USER SATISFACTION WITH COMPUTER-BASED STUDENT INFORMATION SYSTEM (CBIS) IN UNIVERSITI SAINS MALAYSIA

by

QUAH CHUN HOO

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For their support, understanding and encouragement,
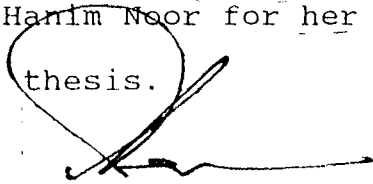   this thesis is dedicated to Annie, Evan, Audrey
                  & Esther Quah

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ABSTRAK

Memandangkan kesan sistem maklumat berkomputer ke atas keberkesanan organisasi agak sukar diukur, kegunaan konstruk kepuasan maklumat pengguna merupakan asas yang paling ketara di dalam penilaian keberkesanan sesuatu sistem maklumat. Kajian ini memilih suatu ukuran yang diperakui untuk menilai kepuasan maklumat pengguna dengan Sistem Maklumat Berkomputer Pelajar (SMP) di Universiti Sains Malaysia. Dengan menyesuaikan soal selidik yang diperkenalkan oleh Bailey dan Pearson (1983), suatu versi soal selidik yang terubahsuai disediakan dan dirintiskan secara percubaan.

Berdasarkan kepada maklumbalas dari pengguna-pengguna di dalam rintisan percubaan, soal selidik berkenaan diubahsuaikan semula sebelum diedarkan kepada tiga puluh sembilan orang pengguna yang dipertanggungjawabkan menggunakan sistem ini di Kampus Induk, Universiti Sains Malaysia untuk memperolehi data dan maklumat yang diperlukan. Data yang diperolehi dianalisiskan dan keputusan utama kajian ini ialah:

1. pengguna-pengguna SMP neutral (iaitu, tidak berbelah berpuashati ataupun tidak berpuashati) terhadap sistem ini;

2. SMP tidak berjaya menemui kedua-dua objektifnya, iaitu untuk membekalkan maklumat yang terkini dan tepat pada waktu keperluannya atau untuk mempertingkat pengeluaran kakitangan pejabat;

3. SMP amat kurang digunakan; iaitu, pada puratanya, pengguna-pengguna hanya merujuk kepada laporan-laporan di dalam SMP sebanyak 1.8 kali sebulan; dan

4. di antara ketiga-tiga golongan pengguna, golongan kerani kanan/kerani dikenalpasti sebagai kumpulan pengguna yang paling aktif berbanding dengan kedua-dua kumpulan lain.

Penemuan bahawa sistem di dua buah Pusat Pengajian tidak berfungsi akibat masalah kabel semasa kajian ini dijalankan mungkin telah mempengaruhi keputusan kajian ini sedikit. Disamping itu, SMP merupakan satu sistem unik yang digunakan di sebuah institusi pendidikan dan oleh itu adalah baiknya sekira keputusan kajian ini tidak dimenyimpulkan kepada sistem-sistem maklumat lain.

Keputusan ini, implikasi dan pembatasannya dibincangkan secara terperinci di dalam kajian ini.

ABSTRACT

As the impact of computer based information system on organizational effectiveness is difficult to measure; the user information satisfaction construct has occupied a dominant role in the assessment of information system effectiveness. This study selects a validated instrument to measure user information satisfaction with Universiti Sains Malaysia's computer based student information system (Sistem Maklumat Pelajar (SMP)). Adapting Bailey and Pearson's (1983) original instrument, a modified version of the questionnaire was developed and pilot tested.

Based on the feedback of respondents, the developed questionnaire was revised and adminstered to thirty-nine designated users of the system in the University's main campus to generate the required data and information. The data gathered in this survey were then analyzed and the main findings are:

1. users of SMP are neither satisfied nor dissatisfied with the system;

2. the SMP failed to meet its twin objectives of providing timely and up-to-date information or to bring about the promised increase in white collar productivity;

3.   the system is highly underutilized; that is, on an average, users refer to the reports only 1.8 times per month; and

4.   of the three categories of users, the chief clerks/clerks have been ascertained to be the most active users of the system compared to the other two groups of users.

The discovery that the System in two Schools were down due to cabling problems at the time the study was conducted could have affected the results to some extent.   Fuurthermore, the SMP is a unique system used in an educational institution and as such it is not advisable to generalize the findings of this study to other information systems.

These findings, their implications, and limitations are discussed in detail in this study.

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CHAPTER I

INTRODUCTION

1.1 Background

In their "Behavioral Theory of the Firm", Cyert and
March (1963) argued that the competitive business envi-
ronment imposes upon managers the need for information.
To meet this need and to improve the white collar pro-
ductivity with the availability of computer systems,
more and more organizations are increasingly automating
their information systems by means of computer technolo-
gy, i.e. relying more and more on Computer-based Infor-
mation Systems (CBIS).

Blank and Ryan (1988) stated that "information
systems (IS) can be defined in many ways, but are gener-
ally a set of logically inter-related procedures de-
signed, maintained, and used by people with the help of
information processing technology to fulfill information
needs of an organization. It is important to note that
while computers are an integral part of many of today's
information systems, they are not a pre-requisite for
such systems".

In the mid 1970's, Universiti Sains Malaysia (USM)
embarked on the computerization of its students' and
academic records. With the advent of the more powerful
computers in the early 1980's and also to increase white
collar productivity, USM proceeded to upgrade its
existing computerized students' and academic records
using a 4381 IBM main frame-computer.

Under this set-up, data input and information output were centrally controlled and generated by the University's Electronic Data Processing Department (EDP). This procedure, however, involved a time-lag between the time of data input and information output. Many Schools and Centres were unhappy with this arrangement as they were not receiving timely and up-to-date information for decision making. Processing of the list of graduating students, selection of recipients for best student awards or book prizes, or the preparation of students' statistics was slow and time-consuming. Hence, at the 21st Vice-Chancellor's meeting with the Deans/Directors/Coordinators held on 6 January 1988, the idea was mooted that Schools/Centres be permitted to download students' records from the University's main-frame computer to the individual Schools/Centres on-line via a Personal Computer (PC) in the School/Centre acting as a work station.

A task force headed by the Deputy Vice-Chancellor of Student Affairs was established to oversee and design an appropriate system for the downloading of information from the main-frame computer to the individual Schools/Centres. On the recommendation of this task force, the University's Computer-based Student Information System (Sistem Maklumat Pelajar (SMP)), was implemented on a pilot run basis on the four natural science schools, namely School of Biological Sciences,

School of Chemical Sciences, School of Mathematical and Computer Sciences, and School of Physics in mid 1989. The detailed features of the SMP are presented in *Appendix A*.

Among the purported benefits of the SMP (as stated in the minutes of the meeting concerning Academic records for Schools dated 28 January 1988) are:

(i)   it would provide the Schools/Centres with timely and up-to-date student information to assist in their planning and statistical analysis;

(ii)   it would free the students' affairs clerk of the manual task of having to transfer student data to individual student files/cards in the Schools/Centres; thus, the clerk concerned would be freed to assist in other duties like research, publications and central services.

Based on the encouraging feed-back from the initial four natural science schools on its usefulness, the SMP was later extended to the remaining Schools/Centres in early 1991.

1.2   The Problem

For any information system to be useful to an organization, the information output should meet certain standards. Cyert and March (1963) argued that if a formal information system exists, its success at meeting those needs either reinforces or frustrates the user's

sense of satisfaction with that source. Evans (1976) went a step further by arguing that a lower limit to satisfaction exists below which the user will cease all interaction with the system and seek alternative sources. According to Blank and Ryan (1988), "information output that falls short of these standards places a double burden on the organization. First, there is the obvious expense of production output. These expenses must be absorbed by the organization while receiving little or no benefit. The second burden is brought about by decisions based on sub-standard output. Poor decisions lead to excessive costs and lost opportunities".

Although the University's SMP has been in existence since 1989, it has been observed that very few Schools/Centres actually utilize the system fully. In fact, almost every School/Centre maintains its own student records either on a card-system, on hard-disk/diskettes in stand-alone personal computers (PC), or rely strictly on the centrally generated information output.

Among the professed benefits of CBIS are increased productivity, improved decision making and a reduction in paper-work. In an age of rapid changing technology, where more and more organizations are relying on CBIS to help solve problems and improve decision making, it is ironical that the majority of the Schools in USM, one of

the leading academic institutions of higher learning in Malaysia, whose motto is "We Lead" still prefer the traditional manual system to the computerized one. The fact that the vast majority of Schools still opt for this traditional system is cause for concern. Not only is the maintenance of dual information systems i.e. the individual School's traditional system vis-a-vis the SMP, redundant, time-consuming and expensive, the reliance on the traditional system also inhibits the University from forging ahead into new frontiers, namely, towards the achievement of the paperless organization.

While it is true that user satisfaction or dissatisfaction with a CBIS can be determined by user interview alone, it is felt that a user information satisfaction (UIS) survey prior to conducting interviews as suggested by Baroudi and Orlikowski (1988) might assist the authority concerned to :

(i)   identify problem areas in the SMP, if any;

(ii)   structure the interviews around the identified problem areas, hence saving time in searching for the real issues;

(iii)   avoid focussing on the idiosyncratic complaints of certain individual users; and

(iv)   reduce the number of interviews required to obtain a deeper understanding of the problem areas.

Given the above-mentioned problem and with the University embarking on its campus-wide area network by the end of 1994, where each individual School/Centre would be provided with six-direct lines to the main-frame computer as against the present single line, an appraisal at this stage of the usefulness of the SMP would seem necessary and appropriate.

1.3 The Objective

Mostert et al. (1989) recommended that an information system be evaluated not more than twice per year. In early 1992, the University's Computer Centre conducted a questionnaire survey on the usage of the SMP. A discussion with the concerned official indicated that the findings of this survey have yet to be reported. Since then, no other formal evaluation on the effectiveness of the SMP has ever been undertaken by the University. The major objective of this study is to evaluate the usage and the satisfaction of users with the SMP. This study attempts to examine empirically:

(i) the users' overall satisfaction with the SMP; and

(ii) identify problem areas in the System and to recommend corrective actions for its modification or improvement, if any.

1.4 Organization of the Study

The chapters of this study are organized as follows:

Chapter I states the background, the problem, the objectives and the organization of the study.

Chapter II details the empirical evidence for the use of User Information Satisfaction (UIS) as the surrogate for measuring the effectiveness of Computer-based Information Systems (CBIS) as reported in previous researches. It also describes the theoretical frame-work of this study.

Chapter III describes the methodology and statistical procedures employed in the study. It explains the instrument used to measure user information satisfaction, the population of users, and the method of data collection.

Chapter IV presents the results of the statistical tests.

Chapter V presents the discussion, limitations, summary, conclusion and recommendations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

Management's desire to improve white collar productivity through a more effective utilization of information system is the primary motivation for the measurement and analysis of CBIS.   Productivity benefits from CBIS result from both efficiently supplied and effectively utilized CBIS outputs (Cheney and Nelson, 1988).   Despite the growing importance of CBIS on organizational effectiveness over the last decade, pure information system evaluation has remained an illusive concept.   Ives et al. (1983) argued that UIS is a perceptual or subjective measure of system success; it serves as a substitute for objective determinants of information system effectiveness which are frequently not available.   Melone (1990) supported this view when she stated that "employing user satisfaction in the evaluation of IS effectiveness is certainly well established in the literature".   According to Raymond (1987), as the impact of a Management Information System (MIS) upon organizational effectiveness is basically unmeasurable, measures of user satisfaction provide the most useful assessments of system success.   This view is shared by Baroudi and Orlikowski (1988) who stated that "the   measurement of how satisfied a user is with his or

her information system (user information satisfaction or UIS) has become a pervasive measure of the success or effectiveness of an information system".

2.2 Empirical Findings

Measuring CBIS success is difficult and many approaches have been suggested. Srinivasan (1985) and Raymond (1987) have pointed out that the empirical literature contains basically four types of surrogate measures of systems success, namely; 1) user satisfaction [e.g. Edstrom (1977)]; 2) level of usage [e.g. King (1978)]; 3) user decisional performance [e.g. Dickson et al. (1977)]; and 4) organizational performance [e.g. Turner (1982)].

With respect to the measurement problem, research has shown that an approach based on user satisfaction, i.e. on the user's *subjective* judgment, is preferable to an approach based on *objective* measures of usage and performance (O'Brien, 1977; Hamilton and Chervany, 1981). In fact, apart from controlled laboratory experiments, problems such as the delayed effect of usage upon performance (individual and organizational learning), the difficulty of specifying acceptable measures of performance, and the necessity of controlling factors other than usage which affect performance, render the second approach much less attractive from a methodologi-

cal and practical standpoint. Melone (1990) appeared to have similar views when she mentioned that user satisfaction has received the greater support and has served as the primary construct by which information systems are evaluated and behavioral issues examined.

According to Ives et al. (1983), the construct of UIS has been operationalized in many different ways. Several studies employed single-item rating scales (Barrett et al., 1968; Lucas, 1976) although such scales have been criticized as unreliable (Nunnally, 1978; Larcker and Lessig 1980). Single-item scales also provide little information as to what the user finds dissatisfying (or satisfying) and are thus of limited utility outside a research setting. Generally, UIS measures have not been carefully validated. However, the predominance of UIS as an evaluative mechanism has led researchers (Bailey and Pearson, 1983; Ives et al., 1983) to call for and propose a standard measure of UIS with established validity and reliability. The advantages of a standard measure are twofold. Firstly, a standard measure allows comparison of scores across departments, systems, users, organizations, and industries. Secondly, a standard measure allows both practitioners and researchers to utilize a readily available instrument, avoiding the time-consuming process of developing a new measure each

time an assessment of UIS is required (Baroudi and
Orlikowski, 1988). The efforts to develop a standard
measure of UIS by earlier researches have been outlined
below:

Gallagher's (1974) study focused on user perceptions of
the information value of reports provided by an informa-
tion system. The questionnaire used by him had two
types of question requests for managers to estimate the
dollar value of a report, and semantic differential
adjectives on which the managers rated the reports.

The questionnaire results were based on responses
from 75 managers utilizing the same information system
in a single company. Gallagher (1974) concluded from
his results that both the estimated dollar value and the
semantic differential measures had potential for analyz-
ing information value. However, the correlation between
the two measures was too low to conclude that they were
measuring the same phenomenon.

Several other problems exist with Gallagher's meas-
ures. Both measures focus only on the product (in this
case, a report) and not on the quality of service
provided by the information services function. Moreo-
ver, the scales could not be easily generalized to other
information system products. The dollar estimates have
no anchor point and there was no attempt to validate the

relationships between the estimated and real dollar value of a report. Although Gallagher interviewed respondents to verify their beliefs in their estimates, the standard deviation was extremely high and the distribution quite skewed. Moreover, 30 percent of the respondents did not respond to the dollar value question, citing lack of familiarity with information system costs as the reason. Finally, no validation of the semantic differential scales was reported (Ives et al., 1983).

Jenkins and Ricketts (1979) developed a twenty item measure of "user satisfaction" on the basis of "a survey of existing literature and structured interviews with leading researchers in the field". Eighteen of the twenty items were chosen as representative of each of five factors defined *a priori* as constituting user satisfaction (i.e. input procedures, systems processing, report content, report form, and report value). The other two items were overall measures of UIS. Each item consisted of a 7 point, semantic differential scale anchored at each end by bipolar adjectives [for example, 1 (very untimely), 2, 3, 4, 5, 6, 7 (very timely)].

The instrument was psychometrically tested in five laboratory experiments involving 197 participants. Analysis showed each item to be normally distributed and demonstrated an acceptable overall inter-item reliabili-

ty i.e., coefficient (alpha) of 0.85. The scores from five factors derived by factor analysis were used in a regression equation with one of the two global satisfaction measures serving as a criterion variable. These factors significantly accounted for approximately 30 percent of the variance in global satisfaction scores. The factor analysis, however, failed to substantiate the factor structure originally proposed.

The work of Jenkins and Ricketts (1979) has several limitations. The procedure used to generate the original items is not rigorously described. The instrument was designed to focus on the information system product; like Gallagher's (1974) scale, it does not cover information systems service. The factor structure originally proposed did not hold up in factor analysis (Ives et al., 1983).

Larcker and Lessig (1980) developed two 3-item scales that together constitute "perceived usefulness". The first scale measures "perceived importance", an indicator of "whether the information is relevant, informative, meaningful, important, helpful, or significant". The "perceived usableness" scale indicates "whether the information format is unambiguous, clear, or readable".

Items were initially derived by faculty and students who proposed characteristics of information associated with "importance" and "usableness"; these dimensions had

been selected as "two aspects that seem to be common to prior measurement instruments". The list of suggested characteristics was reduced to six items by another panel of faculty and graduate students. The items were experimentally tested in a study of decision making involving 29 faculty and graduate students. Factor analysis of the six items verified the independence of the two scales.

Larcker and Lessig (1980) analyzed the convergent (between measures) and discriminant (across settings) validity of the two dimensions using the multitrait-multimethod procedure of Campbell and Fisk (1959). They found acceptable inter-item correlations within each evaluation setting and acceptable differences between correlations across settings and concluded that both convergent validity and discriminant validity were established. The reported reliabilities (Cronbach's alpha) for the two dimensions ranged between 0.64 and 0.77.

Larcker and Lessig's (1980) measures have several critical weaknesses. The original two dimensions, importance and usableness, are not empirically derived and, as the authors note, may be "ignoring additional dimensions of perceived usefulness such as information accuracy or timeliness". Like the other two measures, the instrument relates specifically to the information system product and not to factors related to the quality of service.

The reliabilities reported for the two scales are relatively low for applied research although Larcker and Lessig (1980) pointed out that they are acceptable for exploratory work. The instrument was developed and the study conducted in an artificial setting involving faculty and graduate students using a capital budgeting decision. The validity of generalizing the measures to more realistic settings and other problem types is unproven.

Finally, their application of the multitrait-multimethod procedure to establish validity may be questioned; the authors interpreted different measures of the same construct to be different measurement methods. They also interpreted the different evaluation settings (variations on the capital budgeting decision) to represent traits. (Ives et al., 1983).

Bailey and Pearson (1983) developed a list of "factors" that contribute to information satisfaction. The list was derived from the existing research on computer user interactions and was then reviewed for completeness and accuracy by three data processing professionals. It was then compared to an analysis of critical incidents collected in interviews with 32 user managers. As a result, 39 distinct factors were identified, which were the basis for an instrument which utilized the semantic differential technique. Four adjective pairs were provided for each factor, plus a "satisfied-dissatisfied"

pair and an importance rating. The resulting instrument was completed by the same managers who had previously been interviewed.

Bailey and Pearson (1983) originally proposed a scoring method which used the "importance" rating as a weighting factor when calculating the overall satisfaction score; a description of this scoring method is found in his paper, "Bailey, J.E., and Pearson, S.W., Development of a tool for measuring and analyzing computer user satisfaction, Management Science 29, 6(May 1983), 519-529. In Pearson's sample, the weighted and unweighted scores were highly correlated, making the additional information provided by the importance rating unnecessary. A sample factor, "reliability of output information", and its associated items are shown in Table 2.1.

TABLE 2.1 An example of information satisfaction factor (from Pearson and Bailey, 1983)

	Reliability of Output Information	
Consistent	1 2 3 4 5 6 7	Inconsistent
High	1 2 3 4 5 6 7	Low
Superior	1 2 3 4 5 6 7	Inferior
Sufficient	1 2 3 4 5 6 7	Insufficient
Satisfied	1 2 3 4 5 6 7	Dissatisfied
Important	1 2 3 4 5 6 7	Unimportant

Reliability, calculated for each factor based on the variance in responses between the four adjective pairs, was found to be at an acceptable level. Content validity was claimed based on the method used to develop the instrument. Predictive validity was established by comparing the total score on the instrument with an overall satisfaction rating which had been collected during the interview; the correlation coefficient was 0.79. The scores on each factor were also compared with the "satisfied-dissatisfied" adjective pair. Although the independence of these measures was subject to question, the correlations were all very high. Finally, construct validity was established by examining the responses for each factor on the importance scale and comparing them with the rankings of importance obtained earlier, and by correlating the individual factors against the total score; the correlations (Spearman) were at acceptable levels.

There are several problems with Pearson's procedures. The sample on which the instrument was tested was relatively small and may have been biased by their prior participation in the development of the instrument. As Bailey and Pearson noted, the construction of the instrument did not assure independence of responses: This may have unduly affected the reliability scores and overemphasized the claims for construct validity (Ives et al., 1983).

Ives, Olson and Baroudi (1983) improved on the original Bailey and Pearson measure by reducing the list of "factors" from 39 to 33. With no well-established minimum value for validity correlations and since all reliabilities of Pearson's measure were at least at 0.80 level, scales could not be eliminated based on any one criterion. Ives et al. (1983) ranked each scale on the following criteria: (1) reliability, (2) content validity, and (3) construct validity. The lowest ten values in each category were examined under the assumption that a low ranking in a category indicated only weak signs of the desired property. In the case of construct validity, the scale had to possess both poor ranking and either not load or load separately in the factor analysis. These rankings were then compared and any scale which was found to be low in two of the three desired properties was eliminated. Using this process, the following scales: (1) competition with EDP unit; (2) chargeback method; (3) vendor support; (4) computer language used; (5) security of data; and (6) format of output, were selected for elimination.

Ives et al. (1983) next proceeded to reduce the number of items per scale. To identify candidate items for elimination without biasing evidence of reliability for the new measure, a 100 person "holdback" sample was removed from the original group of respondents. The remainder of the sample (n = 100) were used to determine

which items could be safely dropped. Finally, the holdback sample data were tested to determine both the reliability and validity of the new measures. Ives et al. (1983) recognized that it would be possible to improve internal consistency and reliability, or at least to minimize the effects of reducing the length of the instrument, by removing those items within a scale that had the lowest correlations with the other items. On the basis of inter-item correlations, two items were then eliminated from each scale. From the test results on the holdback sample, the reliability and validity data for the two item measures were ascertained to be adequate.

The Ives et al. (1983) instrument is also not free of shortcomings. Treacy (1985) assessed the reliability and validity of the Ives et al. (1983) instrument and concluded that: (1) the variables found through exploratory factor analysis were labeled in imprecise and ambiguous terms; (2) many of the questions used were poor operationalizations of their theoretical variables and the instrument failed to achieve discriminant validity. In addition, Galletta and Lederer (1986) found test-retest reliability problems with the Ives, et al. (1983) instrument and, because of the heterogeneity of the items (information product, EDP staff and services, and user involvement), expressed the need for caution in interpreting results (Doll and Torkzadeh 1988).

Baroudi and Orlikowski (1988) developed a short form UIS questionnaire consisting of 13 scales with 2 items per scale. The 13 scales included on the short-form measure were those selected by Ives et al. (1983) because they displayed the most desirable psychometric properties.

Construct validity was established through two methods. The first, weaker method examined the correlations between each scale and the total UIS score; the correlations were found to be at acceptable levels. The second method employed factor analysis using varimax rotation; all but one of the 13 scales loaded as expected; the only exception loaded strongly on two factors providing strong evidence for the construct validity of the measure. Convergent validity was established by comparing the results of interview assessments of user satisfaction or dissatisfaction with the satisfaction scores obtained by the short form questionnaire; the high correspondence between the scores obtained from interview assessments of user satisfaction or dissatisfaction with those obtained by the short form questionnaire suggests evidence of convergent validity. Finally, reliability for the short form measure was determined by calculating Cronbach's alpha (Ives et al., 1983; Doll and Torkzadeh, 1988) for the two items which comprise each of the 13 factors, for the overall satisfaction score and for each of the

three factors, namely, (1) EDP staff and services; (2) information product; and (3) user knowledge and involvement. All the reliabilities were above the .80 level required for research purposes suggesting that the short form measure is internally consistent and reasonably free of measurement error.

The short form measure developed by Baroudi and Orlikowski (1988) is not a universally applicable and immutable measure. It may thus be appropriate in various situations to modify the measure to more adequately reflect the requirements of the specific organization. Secondly, the short form UIS measure was developed to save time in application and hence the questions are minimally verbal with reference being made only to the scale in question. Hence, lack of clarity is likely to be a problem. Finally, the short form measure has not been tested in the context of decision support systems (DSS); ad hoc or smaller, micro-based applications; or end-user developed systems.

2.3 Conclusion

The development of several instruments with which to measure user satisfaction has certainly encouraged more widespread incorporation of the construct in research and its use by practitioners in evaluating system effectiveness. Table 2.2 contains a summary of the six measures reviewed. From the table, we note that the

three most popular scales are those of Bailey and Pearson (1983), Ives et al. (1983), and Baroudi and Orlikowski (1988). Apart from being both valid and reliable, these scales provide information about the overall satisfaction with information satisfaction products and services (Melone, 1990).

TABLE 2.2 Evaluation of alternative UIS measures

Measure	Year	Derived From	Empirical Support	Level of Coverage	Number of Indicators
Gallagher	1974	Empirical	Adequate	Product	18
Jenkins & Ricketts	1979	Literature and interviews	Inadequate	Product	5
Larcker & Lessig	1980	Interviews	Adequate	Product	2
Bailey and Pearson	1983	Literature, interviews, and empirical	Adequate	Product & support	39
Ives, Olson & Baroudi	1983	Literature & empirical	Adequate	Product & support	33
Baroudi & Orlikowski	1988	Literature & empirical	Adequate	Product & support	13

2.4   Theoretical Framework

Drawing from the literature reviewed, it appears that the earlier instruments focused on the information product itself while the later instruments focused on both the product and support services of the information system. The support services factor was felt to be too general and was later reclassified into two more distinct factors, namely EDP staff and services, and user knowledge and involvement by Ives, et al. (1983).

Hence, it appears that the effectiveness of a CBIS (users information satisfaction) is dependent on three variables, namely, information system product, EDP staff and services, and users knowledge and involvement in the system.

The surrogate UIS is the dependent variable of primary interest in this study. Information system product, EDP staff and services, and the respondent's knowledge and involvement are the three independent variables that are expected to influence UIS either positively or negatively.

The variables and their relationship are briefly described. According to Melone (1990), UIS has been associated with various terms such as "felt need", "system acceptance", "perceived usefulness", "MIS appreciation, "feelings" about a system (Ives et al., 1983) and more, generally, "attitudes and perceptions" (Lucas, 1975). Specific definitions for the related constructs range from the *manifold of beliefs about the relative value of the MIS"* (Swanson, 1974), *"to the extent to which users believe the information system available to them meets their information requirements"* (Ives et al., 1983). While these definitions are in some ways different, they hold in common the notion of a user providing some form of evaluative response. In this study, UIS is defined as the extent to which users believe the information system available to them meets their information

requirements. UIS therefore, provides a meaningful
"surrogate" for the critical but unmeasurable result of
an information system, namely, changes in organizational
effectiveness (Ives et al., 1983).

The three independent variables as defined by
Baroudi and Orlikowski (1988) are as follows :

The first independent variable *information system
product* is defined as the quality of output delivered by
the information system. It focuses on the content of
the product, namely accuracy, relevance, format, mode,
etc.

The second independent variable, *EDP staff and serv-
ices*, is defined as the attitude and responsiveness of
the EDP staff, and their relationship with the user.

The third independent variable, *knowledge and in-
volvement*, refers to the quality of training provided,
users' understanding of the system, and users' partici-
pation in the development of the system.

2.5   The Relationship

The existing literature suggests that the dependent
variable CBIS effectiveness (or UIS) is best explained
by variations in the three independent variables, namely
information system product, EDP staff and services, and
knowledge and involvement.   On the basis of this under-
standing, this study attempts to test whether this
hypothesis is true or not.