one similar to that of Doll and Torkzadeh (1988), where each of the pre-trial needs and expectations is measured for the extent to which expectations were confirmed or disconfirmed.

Proposition 2. *The correspondence between users' expectations and the attributes they subjectively experience in the information system will determine the confirmation or disconfirmation of expectations.*

At first Proposition 2 might seem tautological, in that Expectation Confirmation is defined as the correspondence between expectations and perceived system attributes. However, if Expectation Confirmation should be measured as a multi-item factor as we have suggested, then it would be possible that the expected correspondence would not materialize.

Shirani et al (1994) argue that the level of UIS depends on the nature of confirmation or disconfirmation as follows:

- If the user's expectations are favorable, and the system confirms these favorable expectations, the user will experience a moderate degree of satisfaction.
- If the user expects a poor system and this low expectation is confirmed, the user will be moderately dissatisfied.
- If the user expects a good system but the system is actually poor—thus the user's expectations are disconfirmed—the disappointed user will be very dissatisfied.

- If the user expects a poor system but the system pleasantly surprises them with its quality, the user will be very satisfied.

Proposition 3a. *When the system the system attributes are perceived as good, users will generally be satisfied with the system, and vice versa.*

Proposition 3b. *Disconfirmation of expectations (whether high or low) will intensify the degree of users' satisfaction or dissatisfaction, when compared to when expectations are confirmed (whether high or low).*

Perceived Value

Perceived Value is an important item in the ACSI model (Fornell et al 1996), because it gauges whether customers believe they are getting their money's worth. Even if they have a low opinion of a product's quality, a correspondingly low price would not make them nearly as dissatisfied as would an expensive product at a high price. Likewise, satisfaction with a high-quality product increases if it can be obtained at a relatively low price.

Although this factor is so obviously relevant in the ACSI model, Perceived Value is somewhat troublesome to port over to a UIS model, because users within an organization do not normally "pay" for IT services. (At least, not directly; many users do not explicitly feel the bite of overhead allocation that is carried out in some organizations for the IS function.) However, users do experience costs in the form of time and effort spent on learning and using an information system. When it is not mandatory to use the system—and this is an important condition—users must decide whether it would be worthwhile to spend the time and effort learning to become proficient in using the system. The amount of time or effort required is directly related to how easy the system is to learn. Once users have formed a good idea in their minds how easy they think the system would be to use, they must decide whether the system

would be useful enough to justify that effort. This valuation is complicated by the fact that a user cannot accurately judge how much time or effort the system will need until they actually expend the time and effort. Yet, users do form an initial assessment, and it is likely that this initial perception does affect their satisfaction with the system.

Technology Acceptance Model

The Technology Acceptance Model (TAM) (Davis 1989; Davis, Bagozzi and Warshaw 1989) is a valuable theoretical model that incorporates ease of use and usefulness. The theory underlying this model postulates that both the perceived usefulness and the perceived ease of use of an information system have a positive effect on users' intention to use technology, which in turn affects their actual use of it. Perceived ease of use, however, has a smaller effect than perceived usefulness, especially after the system has actually been implemented (Szajna 1996).

There are two versions of the TAM (Davis, Bagozzi and Warshaw 1989) based on the stage of system implementation. In the pre-implementation version, both perceived usefulness and perceived ease of use have an effect on the intentions to use a system. In the post-implementation version, perceived ease of use has much less of an effect on intentions; its primary effect is on perceived usefulness. Szajna (1996) explains: "The implication is that once individuals have been using an IS, their subsequent intentions are formed from their perceptions of its usefulness. Intentions then are expected to predict future technology acceptance behavior." (p. 86)

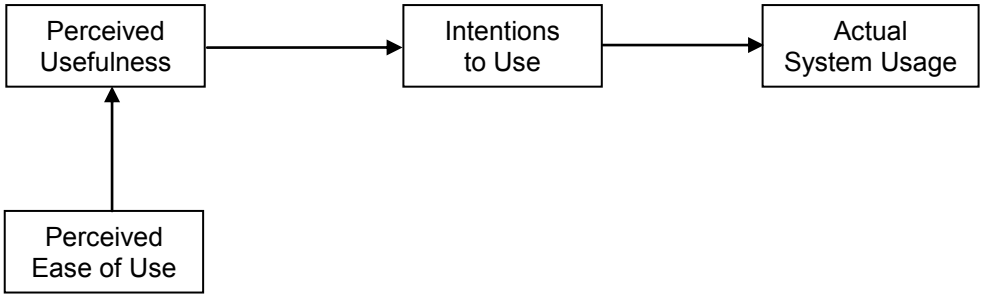


Figure 4. Post-Implementation Version
of the Technology Acceptance Model [Szajna, 1996 #281]

The key feature of Perceived Value in the ACSI model is the tradeoff between price and quality. It is the balance between these two elements that determines whether or not a customer is satisfied with a product. In building the TAM, Davis (1989) refers to a similar "cost-benefit paradigm" when users balance off the perceived usefulness of a system with how easy they perceive it is to use it. "This research explains people's choice among various decision-making strategies … in terms of a cognitive tradeoff between the effort required to employ the strategy and the quality (accuracy) of the resulting decision" (p. 321). Davis emphasizes that subjective perceptions are more relevant in determining users' rational behavior than are objective measures of usefulness or ease of use (such as clicks per task, or number of elements in the graphical user interface).

Incorporating TAM concepts into Perceived Value

Although this concept of Perceived Value is not well developed in the UIS literature, Ives et al's (1983) instrument does include a very similar item in the long form of their questionnaire: "Perceived utility (worth versus cost)" (p. 793). In addition, several of their items actually reflect how useful the system is for the users (for example, "Personal job effects resulting from the

computer-based support" (p. 739)). Similarly, Doll and Torkzadeh's (1988) instrument contains one user-friendliness and one ease-of-use item that are components of the Perceived Value concept we are developing here. Drawing from these instruments and from the TAM, the ISUM would incorporate various items reflecting perceived ease of use and perceived usefulness within the Perceived Value factor. The tradeoff interaction between these two would result in an "information value" effect that should have a positive effect on user satisfaction.

Although there probably is some tradeoff between perceived usefulness and perceived ease of use in evaluating "information value", the literature emphasizes that perceived usefulness is far more important than perceived ease of use (Davis 1989; Davis, Bagozzi and Warshaw 1989; Keil, Beranek and Konsynski 1995). In fact, some studies have suggested that ease of use does not have a direct relationship on system usage; its effect is entirely mediated by perceived usefulness (Davis 1989; Gefen and Keil 1998). This is particularly the case after the system has been installed and users have tried it (Davis 1989; Szajna 1996).

This "perceived information value" construct is similar to the satisfaction effect for government services in the ACSI model (Fornell et al 1996). In this case, citizens must decide on how useful the available services are as to whether or not they will use them. It is noteworthy that in ACSI surveys, the public administration/government sector consistently ranks the lowest in customer satisfaction relative to private sector industries (Fornell et al 1996). This could be because customers do not have much of a choice. Since the ACSI model surveys customers based on prior experience with a product, it is likely that for those products with more competitive markets, customers shopped around for a vendor for whom they believed their satisfaction would be highest. The monopolistic public sector does not allow this luxury, so customers are stuck with using a service that they would not have chosen, had there been an

alternative. IS departments are somewhat similar in that users do not have much of a choice other than the IS department that their organization provides. In both cases, customers/users do have the choice of whether or not to actually use the system. Hence, we would expect similar response patterns.

There is a possibly an important difference between price for products and the time and effort invested in learning a system: A price is usually given upfront for the product, whereas the perceived ease of use of a system is a guess that can be quite far off. However, with many services that customers buy, the price tag is just an entry fee; there might be hidden or maintenance costs that the customer cannot accurately estimate. For instance, the upfront cost of buying an office copier might give little indication of the long-term ongoing costs of toner, paper and maintenance. In this respect, the uncertainty in the precise cost of product or cost as effort, and hence the need for customers or users to act upon their perceptions, might be rather similar between the two models.

In the ISUM, the predictors of Perceived Value are the Attributes Experienced (users' subjective judgment of system attributes) and User Expectations (what they need, want or expect from the system). A user's judgment of if the system is worthwhile is based on if they believe that the attributes they perceive will meet their needs. Perceived Value has a positive influence on User Information Satisfaction, and along with Expectation Confirmation, is one of its primary determinants.

Proposition 4. *The correspondence between users' expectations and the attributes they subjectively experience in the information system will determine their judgment of the system's value or worth to them.*

Proposition 5. *The more valuable users judge a system to be for them, the more satisfied they will be with it.*

User Information Satisfaction

User Information Satisfaction is the key factor in the ISUM. In the Time-2 stage of the model, UIS is predicted by both the Expectation Confirmation (the degree to which a user's expectations are met) and by the Perceived Value (the user's judgment of if the system is worthwhile). In the Time-3 stage, UIS interacts with user Response to Feedback and ultimately predicts Voluntary System Usage. The Time-3 stage will be discussed in the next section.

We defined user information satisfaction as a user's judgment of how well the attributes of an information system match his or her needs and expectations. MIS research involving UIS tends to take one of two approaches in measuring this variable. In research that explicitly models factors representing attitudes (such as user expectations and attributes experienced), UIS is usually modeled as a distinct factor. In these cases, it is common for one to three questions to be asked to gauge the users' information satisfaction. The ACSI model (Fornell et al 1996) adopts this similar approach, where three simple items are used to measure customer satisfaction.

Such simple measures have often been criticized as being unreliable and generally unhelpful in identifying the source of user dissatisfaction (Ives, Olson and Baroudi 1983). In response to this oversimplification, more complex UIS instruments have been developed (Doll and Torkzadeh 1988; Ives, Olson and Baroudi 1983; Palvia 1996). In this other approach, these instruments use multiple items for a much richer perspective of what exactly users might be dissatisfied with. This makes them useful for both researchers and practitioners (Ives, Olson and Baroudi 1983). UIS is measured as a composite index of the various items and factors in these instruments. However, the multi-item tools are not unequivocally superior: Galletta and Lederer

(1989) found that the Ives et al tool had low test-retest reliability among many of its 13 items. In contrast, a simple four-question measure of UIS they used in the same experiment proved highly reliable on retest.

As the ISUM represents user attitudes, it will adopt an approach similar to that of the ACSI model: The UIS factor will consist of only three or so questions itself, similar to those used in the ACSI model (Fornell et al 1996) or Galletta and Lederer's (1989) summary instrument. The need for a multidimensional understanding of what contributes to satisfaction (Ives, Olson and Baroudi 1983) is met through the other factors in the model, which would give practitioners and causal researchers the rich information they need.

Time 3: Decision for sustained system usage

For most models that represent user information satisfaction, UIS itself is the goal. However, Fornell et al (1996) point out that the ultimate goal is usually to understand how satisfaction leads to loyalty to the product. Thus the ISUM goes beyond the scope of prior UIS models to include an explanation of how UIS affects sustained system usage when user have a choice whether or not to use the system. At this stage, the ISUM also considers the effects of feedback that users give about any initial sources of dissatisfaction. It models the effects of the system developers' response to this feedback upon UIS, and ultimately on the users decision to continue using the system.

Voluntary System Usage

There are two primary purposes for measuring user information satisfaction. First, when users have a choice whether or not to use a system, UIS is a key predictor of whether or not they will actually use it (Gatian 1994). In these cases system usage is theorized to be a good proxy for

IS effectiveness (for example, see Nelson and Cheney 1987). In the second situation, however, users are required to use the system. Such usage obviously cannot be used to estimate system effectiveness, as usage might only measure how strongly the requirement is enforced. In this situation, it is more appropriate to estimate system success by using UIS as a direct proxy (Burkman 2000). Based on this dichotomy, the Time-2 stage of the ISUM stops at predicting UIS, which is sufficient for both mandatory- and voluntary-use systems. The Time-3 stage goes on to predict usage based on UIS strictly for system where use is optional.

Voluntary System Usage can either be measured as intentional usage, as in the ACSI model (Fornell et al 1996), or as actual usage. Intentional usage is probably used most often simply because it is easier to measure, but research that has measured both intentional and actual usage has often found a large gap between the two (for example, Szajna 1996). Moreover, self-reported usage might not be as accurate as actual usage. And to complicate things further, how much usage constitutes "actual usage" is rather ambiguous (Melone 1990). Thus, to make sound conclusions, anyone who uses a model that predicts system usage must carefully clarify the measurement items and weigh the costs between ease of measurement and accuracy.

It cannot be ignored that system usage itself is an experience that contributes to UIS, rather than the one-way representation of UIS as the predictor of system usage (Melone 1990). The ACSI model (Fornell et al 1996) assumes that the customer who is evaluating their satisfaction of the product has actually purchased and used it at least once. The ACSI is a predictor of continued loyalty, given at least one trial. Similarly, the UIS instruments assume that the customer is evaluating the IS after having tried it. Davis et al (Davis 1989; Davis, Bagozzi and Warshaw 1989) recognized this distinction between pre- and post-implementation models when building the Technology Acceptance Model. Moreover, the TAM uses "acceptance" as its

usage variable—acceptance does not imply just one trial use, but continued usage. Thus system usage in UIS research is akin to customer loyalty in marketing, and the measure in the ISUM does not refer simply to trials of the system, but rather *sustained system use*.

Proposition 6. *When system usage is voluntary, the more satisfied users are with the system, the more likely they will continue to use it.*

Response to Feedback

The Customer Complaints factor of the ACSI (Fornell et al 1996) model is a particularly interesting variable with a lot of potential if its scope were expanded somewhat. First, it should be recognized that complaints are simply negative feedback. Users might give either positive or negative feedback; that is, they might complement the system developers for doing a good job, or they might complain about dissatisfactory features of the system.

In the ACSI model (Fornell et al 1996), complaints are directly and negatively affected by satisfaction. Likewise, positive feedback should be understood to be a direct reflection of high satisfaction. Probably the most significant effect that positive feedback would have on the attributes of a product or service is that the vendors would continue to do what they have been doing; thus positive feedback would probably not significantly affect customer expectations, perceived attributes or satisfaction. On the other hand, when customers are dissatisfied with a product, they will either complain or keep silent about their feelings. In either case they may show their displeasure by becoming disloyal to the product. Fornell and Wernerfelt (1987) theorize that complaints can have two possible results: The vendor might respond positively by addressing the customers' concerns, which would increase loyalty; or the vendor might neglect the complaints, which would reduce customer loyalty even further. Thus, complaints, or negative

feedback, are the more relevant factor in the model. Following the example of the ACSI model, the ISUM focuses only on the effects of complaints about the system.

Note that in this context, as in the ACSI (Fornell et al 1996), "complaints" is simply a synonym for "negative feedback"; it does not imply that the users necessarily have a "negative attitude" when giving their comments. It simply means that, whether given politely or rudely, this kind of feedback brings up areas where the users are dissatisfied and would like to see improvements. It is well established that user involvement in the system development lifecycle improves user satisfaction with the system (Karten 1994). This effect is usually interpreted as an increase in satisfaction because the system attributes will more closely match user needs or expectations. However, it can also be seen as an increase in satisfaction due to dynamic feedback: the system developers are responding to user input, which is expressed as suggestions for improvement; that is, negative feedback.

In the ACSI model (Fornell et al 1996), complaints are affected by customer satisfaction, and they only affect loyalty. This is a somewhat simplistic representation of the effect of complaints, for it is far more likely that rather than affecting loyalty directly, resolved complaints increase loyalty indirectly by increasing satisfaction. Thus, the ISUM represents Response to Feedback as a factor that interactively affects UIS, while UIS directly affects system usage.

Ives et al (1983) provides a number of items related to feedback, which are based on the interaction between users and the EDP staff and services (see Table 2). Similar to the customer complaints item that the ACSI model (Fornell et al 1996) includes, the ISUM asks about how much negative feedback users have given to the system supporters or developers. It is important to note that whether feedback is positive or negative, users generally share how they feel only when they are very happy with a system or very dissatisfied (Gefen and Keil 1998). When

system developers really want user feedback, they must make deliberately solicit this feedback in ways that make it easy for users to give. For example, the system might have easily accessible short surveys or comment forms built right into them. Because the amount of feedback is a function of how easy it is to give it, the ISUM would explicitly ask about this.

The effects of developer responsiveness

Although the quantity of feedback is important in the ISUM in determining user information satisfaction, what is really important is how system developers respond to this feedback. Gefen and Keil (1998) extended the TAM (Davis 1989) by identifying the responsiveness of IS developers as a contributor to users' perceived ease of use and usefulness. The key feature of their work is an application of Social Exchange Theory (SET) (Blau 1964; Kelley and Thibaut 1978) to the relationship between developers of the IS department and users:

> In essence, SET views interpersonal interactions in a manner somewhat similar to an economic exchange: people elect to partake in the exchange only if their expected "rewards" from it outweigh their "costs"—or at least satisfy their expectations and exceed alternative investments. … SET therefore views interpersonal interaction as a rational process composed of a set of cost-benefit analyzes. … Unlike an economic exchange, however, there is no commerce and no explicit barter involved in a social exchange. Likewise, there are no regulating procedures that guarantee the delivery of the expected "rewards". … SET deals with costs and rewards that are *subjective* (i.e., perceived) and *not explicitly bartered* (Blau, 1964). (Gefen and Keil 1998p. 38)

The relationship between IS users and IS developers is a kind of social exchange (Gefen and Keil 1998). When users take the time to give developers feedback about the system—whether before, during or after implementation—the users expect that the developers will respond by changing the system to meet their needs. If the users perceive the developers as being responsive to their feedback, then because they feel that their social exchange is paying off, the users will perceive the system as being both useful and easy to use. If, however, they perceive developers as being unresponsive, they will perceive the system as not useful or easy to use. Gefen and Keil's (1998) empirical tests supported their hypotheses. They used these results to extend the TAM by adding developers' responsiveness as a determinant of perceived ease of use and perceived usefulness.

The developer responsiveness construct seems to be a kind of disconfirmation effect: Users give negative feedback with the expectation of a positive response. This effect could be expressed across multiple factors as an attribute of the User Expectations (that are increased by giving feedback), Attributes Experienced (that is, the perceived changes or non-changes in the system as a result of the feedback), and Expectation Confirmation (the degree to which feedback led to desired changes in the system). However, such an operationalization would significantly complicate the model. The best approach for the ISUM would probably be to include simple disconfirmation items within the Response to Feedback factor, and to assess how these directly impact user satisfaction in further trials of the system.

Proposition 7. *The more satisfactorily system developers and maintainers respond to users' negative feedback about the system, the more satisfied the users will be with the system.*

Conclusion

This paper has presented the Information Satisfaction and Use Model (ISUM), a comprehensive model that brings together key research in user information satisfaction and system usage to explain their relationships with the factors that contribute to them. The ISUM draws from the prior UIS research, and is based primarily on Ives et al (1983) and Doll and Torkzadeh's (1988) UIS instruments, and on Shirani et al's (1994) UIS model and from the American Customer Satisfaction Index model (Fornell et al 1996). The ISUM provides a comprehensive framework that captures most of the important theoretical findings in the UIS literature, and makes relevant propositions that help to understand the factors better in their interactions with each other. The ISUM also introduces and emphasizes some important factors that have not been part of the main stream of UIS research. The perceived value of an information system is introduced as a cost-benefit weight that mediates between users' expectations and their perceptions of the system attributes in determining their satisfaction with the system. Another new element is the effect of system developers' response to user feedback in affecting their satisfaction. The confirmation or disconfirmation of user expectations, while not new in UIS research, is reemphasized and placed in a theoretical framework. Also, the nature of user expectations pertaining to UIS is clarified as users' perceived needs, moderated by their individual and organizational characteristics.

While the ISUM presented here is comprehensive in its scope, this study has some notable limitations. Most of the factors that are theorized to affect UIS are perceptual and subjective, rather than objective. Although the discussion has often noted this, it does not fully explore the psychological implications of modeling perceptual variables. Deeper investigation is necessary to accurately represent and measure the theoretical constructs. Another limitation is

that although the ISUM makes propositions regarding the interaction between several important factors, there are some potential relationships that are not explored. For example, User Expectations could be theorized to directly influence Attributes Experienced (see (Fornell et al 1996)). Also, some of the proposed relationships work in both directions, rather than in just one as the ISUM represents. For example, in Figure 3c, Voluntary System Usage probably evokes feedback, whose response would update UIS. The ISUM does not represent any recursive loops, although a number of these could be theorized. Finally, the scope of this present study has not permitted the obvious next step, conceptualizing the factors and developing concrete instruments and hypotheses for empirical testing of the model. This present work has been limited to laying the theoretical framework upon which future work can be based.

The perspectives on UIS presented ISUM should be helpful to both practitioners and to researchers. For practitioners, it has been a difficult problem to measure the effectiveness of information systems. One of the most widely accepted shortcuts to direct measurement has been to consider how well the system is accepted by users for whom it is designed; that is, how much they actually use the system, in situations where usage is not mandatory. One of the primary factors that determine usage is users' satisfaction with the system. If IS managers can create a system with which users are satisfied, then it is more likely that they will use the system. Even when system usage is required for job tasks, the users' satisfaction with the system would increase their productivity and enable them to be more effective in their jobs as they work towards the organization's goals. The ISUM helps managers understand the factors that contribute directly and indirectly towards UIS and system usage, and thus alerts them to where their efforts would be most productive in trying to make improvements.

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