

DEVELOPING AND EVALUATING METHODS FOR USER SATISFACTION MEASUREMENT IN PRACTICE

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ABSTRACT

With the broader impact of information technology in organizations and the higher expenditures related to IS services, there is a growing need to evaluate the quality of these services, and specifically to measure user satisfaction. Developing the appropriate instruments may be a difficult and tedious endeavor. On the other hand, existing tools and methods may be limited in their applicability to the organization's particularities and needs. In this paper, we review existing instruments and concepts related to user satisfaction measurement and discuss their limitations. We also propose, through a case study, how this existing body of knowledge can be used, in spite of its limits, as a starting point for developing one's own methods and tools.

INTRODUCTION

The role of the Information System (IS) department has changed considerably during the last decade. With IS having a much broader impact on organizational effectiveness and strategy, IS departments are required to justify their role and to adopt a customer-based approach to serving users more than ever before. There is a growing need to evaluate IS services and user satisfaction, both from the organization's point of view, in order to estimate benefits, and from the IS department's point of view, to improve performance. Jones reports that for most organizations, user satisfaction scores 3 out of 5, and approaches 40% across all platforms for custom software. These averages are rather low and should be considered as unsatisfactory. He also suggests annual or semi-annual surveys of user satisfaction as a basic control mechanism to address this problem.

Although some validated instruments have been developed to measure user satisfaction, they have been

limited in the flexibility they provide to fit all of the organization's specific measurement needs. IS departments that want to put in place evaluation techniques will first need to define their evaluation objectives, who they want to survey, when they want to survey, about what, etc. The conceptual frameworks that evolved from the "user satisfaction" stream of research can provide a valuable guideline for this exercise. Then, they will need to develop the appropriate instruments. Some of these may be borrowed and adapted from existing ones.

The objective of this paper is twofold: First, to review existing theories and instruments related to user satisfaction measurement and to discuss their limited applicability to practice. Second, we illustrate with a real world case how the previously developed theories and frameworks can be used as a guideline to evaluate and develop an organization's user satisfaction measurement

strategies and instruments. Rather than proposing one or several instruments to be used in some specific situations, we therefore propose a method to select or improve on existing instruments, depending on the situation of each particular organization.

Review of Concepts and Measurement Instruments

Many authors agree that measuring "user satisfaction" is the most useful and easy way to evaluate information system success. Through the years, many different research streams have focused on developing tools and techniques to measure satisfaction. In the following paragraphs, the most influential work on this topic is described. All these instruments have been validated and offer interesting starting points for those who seek to develop in-house measurement tools. We will discuss their particular limitations in the next section.

"User Information Satisfaction" (UIS)

Initially, this research work was undertaken because of two important observations: (1) the difficulty of measuring the impact of new systems on organizational productivity, and the increasing popularity of satisfaction as a surrogate measure, and (2) the absence of a formal, reliable and valid tool to measure satisfaction. Most of this work was therefore dedicated to the development of an appropriate tool to measure Information System User satisfaction.

The first questionnaire was developed by Bailey & Pearson. The original version contained 39 IS satisfaction dimensions (for example, *Top management involvement, Vendor support, Accuracy, Timeliness, Format of output, Error recovery, Confidence in the system*). Four different scales were used (e.g.: *Strong Vs Weak, Consistent Vs Inconsistent, Good Vs Bad, Significant Vs Insignificant, Precise Vs Vague, Harmonious Vs Dissonant*). The user had to evaluate or quantify each of these dimensions.

Ives, Olson & Baroudi reduced the length of the questionnaire to 13 items and two scales per item, while showing that the short version remained a powerful and valid tool to measure satisfaction. Later on, Galletta & Lederer found Olson & Baroudi's short version low on reliability, attributing this to the ambiguity of the different scales. They added four global questions on user satisfaction:

"How satisfied are you with your involvement and participation in the operation and ongoing development of information systems?"

"How satisfied are you with the support and services of the EDP department?"

"How satisfied are you with the information product itself?"

"In summary, how satisfied are you with the entire information systems environment?"

The original version of the questionnaire, and the subsequent revisions, were widely used in information systems research as an indicator of system success. Through time, however, there have been significant changes both in the technology and the type of services provided by the IS department, making this instrument somewhat obsolete. New formulations were subsequently suggested and are described below.

"End-User Computing Satisfaction" (EUCS)

With the advent of personal workstations and "end-user computing", the tools measuring user satisfaction developed by Bailey & Pearson and by Ives & al. became out of date and needed to be adapted to these new environments. Doll and Torkzadeh noted that:

"The Ives, et al., instrument was designed for the more traditional data processing environment. It measures general user satisfaction with EDP staff and services, information product, and user involvement/knowledge rather than satisfaction with a specific application. Indeed, it has not been validated for use in assessing specific end-user applications. It also ignores important ease of use aspects of the man-machine interface."

Doll and Torkzadeh [3] developed a new UIS instrument to measure the satisfaction of end-users who directly interact with a specific application. The twelve-item instrument can be construed as a measure of satisfaction with components of a specific information system product:

CONTENT

C1: Does the system provide the precise information you need?

C2: Does the information content meet your needs?

C3: Does the system provide reports that seem to be just about exactly what you need?

C4: Does the system provide sufficient information?

ACCURACY

A1: Is the system accurate?

A2: Are you satisfied with the accuracy of the system?

FORMAT

F1: Do you think the output is presented in a useful format?

F2: Is the information clear?

EASE OF USE

E1: Is the system user friendly?

E2: Is the system easy to use?

TIMELINESS

T1: Do you get the information you need in time?

T2: Does the system provide up-to-date information?

They use a Likert scale ranking from "1 = Almost never" to "5 = Almost always". The instructions are given so that the respondent can choose the rank "which best described their satisfaction".

This questionnaire offers a basis for evaluating end-user satisfaction, i.e. the opinion of those who use the system interactively to access information in a pre-defined format. It does not address a number of issues related to, for instance, decision support systems, executive support systems, group systems, etc.

"Service Quality" (SERVQUAL)

The objective of this stream, to measure service quality, was basically triggered by: (1) the need and the opportunity to develop a standardized tool to measure customer perceptions of the quality of the service provided by an organization, and (2) a "quality" model based on the gap between the real quality and the one perceived by customers, or the visible quality [9].

For many years this area of research developed itself independently from the Information Systems work

and led to a well known and highly used tool in marketing: SERVQUAL [8]. The instrument contains two series of 22 questions: the first series measures customer expectations and the second measures the customer's perception of the organization. In each of these two sections, five dimensions are evaluated and questions are rated from "1 = Strongly disagree" to "5 = Strongly agree".

Since IS departments tend to be more "customer" oriented than before, SERVQUAL provides an interesting tool to include in an exercise to evaluate user satisfaction. In the next section, we describe a model of user satisfaction that includes the service quality dimension.

"Information System Success Model" (ISSM)

The last three areas we have described continue to be developed independently, but some recent work has attempted to reconcile these different streams into one global model of information system success. The "Information System Success Model" (ISSM) was elaborated based on the observation that previous research confounded components of satisfaction and factors that are causally linked to satisfaction:

"[...] we were concerned that the items included be measures of satisfaction rather than measures of factors that cause satisfaction. In the early stages of research on new phenomena, cause and effect items are often grouped together to describe phenomena. Bailey and Pearson's (1983) work on the development of a user satisfaction instrument is a good example of this tendency. The items they used to measure user satisfaction included several factors, such as user involvement, top management involvement, documentation, relationship with EDP staff, and vendor support, that are often treated by others as variables that cause satisfaction."

In the same order, DeLone & McLean argued that "quality" and "satisfaction" are not the same and should be separated in a conceptual description of system success. Their proposed model evolved into the Augmented ISSM, which is presented in Figure 1.

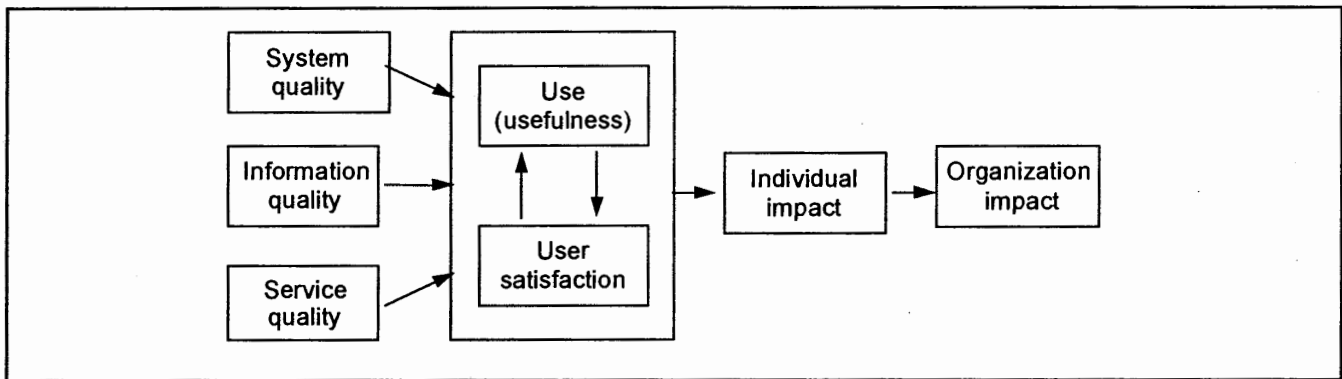


Figure 1: Augmented Information System Success Model [Pitt, Watson & Kavan, 1995]

According to this new model, three dimensions, "System quality", "Information quality" and "Service quality" influence two other important dimensions: "User satisfaction" and "Use (Usefulness)". These two will influence each other and will influence the individual's task and productivity (Individual impact). An impact at the individual level will in turn have an impact on the organizational level and modify organizational performance.

Although many subsequent articles have been published to revise, criticize or extend the ISSM model, it still prevails today as a more complete picture of the dimensions that compose user satisfaction.

Limitations of the Instruments

Most of the work described earlier has been dedicated to the development of instruments that would (1) contain the major components underlying the complex concept, and (2) be valid and reliable in order to be used for research and practice. The use of these instruments in research has been widespread, as user satisfaction is a convenient surrogate measure for system success. Although they were intended to be usable in a variety of situations, in practice they do not seem to have had the same popularity. One of the reasons may be that until now, very few organizations have put some effort in evaluating their systems once implemented. Another reason, which we argue, may be that existing tools have limitations that prevent their direct use in practice.

Specifically, the limitations are:

The instruments were developed to assess the satisfaction level of a single respondent (mainly the end

user), whereas there are, in practice, different users requiring different surveying tools.

The evolution of the measurement of the user satisfaction concept has occurred through incremental additions of sections to one questionnaire, in order to facilitate its use in research projects with one type of respondent. However, when an organization wishes to assess the success of its information systems, many different users have to be taken into account. For instance, evaluating the implementation of an operational system would require the input: (1) from the end-user, or the person who has the hands-on experience with the system; (2) from the department manager, who cannot speak per se of the specific functions of the system, but of its impact on productivity, on meeting departmental goals, etc.; (3) at a higher level, middle management or top management may have opinions to express about the contribution of systems, both to the general productivity of the firm or to their capacity to locate useful information. These different users will not only be questioned on different aspects of systems implementation, but in most instances with different types of instruments. Managers, for example, will be surveyed better using open-ended questions during an individual interview or focus groups.

The format of the instrument may not be well suited for all measurement exercises

The SERVQUAL instrument was developed as a paper or electronic format and is not appropriate for other types of surveying, such as by telephone, or face to face. This format is certainly the most appropriate for research purposes as it facilitates the respondent's answering at his

or her own leisure and is practical for large samples. However, in an organizational setting, it may be desirable to use telephone surveys in order to increase response rate, response time and for human contact. Questions by telephone are most often shorter and stated in a multiple-choice format. As we mentioned earlier, an organization would also need to perform face-to-face interviews with more open questions for upper management.

The organizational objectives may put more or less emphasis on certain aspects

The data collected in an IS evaluation exercise may serve several purposes: In certain cases, the data can be used to assess specific project leader or team performance, to give out bonuses or to perform corrective procedures. The questionnaires must therefore focus on a particular service or product, and provide useful information to IS personnel. In other cases, the IS department may want to evaluate its global image. The required data does not need to be specifically related to a development team's performance, but more to the overall user perception and attitudes. Therefore, the type of measuring instruments used will depend upon the organization's objectives and how it intends to use the data.

The evaluation may target a specific new system or software implementation, or more broadly, the routine support or services provided

If the IS department wishes to collect data on a particular product, users will be surveyed after a few months following their initial use of the new product. The questions need to address specific issues such as system functionality, quality of training, and quality of support. This data will provide the information required to adjust the system and to evaluate the implementation process. On the other hand, the IS department may require data on ongoing services and support, for all the systems used in the organization. This type of survey will be conducted periodically. Trends can be analyzed through time, and the data can be used to modify the image and to improve the IS-user relationship.

The timing of assessments should differ depending on the individual and organizational impacts

Jurison suggests that IS managers should consider short-term and long-term benefits when they develop their evaluation strategies. Not all users benefit

equally from IT. The individual benefits, for instance, can be measured in the few months following implementation, whereas the organizational impacts may only be observable after a year. Therefore, the timing for individual impact evaluation and the content of the surveys should be different from the ones that assess broader impacts.

Considering these limitations, what organizations may need is a proper framework to help them select which instrument is more appropriate in a specific situation, or to modify existing ones. We will illustrate in the following pages how a real world IS organization went about evaluating its user satisfaction measurement methods and discuss how other organizations may go about this exercise.

CASE STUDY

In this section, we describe the methods used by a large IS organization to evaluate user satisfaction. This case study illustrates the measurement needs of a typical IS provider and shows how the limitations mentioned earlier apply to their specific context. The people responsible for the measurement process were somewhat aware of problems with their instruments and wanted to evaluate and revise their techniques. We describe how they went about executing this evaluation using the ISSM model as a guideline. The exercise was performed as follows:

- 1- Specification of organizational objectives;
- 2- Examination of the instruments used:
 - Their relationship with the organizational objectives;
 - Their constituents;
- 3- Validation of instruments.

Description of the Organization and Information Systems Effectiveness Measurement

The organization is a provider of telecommunication solutions, data processing and systems integration and employs over 4000 systems specialists throughout the globe. Although it provides information system services mainly to its parent company, its external clientele is increasing gradually. The surveys that were currently used to assess user (or in this case, customer was the term most often employed) satisfaction were the following:

1. *The product survey:* This phone survey was used to measure customer satisfaction for a specific deliverable, and was administered in the months

following the completion of the project. The content of the questionnaire was often adapted to fit with the characteristics of the related product. The respondent was either the "sponsor" or the "end-user" of the implemented product. The response rate was around 65%.

2. *The services and support survey*: This mail-out survey was used to verify customer satisfaction with respect to the service and support related to a particular system. The response rate was around 53%.
3. *The managerial satisfaction survey*: This survey took the form of an interview of middle management by the service provider's managers, on a one-to-one basis. The survey's purpose was to measure the customer's level of satisfaction of the relationship with the service provider for all systems and services. This survey was performed on a yearly basis.
4. *The general satisfaction survey*: This mail-out survey aimed at measuring the general satisfaction of customers and was completed on a yearly basis. The response rate was 43%.

The data from these surveys was used in several ways. Data specifically related to a recently implemented product was given to the project leader. The project leader could then take corrective action if required, either on the implemented product or on subsequent product implementations. Bonuses were also given periodically based on the results of the surveys. The overall performance of the IS organization could also be analyzed by management. Some feedback was also given to the users as to the general satisfaction levels obtained.

Evaluation of Instruments

The overall objectives of the organization were to collect data on three broad components:

- Detailed Level* = "do we do it right?"
- Decision Making Level* = "do we do the right things?"
- Overall Perception of the Organization* = "what's our reputation?"

If we relate the objectives stated by the IS group with the "Augmented ISSM" proposed by Pitt, Watson and Kavan, we may determine the general dimensions that should be included in each of the surveys:

Deliverable surveys ("product" and "service and support") ("Do we do it right?"): If we do it right, then we deliver a quality product. We may therefore translate this general objective into three dimensions: "System quality", "Information quality" and "Service quality". We may also want to know how these influence "User satisfaction".

"Managerial" survey ("Do we do the right things?"): If we do the right things, we can suppose that these things have the desired impact on individual and organizational performance. This survey is therefore dedicated to dimensions such as "Use" (or "Usefulness"), "Individual impact" and "Organizational impact". We will also want to know how "Use" influences "User satisfaction".

"General" survey ("What's our reputation?"): If our reputation is good, customers are satisfied, loyal, and contribute to spread a good image of the IS organization. This survey is therefore mostly dedicated to the "User satisfaction" dimension. However, since all the components of the ISSM model are more or less related to a general measure of success, then the survey will also need to tap onto "System quality", "Information quality" et "Service quality", "Individual impact" and "Organizational impact".

Table 1 illustrates the previous discussion, as it associates the augmented ISSM model components with each of the four surveys. The most important cells for each survey to include are marked in black, while the gray cells mark indirect dimensions. A white cell indicates no association. This table indicates that the surveys, as their objectives are stated, cover together all of the dimensions prescribed by the Augmented ISSM model. Also, the surveys pursue different objectives and different dimensions and therefore complement each other very nicely.

Table 1: Objectives of each survey related to the Augmented ISSM

	System quality	Information quality	Service Quality	Use (Usefulness)	User satisfaction	Individual impact	Organizational impact
"Ongoing" Objectives							
"Product" Objectives							
"Face to face" Objectives							
"General" objectives							



Directly measured by the instrument



Indirectly measured by the instrument



Not measured by the instrument

This analysis allowed the IS organization to validate its general objectives, as they could ensure that these covered the main components prescribed by the Augmented ISSM. If these objectives had not conformed to the Augmented ISSM, then it would have been useful to question the stated objectives, identify the missing elements, and, if necessary revise the objectives. The analysis also helps to verify that the surveys correspond to their stated objective, and that they do not redundantly measure the same things.

Dimensions Which Were Actually Measured by the Questionnaires

Once the general objectives of the surveys have been analyzed, the next step is to verify that the content of the surveys corresponds to the items prescribed by the

Augmented ISSM model. In a table similar to Table 1, we classified each question found in the surveys according to its corresponding dimension (Table 2 illustrates this classification. The underlined questions fell into many categories). This provided a useful way to assess if 1) the questions correspond to the constructs underlying what the survey was designed to measure and 2) that the survey was complete and addressed all of the dimensions that it was designed to measure.

With this classification, it was possible to analyze the content of each survey and verify that it complied with the stated objectives. When looking at Table 2, we observed that:

"Service and support" survey: A large proportion of the questions concerned the *"Service quality"* dimension, which is in accordance with the general objective of the

Table 2: Content analysis of the surveys

	System quality	Information quality	Service Quality	Use (Usefulness)	User satisfaction	Individual impact
"Service and support"	4.1, 4.2, 4.5	4.6, 4.7	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1, 3.2, 3.3, 3.4, 4.3, 4.4, 4.8, 7		6	<u>5.2</u>
"Product"	Q4, Q5, Q7, Q8, Q9, Q12, Q13	Q4	Q6, Q10		Q3, Q14	Q11
"Managerial"	"Quality of Solutions" "System Performance"	"Quality of Solutions"	"Quality of Solutions" "Meeting Agreed to Dates" "Responsiveness/ Cooperation" "Speed of Delivery" "Value" "People/Team" "Communications" "Ongoing Services and Support"		"Overall"	"Partnership"
"General satisfaction"	Q30, Q31, Q32, Q33		Q4, Q5, Q6, Q7, Q11, Q12, Q14, Q16, Q17, Q18, Q20, Q21, Q22, Q23, Q24, Q25, Q26, Q27	Q8	Q1, Q2 Q3 (loyalty) Q9, Q10, Q15, Q19, Q28, Q29, Q34, Q37	
Total number of questions:	16	4	48	1	15	3

survey. However, very few questions were related to "System quality" and "Information quality". It is important that these dimensions be included even though they are measured in the "product" survey. One question measures "User satisfaction", which is reasonable considering the objectives.

"Product" survey: Most of the questions here were related to "System quality", which is consistent with the general objective of the survey. However, the same comments could be made as for the "Ongoing" questionnaire. The two other quality dimensions should have been included, particularly "Information quality" which is poorly measured overall.

"Managerial" survey: The largest proportion of questions here addressed the "Service quality" dimension, which did not appear to concur with the overall objective. Furthermore, "Usefulness", which is supposed to be the most important factor according to the stated objectives, does not correspond to any question. The dimension "Individual impact" had only one question and the

dimension "Organizational impact" had three, but this appeared to concur with the stated objectives.

"General" survey: The dimension "User satisfaction" was covered with thirteen questions, which is in accordance with the general objectives. However, the other questions were not equally balanced in the other dimensions: some dimensions seemed to have many questions ("Service quality" had 18) while others had none ("Information quality" and "Individual impact").

We therefore concluded that the **correspondence between the general stated objectives of the surveys and their respective content was low**. This means that the survey questionnaires, in their present form, were not very accurate at measuring what they were intended to measure.

On the other hand, there was some redundancy in questions from survey to survey, particularly for the "Service Quality" dimension. In general, the surveys seemed to tap onto the "quality" dimension (particularly service and product quality) more than on the level of satisfaction of customers.

Questionnaire Validity and Reliability

The last phase of the analysis was performed to validate the instruments in terms of construct validity, convergent validity, discriminate validity and reliability using data collected previously by the organization. If an organization does not use previously validated instruments, it is important that these validity checks be performed to ensure that the data is a correct indicator of user satisfaction. Only then can they be trusted to compare the results through time, for IS personnel performance evaluation or to improve IS interventions. We do not detail the procedures for performing this analysis, but refer the reader to other sources such for further information regarding these validation methods.

CONCLUSION

IS departments and organizations are in great need of instruments designed to evaluate the products and services they provide. It is reported that user satisfaction is an important risk factor in IS success and is often low, particularly in the case of custom software implementation [5]. Prior research on user satisfaction measurement has led to development of a series of instruments that can serve as a basis for IS evaluation. However, we argued that many limitations hinder the capacity of practitioners to directly use these tools in their organizational settings.

In this paper, we described an organization that uses "user satisfaction" surveys to assess dimensions such as: product related satisfaction, general service satisfaction, managerial satisfaction, image, etc. The data they collect is used to give out bonuses, evaluate the IS organization and specific teams, and to take corrective action to improve product quality and service. The IS organization uses a variety of techniques, such as face-to-face interviews, mail surveys, telephone surveys, and these are performed at various points in time. We also described how the previously developed models integrated into the Augmented ISSM, could provide a useful framework to evaluate the general strategies and instruments used by the IS organization.

Although in this particular case we evaluated existing processes and instruments, it is also possible for IS departments and organizations to develop from scratch their own evaluation methods, following a similar analytical process. The organization first needs to define the objectives of their evaluation exercise. It may be related to one project (in the case of an external provider, for instance) or to an ongoing relationship with customers

or users, as is typical for in house development. The ISSM model, as we have seen in our case study, provides a valuable guide, or checklist, for the specification or validation of these objectives. The next step is to identify the appropriate sample of respondents, the frequency of the evaluation process and the medium (phone, paper, face-to-face). Our case shows that the "impact" dimension was best measured through face-to-face interviews with managers, whereas "quality" dimensions were measured by directly surveying the end-users, either by phone or by questionnaire. When constructing the measurement instruments, the organization can borrow and adapt those which have been previously developed in the literature (such as those described in the first section), while ensuring that the dimensions that they wish to measure are well covered by the instruments (such as the analysis we performed using table 2). Special care should be applied to check the data for validity and reliability before acting upon it or communicating it to the organization.

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