

Exploratory Study on Performance Measures as Indicators of IS Effectiveness

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April 1992

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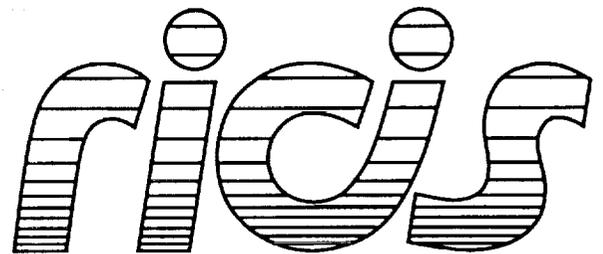
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(NASA-CR-190642) EXPLORATORY STUDY
ON PERFORMANCE MEASURES AS
INDICATORS OF IS EFFECTIVENESS
Interim Report (Research Inst. for
Computing and Information Systems)
37 p

Cooperative Agreement NCC 9-16
Research Activity No. IR.01a

NASA Johnson Space Center
Information Systems Directorate
Information Technology Division



Research Institute for Computing and Information Systems
University of Houston-Clear Lake

INTERIM REPORT

The RICIS Concept

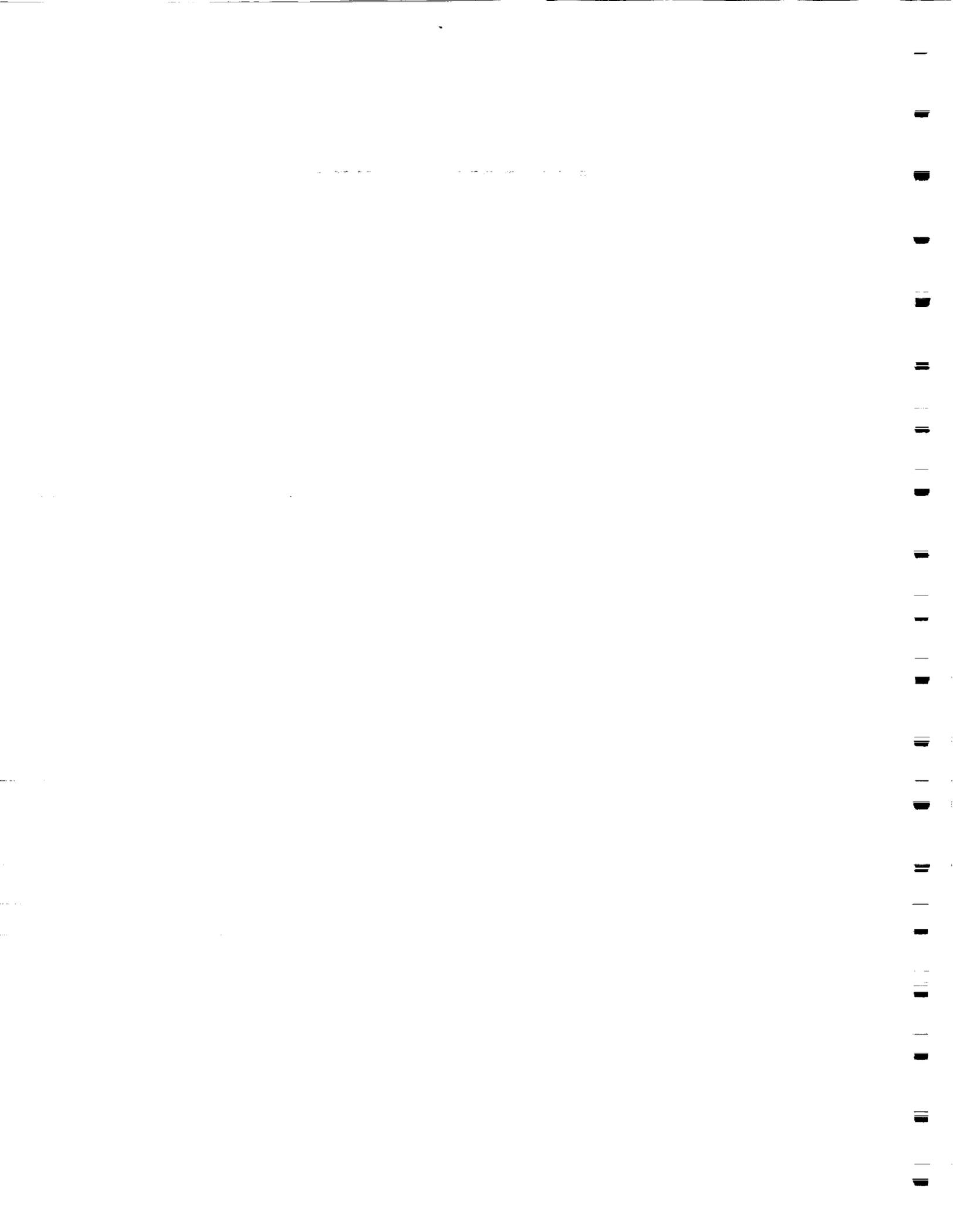
The University of Houston-Clear Lake established the Research Institute for Computing and Information Systems (RICIS) in 1986 to encourage the NASA Johnson Space Center (JSC) and local industry to actively support research in the computing and information sciences. As part of this endeavor, UHCL proposed a partnership with JSC to jointly define and manage an integrated program of research in advanced data processing technology needed for JSC's main missions, including administrative, engineering and science responsibilities. JSC agreed and entered into a continuing cooperative agreement with UHCL beginning in May 1986, to jointly plan and execute such research through RICIS. Additionally, under Cooperative Agreement NCC 9-16, computing and educational facilities are shared by the two institutions to conduct the research.

The UHCL/RICIS mission is to conduct, coordinate, and disseminate research and professional level education in computing and information systems to serve the needs of the government, industry, community and academia. RICIS combines resources of UHCL and its gateway affiliates to research and develop materials, prototypes and publications on topics of mutual interest to its sponsors and researchers. Within UHCL, the mission is being implemented through interdisciplinary involvement of faculty and students from each of the four schools: Business and Public Administration, Education, Human Sciences and Humanities, and Natural and Applied Sciences. RICIS also collaborates with industry in a companion program. This program is focused on serving the research and advanced development needs of industry.

Moreover, UHCL established relationships with other universities and research organizations, having common research interests, to provide additional sources of expertise to conduct needed research. For example, UHCL has entered into a special partnership with Texas A&M University to help oversee RICIS research and education programs, while other research organizations are involved via the "gateway" concept.

A major role of RICIS then is to find the best match of sponsors, researchers and research objectives to advance knowledge in the computing and information sciences. RICIS, working jointly with its sponsors, advises on research needs, recommends principals for conducting the research, provides technical and administrative support to coordinate the research and integrates technical results into the goals of UHCL, NASA/JSC and industry.

***Exploratory Study on
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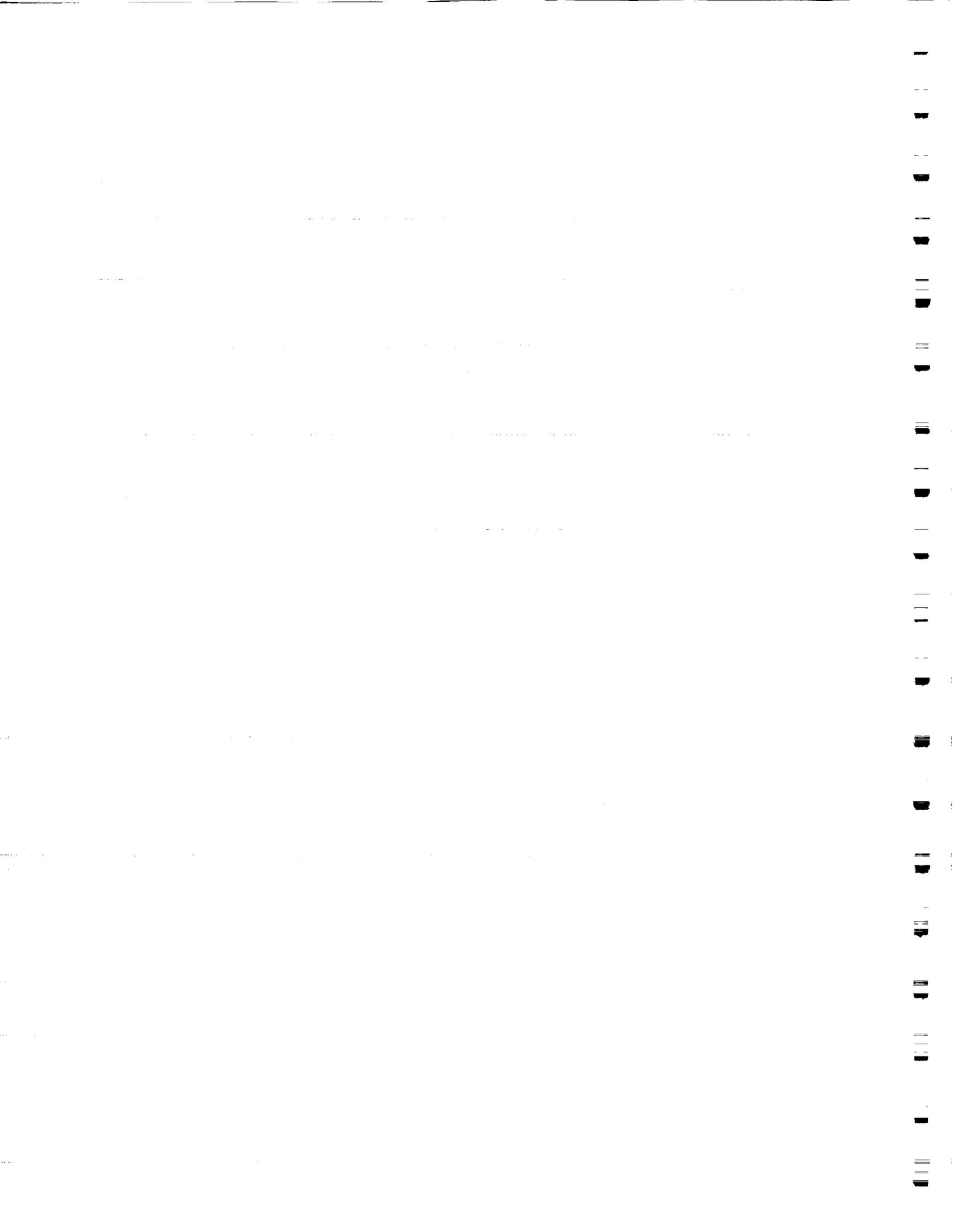


RICIS Preface

This research was conducted under auspices of the Research Institute for Computing and Information Systems by Dr. Peter C. Bishop and Cissy Yoes of the University of Houston - Clear Lake. Dr. Charles Hardwick served as the RICIS research coordinator for RICIS Information Systems Research and Peter C. Bishop served as Co-Chair.

Funding was provided by the Information Technology Division, Information Systems Directorate, NASA/JSC through Cooperative Agreement NCC 9-16 between the NASA Johnson Space Center and the University of Houston-Clear Lake. The NASA research coordinator for this activity was Wallace F. Stewart, Manager, Technology Support, Information Technology Division, Information Systems Directorate, NASA/JSC.

The views and conclusions contained in this report are those of the authors and should not be interpreted as representative of the official policies, either express or implied, of UHCL, RICIS, NASA or the United States Government.



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Executive Summary

The Information Systems Directorate at JSC/NASA has undertaken the reevaluation of its performance measures process and measures. Under the direction of a quality approach it is essential to identify an external perspective of how well an organization is performing. This study was conducted with two major objectives:

- 1, Survey and summarize the academic literature on performance measures as indicators of information systems (IS) effectiveness.
- 2, Survey organizations for their experience in measuring for IS effectiveness.

Four approaches to measuring the effectiveness of IS performance were identified:

1. Listen to the customer for the things they need
2. Align with corporate goals
3. Benchmark against well-respected organizations
4. Ask yourself what critical factors lead to success

The list of known methods for soliciting customer feedback are:

Executive visit
Survey, interview, focus group
Complaints and compliments
Service level agreements

A common set of characteristics that satisfy customers was identified from the literature. The list includes elements such as

Accuracy	Understandability
Timeliness	Reliability
Relevance	Completeness

Future research in this topic area should prove beneficial to determine the metrics for external validity. Suggested topics are listed at the end of this report.

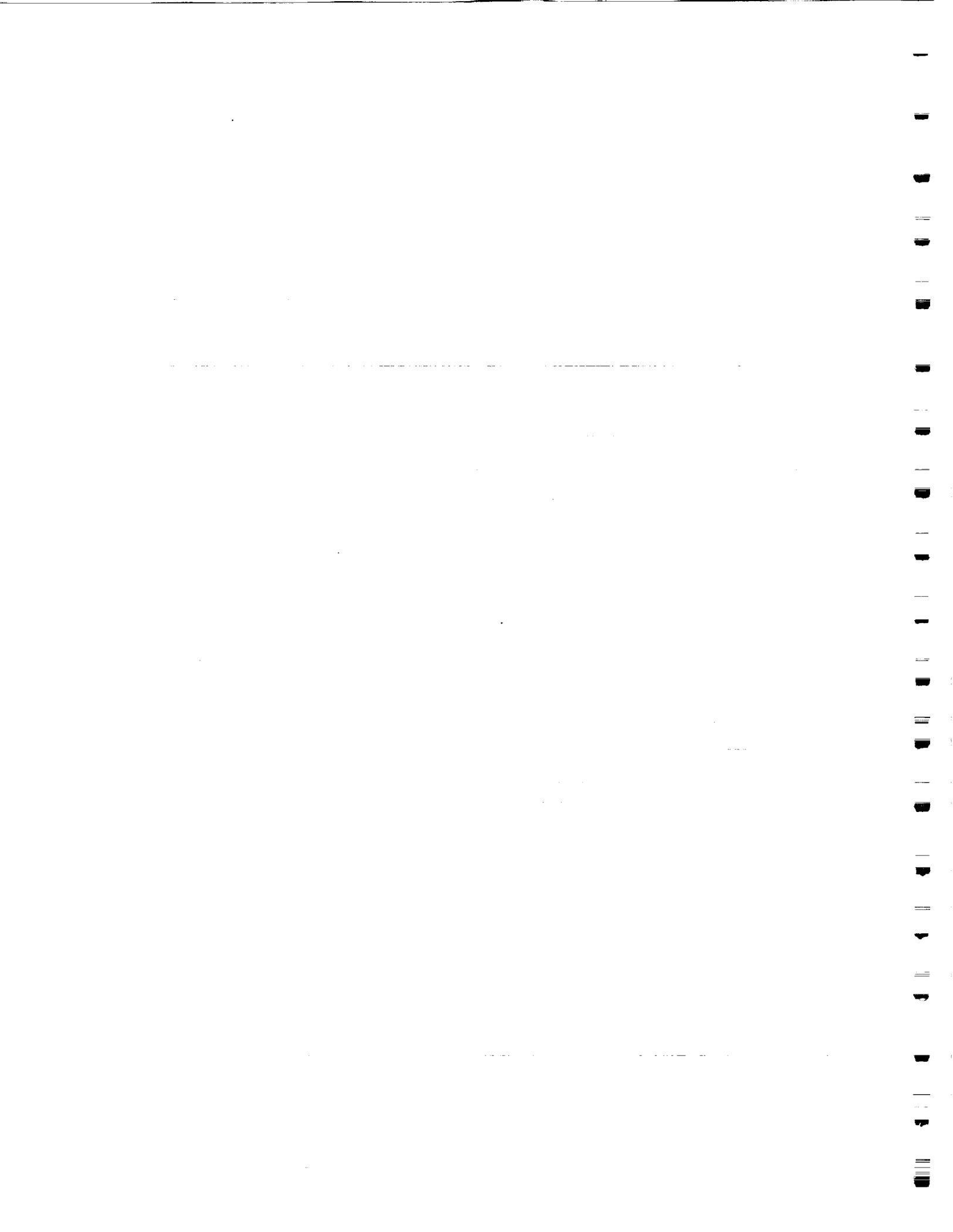


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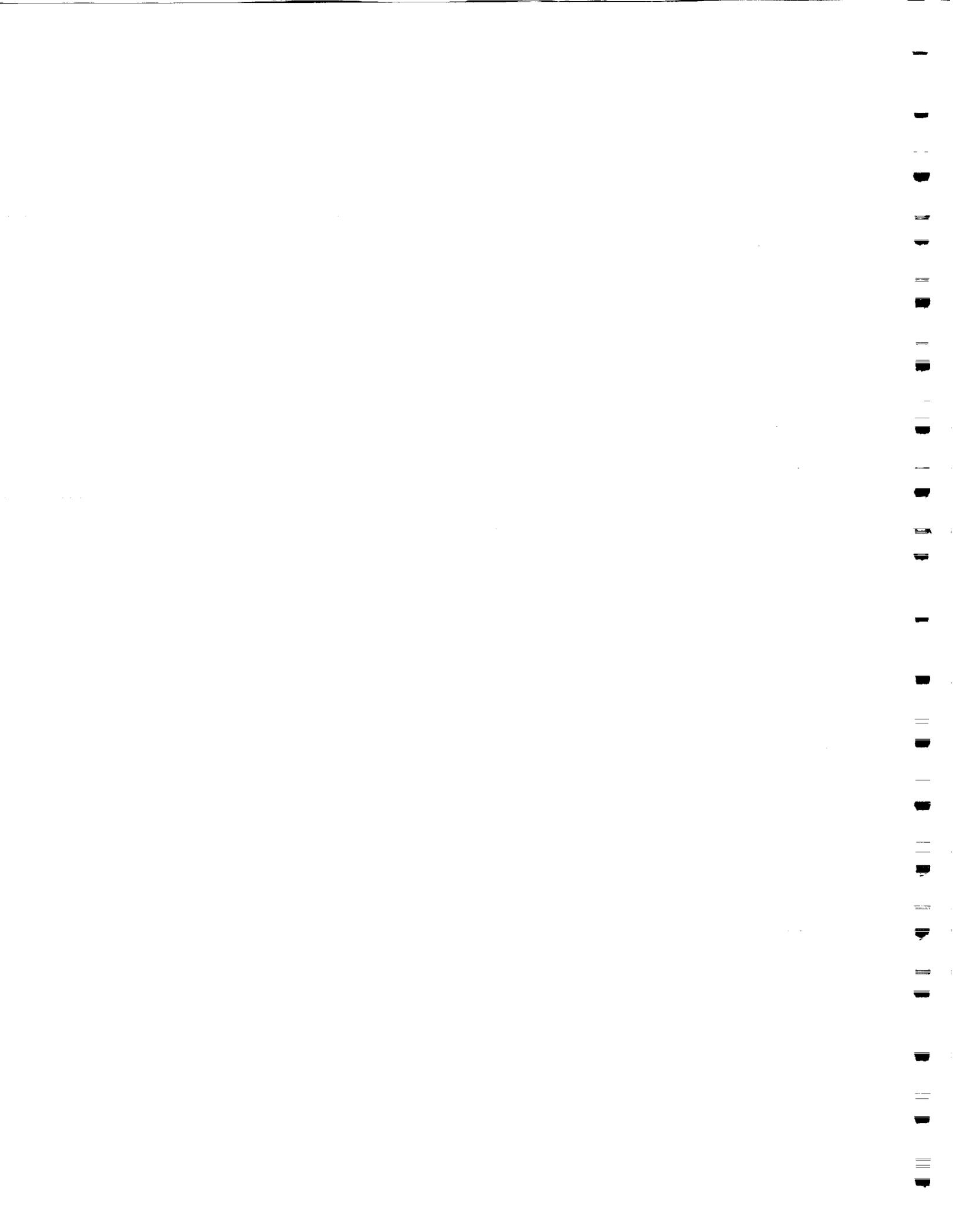
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Exploratory Study on Performance Measures as Indicators of IS Effectiveness

Introduction

The quality approach being developed at NASA/JSC requires that each unit measure its performance in order to guide and document its improvement. The Information Systems Division (ISD) has been collecting measures of its performance for a number of years. These measures include system and network availability, response time, time to resolve problems, etc. These indicators are generally classified as productivity or efficiency measures because they document how much output is produced with a given amount of input. Productivity measures are common and well established in the field of information processing.

Another class of measures is not as readily available. These are measures that relate to how well the organization is doing from an external perspective. The difference between these latter measures and productivity measures is captured in the phrase:

"Doing things right"
vs
"Doing the right things"

The former refers to productivity -- whatever an organization does, it does well. The second questions whether the things it does are in fact the right things to do -- activities that provide value to the enterprise. This study is designed to address the latter domain. The question is simply

"How does ISD know when it is doing the right things?"

Background

The purpose of an exploratory study is to quickly and concisely provide an overview in a designated topic area. The focus of this research is to determine the availability of useful

information on performance measures as indicators of IS effectiveness. A quick survey and summary of the type of information available will be useful in determining if further research in this area will help ISD in developing meaningful performance measures.

Objectives

1. Survey and summarize the academic literature on performance measures as indicators of IS effectiveness.
2. Survey organizations for their experience in measuring for IS effectiveness.

Scope

This study was conducted as a quick, exploratory search for available information on how to measure for IS effectiveness. Information gathered was confined to literature citations available through electronic searches and the library of the American Productivity and Quality Center, and through short surveys completed by IS managers in select local corporations.

Approach

Three basic sources of information were used in this study. First, a literature search of business databases was conducted using Dialog Information Services. The search terms were:

(OUTCOME OR EVALUATION OR PERFORMANCE) AND
(INDICATOR OR MEASURE) AND
(INFORMATION SYSTEM OR DATA CENTER OR MIS)

Most of the citations came from ABI/INFORM, a database that covers all major business publications.

A second source was the library at the American Productivity and Quality Center (AP&QC) of which NASA/JSC is a member. The AP&QC holds an excellent collection of articles on all aspects of quality processes.

Finally, information was gleaned from actual company experience. NASA/JSC is a member of the Information Systems Research Center (ISRC) at the University of Houston. The ISRC is comprised of 20 Major corporations in the Houston area. Information systems (IS) managers from member corporations were queried on how they measure their department's effectiveness. Data were collected in a 30-minute open-ended telephone interview or via a two-page, six question, faxed survey (Appendix A). Six corporations participated in the survey. This is a 33% response rate which is considered very good. Companies responding included three oil and gas companies, a public utility, an environmental company and an insurance/investments firm.

Findings

The value of information technology to modern organizations is widely accepted. Computers and telecommunications are playing and will play an important role in organizational effectiveness and success. Documenting that claim, however, has turned out to be difficult. Because of the intense interest in this subject, there is no lack of literature on the subject. The Dialog search turned up almost 600 references using the terms listed above in just the last three years. As a result, the actual citations used were limited to those in which those terms figured prominently in the title or the abstract.

The overwhelming theme from all of these studies is that the IS customer is the one who ultimately decides whether IS "is doing the right things." In contrast to productivity measures of machine performance, IS cannot answer this question by itself. It requires information based on a partnership with the customer.

A second and equally important theme is that such customer data by itself does not automatically result in a more effective organization. The results of such studies must be fed into an organizational process that uses the results for improvement.

Types of Data

The literature revealed four basic types of data that can be used to answer the question of external performance: customer

feedback, corporate alignment, benchmarking, critical success factors.

1. CUSTOMER FEEDBACK

The overwhelming majority of studies depended on IS customers to tell whether or not IS was offering the right products and services. Historically, IS organizations have always been customer-oriented. On the other hand, given the complexity of the technology, customers were usually in a poor position to know which technology was available in a cost-effective manner. As a result, IS organizations have typically "told" customers what they needed rather than asked them. With quality initiatives, that behavior has begun to change.

The issue of the customer expectations is still a problem, since the media is continuously advertising the benefits of the next wave of technology (along with how inexpensive it is supposed to be) (Caravella, 1989). Asking customers what they want is a perennial problem in all businesses. The problem, however, does not remove the absolute necessity of getting the customer rather than the IS organization to decide what is right for them. As discussed below, this customer data comes in various forms.

2. CORPORATE ALIGNMENT

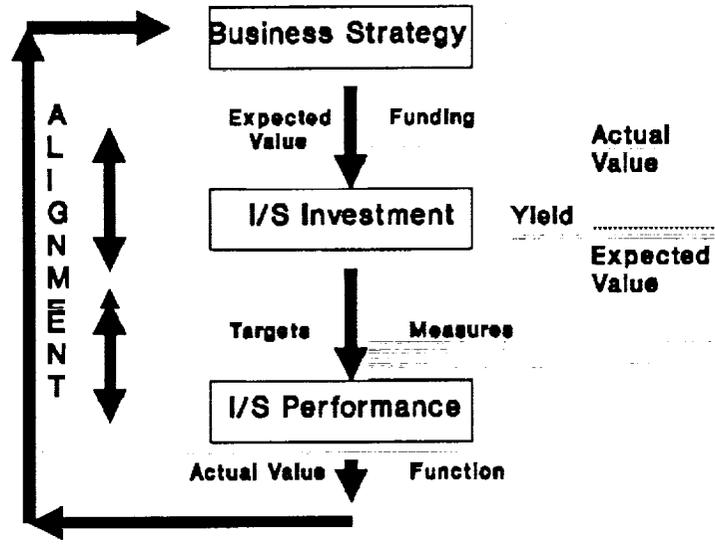
The second type of data is a nebulous concept of corporate alignment. Simply put, IS doing the right thing when it supports the corporate strategy (Rubin, 1991). Alignment is a tricky concept to measure because it involves interpretation of the details of the corporate strategy and just how IS linked to it. Rubin uses a model of alignment which breaks that concept into component parts. A systematic discussion within ISD of corporate goals and ISD's contribution to them should increase the alignment.

3. BENCHMARKING

Another type of secondary data is the emerging strategy of benchmarking -- comparing one's organization with what is thought to be the best in the field. Doing the right things in this context means doing the same things which respected organizations do. Computerworld identified the Premier 100 IS organizations in September 1991 and interviewed them for what they were doing:

1. Doing more than one thing rather than betting on one big project.
2. Looking for ways to hold off spending and getting the most from existing resources (although 58 companies are expecting increased budget).
3. Spending more money on end-user computing.
4. Increasing their computer security.
5. Other related trends:
 - Re-engineering
 - Downsizing
 - Open systems
 - Networks
 - Customer service
 - Global expansion
 - Outsourcing

Surprisingly only 65% of these best companies had "programs in place to measure the effectiveness of their IS operations." Likewise, Rubin (1991) reports that only 20% of 300 measurement programs begun in the 1980s were successes -- that is, the program lasted more than 2 years and results were communicated and used. Thus it seems that measurement programs are much harder to implement than they appear.



Rubin, 1991, p.3

Exhibit 1

4. CRITICAL SUCCESS FACTORS (CSF)

A fourth source of data on external performance is the investigation of the Critical Success Factors. CSFs are what the organization thinks it must do well to succeed. J.F. Rockart, a Harvard professor, applied the concept of CSF to IS organizations in a 1979 article. That article spawned a wave of studies looking into the CSFs for IS organizations. Appendix B contains the CSFs reported in these studies. They form a list of what other organizations have decided are their critical task areas.

On the other hand, the CSF approach will probably be less popular in the 1990s because it has little or no external component. While analyzing what the organization thinks would be necessary for its success is commendable, the CSF approach has no external validation, such as customers, corporate goals, or benchmark organizations, to keep it honest. CSFs do provide a

functional breakdown of the critical task areas that an organization thinks are most important, but they are the least valid in answering the question about whether those are in fact the critical areas.

Discussion

Performance measures nourishes the planning cycle which in turn drives budgeting and implementation, as illustrated in Figure 1. The implementation is then judged either effective or not by the customer touching off another round of improvement. Planning is also informed by information about the organization itself and about the IS environment as it develops.

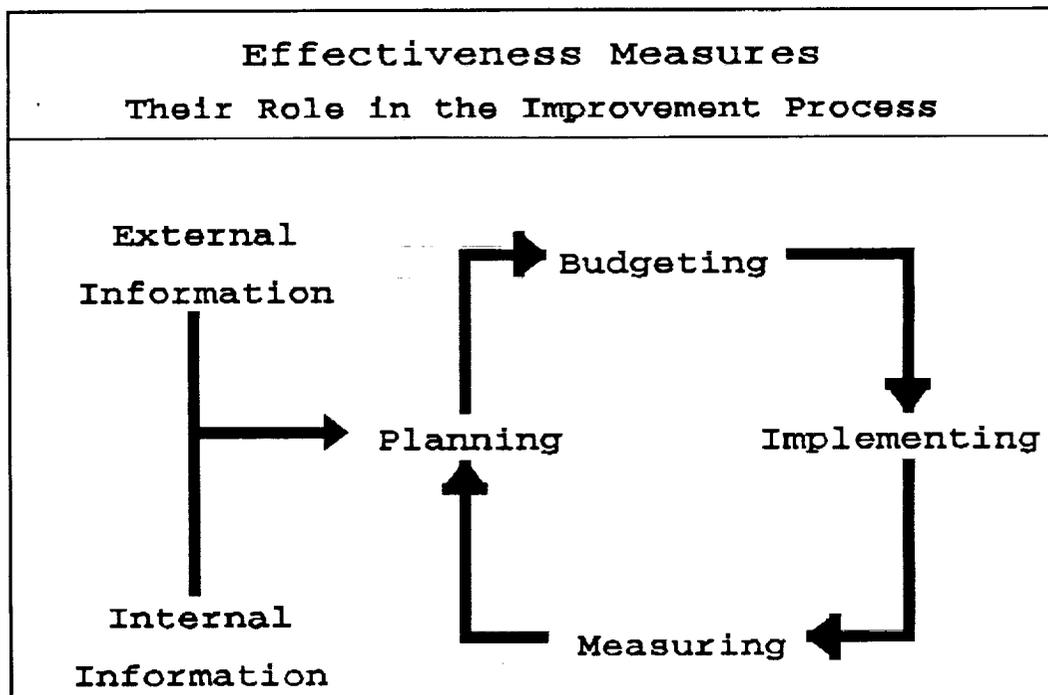


Figure 1

Peter C. Bishop, UHCL, April 1992

Without such a process in place, performance measures may be interesting but they themselves will not lead to greater

effectiveness. With such a process in place, the whole character of management changes. In place of traditional management comes "Management by Fact," a concept derived from the 1992 Malcolm Baldrige National Quality Award Criteria (pp.3-4).

Meeting quality and performance goals of the company requires that process management be based on upon reliable information, data, and analysis...Facts, data, and analysis support a variety of company purposes, such as planning, reviewing company performance, improving operations, and comparing company quality performance with competitors.

Just as we would no longer expect pilots to fly by the "seats of their pants," so in the future managers will not be able to direct their companies using facts. The companies and agencies which adopt this approach now will be more effective and competitive in the future.

Characteristics of Effective IS Organizations

An organization's activities bear on its performance, but a more direct approach is to measure the quality of the products and services it produces rather than just what it does. In this vein, many studies attempt to determine the characteristics of effective IS products and services in order to provide measures of what IS organizations should measure about their products and services. The list in Appendices B and C report the results.

Most of these studies asked IS customers what made them most satisfied with IS systems and products. One comprehensive study (Bailey & Pearson 1983) asked 32 managers (IS customers) from eight organizations to describe what was most important to them about IS products and services. Their responses were compared with a list of 38 items were extracted from the literature by asking the managers to rank the importance of each of the items. Of the top ranked 25 items, 14 items described systems and products and 11 described IS staff and services. These items are presented in Table I. Since they include the most important items from the rest of the other literature in this survey, they represent the best single list of the characteristics of effective IS organizations. Such a list can be used directly as

a set of external performance measures of a typical IS organization.

These results reemphasize the new yardstick for performance -- the ever-present and demanding customer. That customer who, as little as he or she knows about information technology, does know their own business better than the IS organization does and therefore can tell best how to improve it and make it effective. Successful IS organizations forge partnerships with these customers, offering them cost-effective products and services that enhance their ability to meet their goals and be successful. Thus, the simplest answer to the question "Are we doing the right thing?" is "Ask the customer."

Table I
Product and Service
Characteristics

Product/System
Characteristics

Accessible/convenient
Accurate/correct
Complete
Confident in the system
Current/up-to-date
Fast/responsive
Flexible/adaptable
Precise
Recoverable
Relevant
Reliable
Timely
Understandable
Useful

Staff/Service
Characteristics

Attitude
Communications
Convenience
Development time
Documentation
Flexibility
Participation/control
Priorities
Request processing time
Technical competence
Training

Techniques for measuring customer satisfaction

A final class of literature dealt with the various ways that firms used to gauge their customer's satisfaction. Customer satisfaction is not directly related to whether it is actually "doing the right things." It focuses more on how well it does the things which it is currently doing. But customer studies can

also include an "importance" rating along with the satisfaction measures to gauge how critical a product or service is.

1. Customer feedback

The literature contains four distinct methods for soliciting customer feedback, the most popular of which is annual customer survey. Surveys are ubiquitous today and will probably become even more popular in the future. As they spread, however, the average quality of surveys may actually decline.

The most popular format for the items on customer surveys is the semantic differential scale. The scale describes the characteristic to be measured (e.g., degree of EDP training provided) and asks the respondent to place a mark between polar opposites which describe that item (e.g., complete or incomplete, sufficient or insufficient, etc.). The distance between the mark and the more positive pole is a measure of the customer's satisfaction on that item.

Baroudi and Orlikowski (1988) use the semantic differential in a simple 13-item instrument. The items were taken from a much longer list generated by Ives (1983). Each item is rated using two pair of polar opposites for a total of 26 scores. All the items except the convenience and flexibility of services also appear on Bailey and Pearson's lists in Table I.

This approach is a straightforward method for measuring customer satisfaction on a pre-defined set of criteria. Also popular are the more common Likert scales in which each item on a 5- or 7-point scale is labeled individually from "very satisfied" to "very dissatisfied."

Goodman (1990) provides another alternative for customers who actually purchase IS services. He prefers to ask about some future action, such as "Will you use this product or service again?" or "Would you recommend this product or service to someone else?"

Goodman also warns that "good" or "OK" may not be as

positive as it sounds. His study of banks showed that between 20% and 50% of customers who said that a bank's performance was "good" switched banks at the next opportunity. Counting only the "above average" or "excellent" categories as successes will remedy that problem.

Customer opinion can also be gathered in a number of other ways and at a variety of other times:

Focus group (discussion groups on IS products/services)

Follow-up survey after product or service delivery

Critical incident interview (Bitner, 1990)

Pre- and post-implementation audit (Eckerson, 1991)

2. Executive Visits

Another critically important method for measuring customer satisfaction is the executive visit (Cannella 1991; Goodman 1982). Here the executive in charge of the IS organizations meets with the executive of a customer organization to solicit feedback and form an alliance for the future. The executive visit is crucial because it provides direct feedback to the person in charge of IS. It also shows IS's willingness to engage in discussion of its performance at the highest level. Finally, it allows both executives to agree on the major aspects of providing information technology to the customer's organization for the coming year.

Both organizations can then respond to the same set of goals and expectations as they work together at the operational levels. An agreement on goals and strategies can also help manage the customer organization's expectations of what IS can perform in a year. At the same time, it places an extra burden on IS to deliver what it committed to. The executive interview is an excellent addition to any performance measurement program.

3. Complaints and Compliments

A third source of customer satisfaction data is unsolicited

complaints and compliments. Goodman (1982) argues that companies should make it easy for customers to complain. They might even make them feel good about it! The reasons that people do not complain are fairly obvious:

- People do not believe that complaining will do any good.
- People assume that poor service comes with a low price.
- The person who receives the poor service is too busy.
- The person who receives the poor service is not the person who makes the purchase decision.
- The person does complain to the service representative but the representative cannot resolve the complaint and does not report it.

Companies who believe that complaints are important for the quality of their products and service take positive steps to increase the number of complaints:

- Constant top management contact with customers
- Rapid response to problems
- Fewer obstacles to complaining
- Frequent surveys to solicit complaints
- Internal incentives to find and resolve complaints

Goodman concludes with an eight item self-evaluation checklist on how well a company can use complaints as a major source of customer satisfaction data (Goodman 1982, p.44).

-
- I. Do your customers know how and where to ask or complain?
 - II. If a customer has a repeat problem, is there a person to logical contact beyond the sales or service representative?
 - III. Can your customers communicate quickly and easily with top management?
 - IV. Do your senior executives and technical people interact regularly with customers?
 - V. Do you use systematic, periodic surveys of customer satisfaction for past and present customers?
 - VI. Do you have a training program on listening and customer contact skills for customer contact employees?
 - VII. Are your customer contact employees accountable for customer satisfaction?
 - VIII. Are customer satisfaction measures part of the incentive compensation plan for profit center managers?

Exhibit 2

Accountability for customer satisfaction-A self-evaluation

Service Level Agreements and The Workflow Paradigm

A final technique for securing the customer's view on IS performance does not include surveys at all. Rather it involves a negotiated level of performance between customer and provider even before the product or service is delivered. This technique has been used effectively at the Security Pacific Automation company (SPAC), the IS organization for the Security Pacific

Corporation, a diversified financial services corporation (Singleton 1988). The SPAC program, entitled Management by Results (MBR)¹, contains four components of creating and measuring effectiveness: strategic planning, service level agreements, commitment plans, and appraisal and rewards. The service level agreements are user-driven definition of products and services to provided by SPAC. These agreements contain measurable criteria to judge whether SPAC performance was excellent, above average, average, or unsatisfactory.

The service level agreement is part of the broader concept of customer satisfaction described by Center and Henry (1992). They propose a paradigm of evaluation that complements the traditional input/process/output paradigm. The new approach, called the Workflow Paradigm, consists of four interactions between the customer and the IS organization:

- | | |
|-------------|--|
| Opening | Customer makes a request or provider makes an offer for work to be done. |
| Agreement | Customer and provider reach mutual agreement about what is to be accomplished. (This agreement constitutes the conditions of customer satisfaction.) |
| Performance | Provider completes the work and reports completion to the customer. |
| Acceptance | Customer assesses the work and declares satisfaction (or some level thereof). |

Much like the service level agreement, the workflow builds the "right things" and the customer's satisfaction right into the definition of the work itself. The Workflow Paradigm is most appropriate for non-routine, less structured work where Input/Process/Output is more common in routine, production work.

¹"Management by Results," "MBR," and "Commitment Plan" are registered trademarks of Security Pacific National Bank. All rights reserved.

Company Experience

The growth of quality management initiatives in all facets of American business has driven all IS departments to assess themselves in some way. Common characteristics are found in IS departments who are most satisfied with their ability to measure their effectiveness. These characteristics are the following:

- IS director is a senior manager with the company. They function as a chief information officer and have comparable status to the chief financial officer.
- IS upper management has regularly scheduled meetings with other senior managers or with a MIS operating committee.
- IS has a strategic plan which is well understood and integrated with the company's strategic plan.

The most common approach employed to measure IS effectiveness is the customer survey, but this method has had mixed results for the companies who have used them. Surveys are distributed on a quarterly or annual cycle. Information returned from the surveys is analyzed either by one person who has been assigned the responsibility or by a team of people, most often the quality lead team. The statistical analysis goes to the IS department head. The IS head uses the information in direct reports and in initiatives that need the most dramatic change.

Companies reported three major problems associated with assessment survey measurements -- poor response rate, incomplete quantification and inconsistent customer perceptions. Response rates to surveys tend to be low. A 35% per cent response rate is considered excellent. A 22% per cent response rate is considered very good. Too often the response rate is so low as to render them virtually invalid.

The process of surveying poses problems for the IS organization. Departments typically do not have experience and skills in survey design and analysis in-house so that the task is

assigned to someone who must "do their best". It is difficult to take open-ended comments and quantify them in a meaningful way. This job tends to be much larger and require more resources than originally allocated for the task.

Additionally how a customer responds on a survey is easily influenced by their latest experience with technology. If their last experience was good, then they give a good report. If their last experience was bad, then they give negative feedback. The individual's opinion may change drastically during any given period of time.

Making the survey results visible and publicizing their effects is important. Results are often kept on a LAN under "Performance Measures" and appear in reports. It was mentioned as harmful to the morale of the customer to build up the expectation of an assessment survey in the absence of an IS department's ability to use the information in a visible way.

Another type of survey that to determine IS effectiveness is the "climate survey" for IS personnel themselves. Here, response rate is no problem and tends toward 100 per cent. The climate survey measures over-all job satisfaction and is given on an 18-month cycle. The accuracy of the survey results can be verified by a low personnel turn-over rate.

The most effective way of determining customer satisfaction was reported to be the executive interview. The IS department placement in the organization is thought to be crucial to its effectiveness. The IS head who is a part of executive management is thought to be the most effective. One-on-one informal meetings with other division executives is thought to be the single most effective way of getting reliable feedback.

"Quality is what the client perceives it to be -- quality measurements may indicate a technologically-perfect product, but if the client is not satisfied, it is not a quality product."

One of the companies interviewed was ranked by Computerworld as one of the most effective users of IS

information for two years in a row. They do not use customer surveys nor do they rely heavily on quantitative measurements. They depend on feedback from business managers, such as evaluation of current services or requests for additional help. The company's IS director meets with the MIS Operating Committee (CEO, CFO, Sr. VP from each major business area) on a quarterly basis. This committee was singled out as a particularly good forum for two-way feedback and for seeing how IS doing in the field.

At the other end of the spectrum, another company surveyed relies on quantitative data of IS performance and availability on a daily, weekly, quarterly and annual basis. This statistical data is used in trend analysis to determine standard and then compare against standard. "If we are operating above the standard, then we consider ourselves effective."

Effectiveness as perceived by the stockholder was ranked as the hardest measurement to develop. One company reported only 60% satisfaction with its current effectiveness measurements, but it had one of the most comprehensive mission and assessments of the companies interviewed. They reported that the stockholder's opinion was one metric they wanted, but it was not being developed because they were not sure of the approach. For this company, evidence of success becomes part of their strategic plan which included internal customer satisfaction, employee satisfaction and owner (stockholder) satisfaction.

Evidence of strategic alignment with the company is most often determined by the processes in place and the long-range planning activity. Companies who considered themselves as strategically aligned with the executive direction of the company included the concept of "custodians of corporate data" in their mission and roles as an IS department.

Needed improvements that would help IS departments better assess their effectiveness included the following:

- improved ways of measuring enhancement activities

- methods and measures for assessing administrative tasks
- clearer identification of and measures for the discrete processes involved in software design, construction and installation
- process which clearly links individual goals and measures and department goals and measures
- method for assessing stockholders expectations and satisfaction

Conclusion

The literature reveals four approaches to measuring the effectiveness of IS performance:

1. Listen to the customer for the things they need
2. Align with corporate goals
3. Benchmark against well-respected organizations
4. Ask yourself what critical factors lead to success

The list of known methods for soliciting customer feedback are:

Executive visit
Survey, interview, focus group
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A common set of characteristics that satisfy customers was identified from the literature. The list includes elements such as:

Accuracy
Timeliness
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Reliability
Completeness

Future Research

Enough information was found to indicate that additional research in the following areas would be beneficial to ISD at JSC/NASA and to industry at large. Some high priority topics for research include the following:

- * Collect information and artifacts from industry on their IS performance measures and processes.
- * Develop guidelines for determining the external validity of the IS plan.
- * Identify checkpoints and measures for assessing the internal consistency of IS activities.
- * Catalog IS performance measures by industry and correlate perceived effectiveness with type of metric.
- * Describe the correlation between management structure and style with IS effectiveness.
- * Conduct a formal survey at JSC/NASA to define IS effectiveness.
- * Synthesize external information on IS performance measures with internal information and develop recommendations for meaningful performance measurements and a process for performance measurement.

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Appendix A

Information Systems Metrics
SURVEY
March 23, 1992

Requestor: Cissy Yoes
University of Houston--Clear Lake
MC: 478, 2700 Bay Area Blvd., Houston, TX 77058
283-3327 FAX: 283-3322
e-mail YOES@cl.uh.edu

I am surveying members of the **Information Systems Resource Center** on their practices of measuring their performance as an information systems department. I am particularly interested in effectiveness measures.

The information collected from the ISRC membership will be summarized and available to the membership on April 1, 1992. The summary of information collected will be included in a report on **I/S Performance Measures** currently being written for the Information Systems Directorate, JSC/NASA. All participants will receive a copy of this report which is expected to be ready for dissemination in May 1992.

Individual responses to this survey will not be identified by company name or respondent unless explicit permission has been acquired to do so.

This activity may also serve as a foundation for future research currently under consideration by Rudy Hirschheim, ISRC, and Jack Ross, Real Decision Corp. on Information systems Metrics.

Thank you for your help!

Respondent

Company

PLEASE RETURN BY Noon, Thursday, 3/26/92.

You may FAX to 283-3322 or if you prefer to answer by telephone call 283-3327. Leave a message and I will call you back as soon as possible (or you can leave your responses). THANKS.

Appendix B

Critical Success Factors for IS Departments

Caravella (1989)

Formal relationship with end users

Support services to meet user expectations

End user's ability to manage the IS resource

Employees with pride and satisfaction

Timely delivery of quality, cost-effective information services

Information assets that are safe, accessible, and have integrity

Simple, consistent user interface

Recognized by end users as vital and constructive contributors

Raghunathan, Gupta, Sundararaghavan (1989)

System development

Data processing operations

Human resource development

Management of MIS/DP organization

Support of corporate objectives

Performance

Slevin (1991)

Network reliability

Data communications network

I/O services

Documentation

Problem reports

Consulting

Hardware repair

Proactive planning

Facilities management

Internal support

Appendix C

Characteristics of Effective IS Products and Services

Quality Product Characteristics

Hiltz [1986]	Newcomer (1991)	Jenkins & Ricketts (1979)
Actual Usage	Usefulness	Content
Perceived Benefit	understandable	accurate
Satisfaction	current & timely	relevant
	relevant	adequate
	accessible	understandable
Davis (1989)	adaptable	
Perceived Useful	accurate	Form
Perceived Easy to use	precise	timely
(but not necessarily	valid	mode
correlated)	Ease of use	sequence
	(secondary)	
	input	Problem-solving
AT&T	browse	useful for ID
		problems
Accurate	Other	useful for selecting
Timely	error resistant	alternatives
Relevant	controlled access	powerful modeling
Complete	recovery	language
Uniform	time & cost saving	flexible modeling
Consistent		language
Flexible		
Understandable		Input
Reliable		understandable
		comprehensive
		documentation
Ives (1983)		
		Systems stability
Accurate		response time
Precise		error proneness
Reliable		reliability
Relevant		accessibility
Complete		availability
Confident in system		
Current (up-to-date)		
Timely (delivery)		

Quality Service Characteristics

Ives (Service, 1983)

Bitner (Service,
1990)

Ives (User
Involvement, 1983)

Attitude of EDP staff

Reponse to delivery
failure -- extra
compensation for
inconvenience

Training

Communication with
staff

Understanding of
system

CR processing

Reponse to request
for extra service --
go out of way to
fulfill request

Participation in
decisions

Development time

Relation with EDP
staff

Unsolicited employee
action --
doing extra things

Personal control

Flexibility

EDP Resource
priorities

Convenience

