CHARGEBACK SYSTEMS AND USER INVOLVEMENT
IN INFORMATION SYSTEMS

Margrethe Olson
Graduate School of Business
New York University

Blake Ives
School of Management
SUNY Binghamton

ABSTRACT

Computer chargeback systems are installed to meet various data processing objectives. One objective is to increase user involvement in decisions regarding information systems development and use. Presumably, increasing user involvement will result in more effective information systems.

In a field study we examine the relationship between various characteristics of a computer chargeback system, the quality of the chargeback system's user interface, user involvement and user attitudes about information systems services. Suggestions are given both for the practicing information systems manager and for future information systems researchers.

KEYWORDS: Chargeback; Information Satisfaction; User Attitudes

INTRODUCTION

Computer chargeback or cost recovery systems can provide top-level management with an attractive control mechanism for ensuring efficient and effective utilization of information resources. The decision to implement such a system, however, requires considerable thought regarding the objectives of the proposed chargeback scheme. If these objectives are not clearly defined before the chargeback system is designed and implemented, the results may be unimpressive or even dysfunctional.

This paper focuses on one potential objective of chargeback systems, increasing user involvement in the design and use of computer applications. The characteristics of a chargeback system which is designed to encourage increased user involvement will be described and compared with commonly used chargeback schemes which are better suited for other purposes. The results of a field study investigating characteristics of chargeback systems in use and their apparent effects on user involvement will be presented.

OBJECTIVES OF CHARGEBACK SYSTEMS

Accounting for computer utilization has been the subject of an extensive amount of literature. Most authors begin by presenting their perceptions of the objectives of charging back information services costs to user divisions. Among these objectives are:

1. To provide the basic accounting function of cost recovery [6,11,13],

2. To maximize data processing benefits [2,15],

3. To ensure equitable computer resource allocation among users [3,9],

4. To satisfy contractual or legal requirements [7],

5. To regulate the demand for scarce computer resources [5,11],

6. To assist management in planning [16],

7. To motivate and provide evaluation criteria for data processing management [4,16].

Although incomplete, this list of objectives presents a cross-section of the different goals the same cost recovery system may be expected to serve.

User Involvement as an Objective

User involvement is another recognized objective of cost recovery systems [12,13]. Users who are held accountable for information systems costs are expected to be more attuned to how the money is spent than users who are only charged indirectly (i.e., via an allocation strategy) or not at all. Users operating in a chargeback environment are expected to plan information systems ventures more carefully, take more responsibility for systems under development, and carefully monitor tne expenses associated with operational systems. Furthermore, it is expected that users will modify their own requirements for information systems on the basis of the bills they receive from the information services department. Expensive but seldom used reports may be eliminated, input verification reduced, or online update transactions discontinued by users unable or unwilling to pay for information services they feel they can do without.

It is important to realize that the goal of the charging system is, or should be, carefully considered in selecting an appropriate chargeback strategy. For instance, if the primary goal is increasing user involvement, user charges should reflect actual costs for services. If a system is designed to allocate out all costs on some arbitrary basis (e.g., a division's contribution to sales), increased user involvement may result in suboptimization. A user-conducted cost-benefit analysis, for example, may misrepresent costs of computer-based projects as compared to alternative investments.

The organizational environment will also influence the chances of a particular charging strategy achieving an anticipated objective. The existence and characteristics of other charging systems (e.g., telephone, travel, duplication services) will influence receptivity to use of chageback for information systems as a management control tool. Similarly, if interdepartmental transfers of funds are treated as "less real" than interorganizational transfers, an objective such as increased user involvement is unlikely to occur.

PREVIOUS RESEARCH ON CHARGEBACK SYSTEMS

Although there is an extensive amount of literature on the subject of chargeback systems, it is almost exclusively normative. Little research has been done to determine whether the objectives of the various charging schemes described above are in fact met.

Nolan [12] examined the use of different charging schemes and their effect on user/manager attitudes. He assessed the "maturity" of chargeback systems based on four criteria: understandability of costs to the user/manager, controllability of costs by the user/manager, accountability of the user-manager for costs, and cost-benefit incidence (does the manager responsible for costs also get the bill?). Generally, Nolan found that the more mature the information systems organization, the more mature (on the four criteria) the chargeback system. Nolan also found that, "in general, chargeout seems to create keen awareness of the cost of data processing. It also seems to accentuate user/manager responsibility for costs enough to spur communication between user/managers and the data processing

department." He found, for instance, that understandability of costs reduced managers' frustrations with charges for data processing and promoted positive attitudes toward information systems. However, "the most surprising result of the study was that only four percent of the user/managers interviewed understood their charges well enough to take effective control actions."

Chargeback systems, if designed appropriately, can foster user involvement in decisions regarding information systems. As a consequence, more cost-effective systems should be developed and more effective use should be made of information services within the organization. Unfortunately, chargeback systems are rarely designed to effectively meet the goal of increased user involvement.

A RESEARCH MODEL

In the research reported here, our objective was to identify those characteristics of chargeback systems that accomplish the goal of increasing user involvement in decisions affecting the development, management, and use of their information systems. We expect these same characteristics to influence users' attitudes about information services and information systems.

We predict that a successful chargeback system, one that will result in greater user involvement and more positive user attitudes, is defined not only by the technical quality of the system but by the quality of the user interface. The user interface of the chargeback system is the mechanism by which the users actually associate information services with their costs. A system that equitably and

completely represents actual use of services does not necessarily lead users to be more cost-conscious or more committed to new projects unless they can associate the quality of service with its cost. Some important characteristics of a system with a high-quality user interface are those suggested by Nolan [12] to indicate system maturity: that it be understandable to users, that it be controllable by users (i.e., they have the authority to reduce costs by reducing services, etc.), that users be accountable for cost and utilization of information services (i.e., they are included in performance evaluations of user/managers), and that the user who is responsible for information services costs also receives the bill.

In addition, we predict that a chargeback system designed to increase user involvement is more likely to successfully meet that objective if implemented in a supportive environment; that is, there is direct top management involvement in implementation of the system, there is a perceived need for the system on the part of users, and users are relatively sophisticated about data processing and its value to them. A chargeback system introduced in such an environment should also result in positive user attitudes about the "success" of the information system function in general and in greater satisfaction with the systems they use. The expected relationships among the information systems environment, chargeback system, and user involvement and attitudes are depicted with solid lines in Figure 1. The relationships actually tested in this research are shown with dotted lines.

DESCRIPTION OF STUDY

In an attempt to learn how chargeback systems are currently being used, we conducted an investigation of manufacturing firms. Our goal was to identify the types of charging systems in use (i.e., the characteristics of the chargeback system), the quality of the user interface of these systems, and the relationship between the charging strategy and user involvement and attitudes toward information systems. We did not, in our investigation, examine the characteristics of the system environment in which the chargeback system was implemented.*

Research Variables

Four classes of research variables were assessed in the investigation. They are:

1. The type of charging mechanism;

2. The quality of the user interface of the charging mechanism;

3. User involvement in information system development;

4. User attitudes toward information systems and the information services staff.

Each of these classes of variables is discussed briefly below.

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*As noted previously, however, the success of a chargeback strategy will be influenced by the organization's history with similar charging strategies utilized with other resources.

for charging out system costs. The appropriate method depends primarily on the goals of the system and their relationship to organizational goals. The classification of methods defined by Popadic [13] was used in the present study. In each organization studied, the methods of charging for system operations and, separately, for system development were identified and classified as one of these methods. They are the following:

1. Overhead. No charging mechanism is employed. All costs are absorbed by the information services department.

2. Allocation of Expense. Time reporting or CPU utilization records are used to arrive at a rough percentage of use for each department. Usually 100% of all costs are allocated.

3. Standard resource rates. Users are charged by type of service used, according to a fixed rate schedule established in advance.

4. Standard rate per unit processed. Users are charged a prespecified rate for particular units of input or output; i.e., transactions processed, on-line inquiries, reports requested. This method is generally not appropriate for system development.

5. Fixed Price. Users pay a fixed fee for usage of a block of time on a dedicated system or for new system development where the final product is relatively well-defined.

Quality of the User Interface. The characteristics identified by Nolan [12] as representing a "mature" chargeback system were emloyed to assess the user interface of the chargeback system. These are the following:

1. Understandability: the extent to which the user can associate chargeout costs with the activities necessary to carry out his/her tasks.

2. Controllability; the extent to which charges are under the control of the user/manager.

3. Accountability; the extent to which costs and utilization of information services are included in the performance evaluation of the user/manager.

4. Cost-Benefit Incidence; whether or not the user/manager receiving the benefits of utilization of information services also receives the bill for those services.

User Involvement in Information System Development. User involvement can be examined on several different dimensions. Two aspects of user involvement were considered in this investigation. First, types of user involvement, such as steering committees, representation on project teams, sign-offs on stages of development, etc. were assessed. Second, user involvement in stages of system development were examined. A summary measure of user involvement was employed as well as individual measures of the mechanisms used and the stages in which they occurred. Several sample items from the user

involvement measures are reproduced in the appendix.

<u>User</u> <u>Attitudes</u> <u>Toward</u> <u>Information</u> <u>Services.</u> Both user satisfaction with existing computer-based systems and user attitudes toward the information systems staff were measured.

"Information satisfaction" can be employed as a surrogate measure for system quality. If the user/manager perceives the system as providing valuable information not readily available elsewhere, the system designer can be relatively confident of the "satisfactoriness" of the information system for that user/manager. In this study, an instrument developed by Guthrie [8] was used to assess information satisfaction. His fifteen-item questionnaire, based on a measure developed by Porter [14] of job satisfaction, examines the difference between a user's "felt need" for certain types of information to support his or her performance on the job and the amount of such information currently being provided by the information system. The higher the user/manager's perceived need for information, (i.e., the greater the "felt need"), the greater his or her dissatisfaction with the system. Sample items are reproduced in the appendix.

The managers' perceptions of quality of the information systems group were also measured. Two items were used to assess the users' perceptions of how adequately the information systems group meets the needs of their areas of responsibility and of the company as a whole. Two more items assessed the users' perceptions of the efficiency and effectiveness of the information systems department. These items were averaged to provide a measure of user attitudes toward the information systems group. This scale is included in the appendix.

HYPOTHESES

The specific hypotheses examined are shown by a dotted line in Figure 1. The first set of hypotheses examines the effect that the existence of a chargeback system has on user involvement and user attitudes. The second set examines the impact different types of chargeback strategies have on user involvement and attitudes. The final set examines the relationship between the quality of the user interface and user involvement and attitudes. These are discussed below.

Impact of Chargeback Use

We differentiate between organizations that have some method of allocating charges for information services to users in proportion to actual use (Type 2 or greater) and those that treat information services costs as overhead (Type 1). We predict that users who are charged for information services will be more involved and have more positive attitudes about information services and their current information systems than will users who are not charged.

     H1A: Organizations using chargeback systems to recover information systems costs will have users who are more involved in the development and use of information systems than organizations not using chargeback systems.

     H1B: Organizations using chargeback systems to recover information systems costs will have users with more positive attitudes about information systems and services than organizations not using chargeback systems.

Impact of Chargeback Type

We differentiate between two general classes of chargeback systems. Expense allocation systems (Type 2) are an accounting mechanism for information services to distribute out 100 per cent of its expenses based on average use. Resource rate systems (Types 3, 4, and 5) use economic prices for resources, where the price structure is designed to ensure the most effective use of resources. We predict that the type of chargeback system will influence user involvement and attitudes as well as the quality of the user interface:

> H2A: Organizations using resource rate systems will have users who are more involved in the development and use of information systems than organizations using expense allocation systems.

> H2B: Organizations using resource rate systems will have higher quality user interfaces than organizations using expense allocation systems.

> H2C: Organizations using resource rate systems will have users with more positive attitudes about information services than organizations using expense allocation systems.

Impact of User Interface Quality

We predict that without a high-quality user interface, the system will not meet its objectives regardless of the technical quality of the chargeback system. Quality of the user interface affects user involvement and attitudes:

> H3A: In organizations using chargeback systems, those that have a high-quality user interface will have more user involvement in the development and usse of information systems than those with a low-quality user interface.

> H3B: In organizations using chargeback systems, those that have a high-quality user interface will have users with more positive attitudes about information services than

those with a low-quality user interface.

METHODOLOGY

The investigation was conducted in two phases. In the first phase, a questionnaire was mailed to the information services managers of 150 manufacturing firms in eastern New York State, eastern Pennsylvania, and New Jersey. The questionnaire focused on identifying the type of cost recovery mechanism used in each organization. Some general questions about the size and age of the information services department were also asked. The questionnaire was designed to be objective; no questions about "success" or "effectiveness" of information systems or charging mechanisms were asked.

Based on the responses to the survey, a sample of thirty organizations was chosen to participate in Phase II. Companies were selected on the basis of size (at least 500 employees) and the type of chargeback system employed, including some who did not employ chargeback systems. Of the thirty organizations selected, twenty-three agreed to participate in Phase II of the study.

In Phase II, we visited organization sites and gathered more detailed information about the cost recovery mechanism used. We also investigated the quality of the user interface of the cost recovery system as well as user involvement and attitudes. In each organization, up to five participants were contacted: the information systems manager and three to five user/managers, identified by the information systems manager, responsible for those functions that most

heavily utilized information systems.

Using a structured interview instrument, we interviewed information systems manager about the type of cost recovery function used and their perceptions of how effective it was in accomplishing its goals. The information systems manager provided information about the technical quality of the system as well as the quality of the user interface.

Using another structured interview instrument, we interviewed one of the four user managers regarding his or her attitudes about information systems and involvement in their development and use. Questionnaires were distributed to this person and the other three user managers assessing their "felt need" for information systems and their feelings of involvement in decisions affecting information system development and use.

Responses to the structured interviews were coded for analysis. Questionnaire responses were summarized for each organization; user questionnaires were not used unless at least three responses were received.

RESULTS

Of the 23 organizations studied, only two used standard rates per unit processed (Type 4) as a basis for charging system operations; none used either Type 4 or Type 5 (fixed price) for system development. Therefore, Types 3, 4, and 5 were combined to represent resource rates (Type 3) for purposes of analysis. Table I shows the

number of companies exhibiting each type for operations and development.

Inter-item reliability was calculated for the scales for user involvement in system development (12 items), user information satisfaction (15 items), and user perceptions of quality of the information systems group (4 items). Reliability for all three scales was .85 or greater.

Differences between means for Types 1, 2, and 3 for operations and development were tested. Where differences were shown to be significant, contrasts between the three types are reported.

Hypothesis 1

. We tested the null hypothesis that there is no difference in user involvement and user attitudes toward information services for different types of charging systems. Table II shows the F-values and significance levels for user involvement, user information satisfaction, and quality of the information systems group by cost recovery type for development and operations.

Inspection of Table II shows no relationship between the type of cost recovery mechanism and user involvement in system development (H1A). On the other hand, the type of charging for operations is significantly related to information satisfaction, although the type of charging for development is not. Table III shows the contrasts between Types 1, 2, and 3 in information satisfaction. There is a significant difference only between Type 1 and Type 3: Type 3 users

were less dissatisfied than Type 1 users with their information systems.

Although the overall measure of quality of the information systems group was not significantly related to the type of charging scheme, one component variable, system efficiency, was significantly related to charging for development. Table IV shows the F-value, contrasts and means for user ratings of efficiency of the information systems group, by development type. The difference between Type 2 and Type 3 users is significant: Type 3 users perceive information services to be _less efficient_ than do Type 2 users.

Hypothesis 2

The quality of the user interface _was_ significantly related to the type of charging scheme used for system development, as shown in Table V. Thus Type 3 or greater charging mechanisms appear to have a higher quality user interface than Type 2 mechanisms in the organizations studied, and H2C is supported for system development. The difference was not significant, however, for charging for operations. Since the type of resource rates established for development are inherently more understandable than for operations, (e.g. hours of programmer time versus minutes of CPU time), it is not too surprising that this result was found for one and not for the other.

Hypothesis 3

For organizations using Type 2 or greater, the quality of the user interface was not significantly related to either user involvement or user attitudes toward information services. The lack of support for hypothesis 3 was surprising, particularly given the support found for hypothesis 2C, which showed significant differences in user interfaces across charging strategies. Nevertheless, the number of organizations employing Type 2 or greater charging schemes was only fifteen, thus substantially reducing the power of the statistical test of significance. A very strong relationship between variables was required for a statistically significant result to be obtained.

CONCLUSIONS

The results must be treated as preliminary and interpreted with caution. A limited objective of this study was to identify the type of charging systems currently in use. The one overwhelming result was that very few true charging mechanisms beyond expense allocation schemes are being employed (17 percent of the sample), at least in manufacturing firms. In this important respect the results are in agreement with Nolan's previous study. Our interviews indicate, moreover, that only two of the 23 organizations considered user involvement in information system development to be a specific goal of their charging system.

Despite the lack of resource rate-based systems in the sample, some results regarding user attitudes and user involvement are worthy of note. First, there is some evidence that the type of charging scheme is related to user information satisfaction. In addition, there is some evidence that the type of charging scheme is negatively related to user perceptions of system efficiency. It seems reasonable that users who are aware of the costs of information services will question the efficiency of those services more than those who are not. An important negative effect to consider is that users may become more frustrated with the information services they receive if they see the costs.

It must also be noted that the type of charging scheme did not appear to affect the degree to which users become involved in development and use of information services; the relationship between charging scheme type and user attitudes is also weak. Moreover the quality of the user interface, although related to the type of charging scheme, was not related to either user involvement or user attitudes toward information services. Again these negative results may be explained by the lack of power exhibited by the statistical tests due to the small sample size. Alternatively, many other variables may be influencing user involvement and attitudes so that a relatively small amount of variance is accounted for by the chargeback variable.

The typical user/manager we interviewed who is charged for information services receives a bill and, even though he or she may understand the charges, does not know how to affect those charges

through usage. Information systems are usually seen as an expensive but necessary evil. Charging schemes that are implemented for other purposes than to affect user requests for information services probably do not result in changes in user behavior or attitudes regardless of the quality of the user interface or the basis for establishing charges.

Practical Implications

Practitioners considering implementing or changing chargeback systems on the strength of this research should act with caution. As noted previously, the small sample size precludes drawing substantive conclusions from nonsupported hypotheses. The partially supported hypotheses suggest two implications related to the move to a chargeback system based on resource rates (i.e., Types 3-5). First, these systems generally will provide clearer user understanding of charges, although not necessarily any improvement in either involvement or attitudes. Second, given this clearer understanding users may, in fact, become more critical of the information systems group's internal efficiencies.

Suggestions for Future Research

We suggest several avenues for further study of the relationship between chargeback, user involvement, and user attitudes. First, an intensive study of differences between organizations employing at least Type 3 charging schemes, focusing on differences in goals of the charging scheme, the basis for establishing charges, organizational characteristics, organization of the information services function,

and user attitudes and behavior should be carried out. Second, the significance of user involvement and its relationship to user attitudes should be closely examined. The positive relationship between user involvement and various user attitudes that is generally expected is weakly supported at best [10]. The underlying assumption of this paper and much of the MIS literature, that user involvement is essential for successful implementation and use of information systems, should itself be examined further.

We recognize that the implementation of a charging scheme which represents equitable use of information services is very difficult. Designing the charging scheme to be understandable to and controllable by system users is even more difficult and may introduce additional complexities into the objective of using this resource efficiently. Hopefully, future research will focus additional insights into this complex problem.

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APPENDIX

Included here are sample items drawn from the survey scales employed in this study. Sample items are shown for information satisfaction and user involvement. The scale measuring attitudes concerning information services is shown in its complete form.

Information Satisfaction

This scale, developed by Guthrie [8] includes fifteen items. Two examples are shown below:

1. Computer-based information to help me do the planning and budgeting necessary in my management position:

(a) How much is there now?
(min) 1 2 3 4 5 6 7 (max)
(b) How much should there be?
(min) 1 2 3 4 5 6 7 (max)

2. Computer-based information to keep me up-to-date on activities and performances related to my managerial position:

(a) How much is there now?
(min) 1 2 3 4 5 6 7 (max)
(b) How much should there be?
(min) 1 2 3 4 5 6 7 (max)

User involvement was measured with a scale of 16 items comprised of three types of questions.

The first seven items listed development activities that usually are required for a new system and that might be undertaken by either users or data processing personnel. The users were asked to rate the relative contribution of the two groups. The scale and two examples are shown below:

1	2	3	4	5
Data Processing takes most of the responsibility for this task.	Data Processing performs more than half of this task.	This task is about evenly split between us and DP.	We perform more than half of this task.	We take most of the responsibility for this task.

_____ Justifying the proposed application (i.e., cost/benefit analysis)

_____ Determining what computer-generated reports and/or visual display screen formats will look like.

The next five items assessed organizational adaptations that the user manager might make to increase involvement with data processing. A 5-point Likert scale was employed with items including:

_____ Usually someone from my group is put IN CHARGE of the project development group (the data processing people serve under this individual).

_____ Project development groups contain one of more members from my department.

The next four items tapped specific involvement behaviors that the user manager might exhibit. A 5-point Likert scale was employed with items including:

_____ I have initiated attempts to REDUCE some of our demands for data processing services (for example, looking for reports no longer needed or reducing use of online terminals.

_____ I have initiated NEW data processing services (for example, development of a new computer-based information system or of a new management report).

User Attitudes

The following four-item scale measured user attitudes concerning the information services function:

1. How adequately do you feel the data processing group within your company meets the information processing needs of your area of responsibility?

1	2	3	4	5
Poorly	Marginally	Adequately	Very Well	Excellently

2. How adequately do you feel the above data processing group meets the needs of the broader class of users they serve?

1	2	3	4	5
Poorly	Marginally	Adequately	Very Well	Excellently

Data processing departments are often judged on two criteria: efficiency and effectiveness. Efficiency, of course, deals with how well they do what they do. Are reports on time? Are projects developed within preset budgets? Effectiveness takes a broader focus. Are they doing the right things? Are critical "life-blood" applications being developed? Are new computer technologies being successfully integrated into the organization?

3. How efficient do you feel the data processing group is?

1	2	3	4	5
Very Inefficient	Somewhat Inefficient	?	Fairly Efficient	Very Efficient

4. How effective do you feel the data processing group is?

1	2	3	4	5
Very Inefficient	Somewhat Inefficient	?	Fairly Efficient	Very Efficient

TABLE I

Number of Companies
Employing Each Type of Charging Scheme

Type of Charging Scheme	Number of Companies	
	Operations	Development
1. Overhead	8	8
2. Expense Allocation	11	10
3. Resource Rate	4	5

TABLE II

Test of Differences in User
Behaviors and Attitudes Toward
Information Services for Different
Charging Schemes

	Development Type	Operations Type
	F-value (P > F)	F-value (P > F)
User Involvement	1.23 (.29)	.75 (.48)
User Information Satisfaction	1.52 (.22)	4.46 (.04)
Quality of I.S. Group	1.89 (.16)	.43 (.65)

TABLE III

Contrasts between User Information
Satisfaction for Different Charging Schemes
for System Operations

	F-value	P F
Type 1 vs. Type 2	1.60	.21
Type 2 vs. Type 3	1.35	.25
Type 1 vs. Type 3	4.26	.04

Type of Charging Scheme	Mean Information Satisfaction
1. Overhead	33.96
2. Expense Allocation	29.18
3. Resource rate	23.64

TABLE IV

Contrasts between User Ratings of
System Efficiency for Different Charging
Schemes for System Development

	F-value	P > F
Overall	3.12	.05
Type 1 vs. Type 2	1.24	.27
Type 2 vs. Type 3	6.23	.01
Type 1 vs. Type 3	2.09	.15

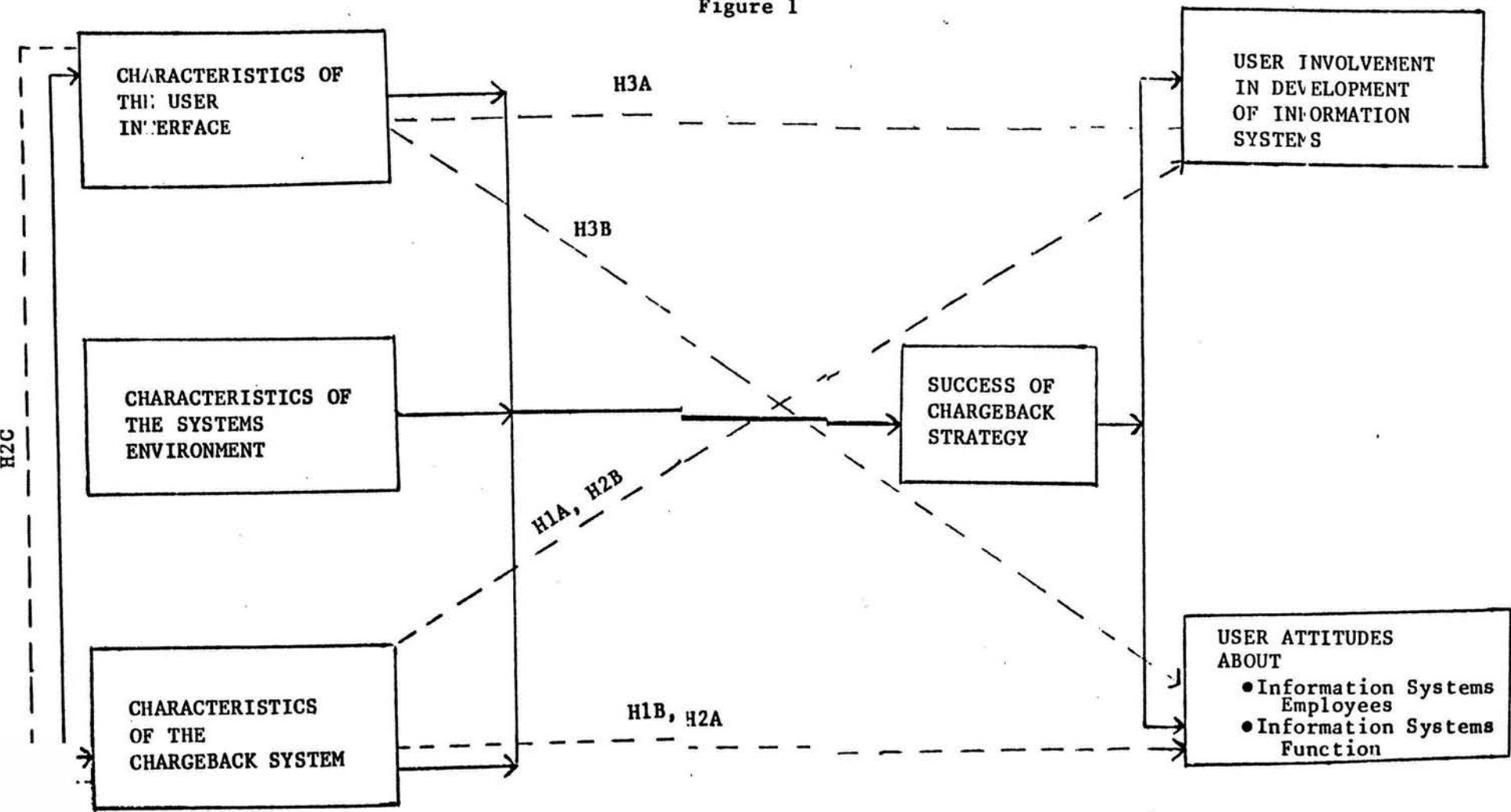| Type of Charging Scheme	Mean Rating of System Efficiency
1. Overhead	3.41
2. Expense Allocation	3.69
3. Resource Rate	3.00

TABLE V

Test of Differences in Quality
of the User Interface for
Different Charging Schemes

	F-values	P > F
Operations	2.23	.15
Development	10.61	.007

Figure 1

Solid lines represent the theoretical mappings
Dotted lines represent specific hypotheses tested