INFORMATION SYSTEMS PROJECT APPROVAL:

TRANSACTION PROCESSING SYSTEMS vs

MANAGEMENT SUPPORT SYSTEMS

by

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ABSTRACT

The new project approval process is a small but
essential part of the activities of the data processing
department. This thesis examines the current project
approval process, with special emphasis on the differences
between the approval criteria for transaction processing
systems and those for management support systems. The data
for this thesis were obtained as part of a survey conducted
at the Center for Information Systems Research, M.I.T. This
survey was formally known as 'The User Needs Survey.'

Our analysis indicates that the current approval process
practised by the firms in our survey does not objectively
evaluate management support systems on the basis of their
merits. We therefore propose here an alternative process,
one which permits comparisons among different types of
systems.

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1. INTRODUCTION

Data processing has now become such an integral part of
most company operations that these companies simply cannot
function without the aid of computers. In spite of this
necessity, the DP department is often managed at arms-length
because its operations are not clearly understood. The rapid
development of computer technology has been largely
responsible for this phenomenon. The application of
computers as a data processing tool is fairly recent, and the
computer department has not had as much time to evolve as had
the traditional divisions in a company - finance, accounting,
manufacturing, etc. Even more recent is the trend towards
using computer systems as management tools. The full
implications of these recent trends are yet to be fully
understood, and they are frequently complicated by
misperceptions regarding the role of data processing, its
capabilities, and its limitations.

This thesis is part of a large survey that attempts to
examine the computer, or data processing, division as
perceived by both managers of the department and managers of
the Finance and Manufacturing divisions. Specifically, we
have attempted to analyze the approval process for new
computer-based information systems. Computer services are in
such great demand within most firms that only a few of the

requests for these services are usually approved. In fact, earlier analyses have indicated that for the companies surveyed, the total demand for all application systems is 512% of current capacity. There is no way any DP department can actually fulfill this level of demand (Alloway, 1979). Given the limited resources and the large need for them, it is imperative that there exist a suitable set of criteria for evaluating project requests. Also, given that the needs cut across many departments, we need a selection procedure that will ensure that the resources are allocated equitably amongst the departments; hence we need to develop some criteria for this complex, judgemental, multi-departmental and crucial task.

Unfortunately, this whole area of project approval is so new that it is practically unexplored. The traditional analyses of approval procedures as applied to other departments cannot be extrapolated to our case because the computer division plays a radically different role from most other departments. Its services are utilized in very different ways by almost all divisions. It provides "life and death" services for many departments and information support services for others.

In view of the absence of any information on the current practice of project selection, our analysis has to start with a very basic look of the current situation in industry. All

in all, there are several stages to our analysis. These
are:-

(1) Examination of current practices in companies. At
this stage we look at the assessments, by DP, Manufacturing,
and Finance managers, of the process of project selection,
approval, and development. Among others, we look for such
trends as differences in opinions regarding what is necessary
in proposal contents, or the extent to which upper management
influence the project selection process.

(2) Research into the relationship between certain
criteria to form a general picture of what are important in
project proposals and how they make sense, if at all. Once
we have formed a picture of the state of affairs, we can then
attempt to group together underlying trends in the responses.
In so doing we would obtain a rough idea of how certain
factors interact logically, or how the project selection
process could affect the nature of the proposals required.

(3) By stage 3, we would be able to form a general model
for the project proposal requirements and project approval
methods. As part of the analysis at this point, we would
examine the causality of certain factors on each other, and
the probable impact on the whole system if changes were made
to some of its constituents.

(4) Finally, we would make recommendations for future
directions. By then we would be able to have a fairly good

idea of where future research should be concentrated. We would also propose methods to increase the success probability of project proposal evaluation techniques.

2. THE SURVEY

This thesis is part of an in-depth survey of managerial information needs, conducted at the Center for Information Systems Research of the Massachusetts Institute of Technology. The overall objective of the survey is to improve our understanding of the application of computer systems as a management tool.

2.1 Purpose

There are many vocal opinions yet little empirical evidence concerning the managerial applications of computers. It is therefore necessary that we go through several stages of elementary analysis before we can actually identify and examine the areas where differences in opinions exist between data processing managers and user managers. Eventually, we would hope that analysis of our survey data would allow us to recommend enhancements in data processing and user management practices that will permit:

- implementation of higher quality systems
- fulfillment of recognized user needs
- expansion of user perceptions of needed systems
- improvement in basic user attitudes towards data

processing departments

- improvement in DP responsiveness to users' needs.

We are interested in both examining the symptoms and understanding the causes of any problems that we may uncover.

These objectives span such a wide spectrum of activities that it would be impossible to cover all the topics in a single thesis. As a result, we have restricted ourselves to examining a task that is focused yet crucial to a data processing department. Here we are interested in the process of approving proposals for new systems development, or project approval for short. In order to understand the process, there are several subobjectives that we have to accomplish. We have to examine:

(1) the content requirements of proposals for new data processing systems.

(2) the criteria relevant to the actual project approval process for new systems.

(3) differences in the role of managers of data processing and user departments in the actual project approval decision.

(4) the relationship amongst the above three factors, and how they tend to create natural biases towards or against certain types of projects.

(5) differences between the actual and desired levels of

user participation in the decision processes. Hopefully, in accomplishing these subobjectives, we will be able to put forward a practical model of the approval process.

2.2 Methodology

The User Needs Survey was very carefully designed and administered in order to ensure the integrity of its results. User and DP managers were directly surveyed on issues of needs, procedures, policies, priorities, and performance. The actual questionnaire, which provided the data for this thesis, is a refinement of a previous questionnaire that was adminstered to a smaller group of respondents.

The first User Needs Survey was carried out in Spring 1978 by Prof. Robert M. Alloway of the Sloan School of Management. That survey gathered data from 114 respondents in six industrial firms. Analysis of that data was done by Robert Alloway et al (Alloway, 1979).

The result of that survey was so encouraging that a larger survey of similar nature was planned. The questionnaire for this second survey was essentially similar to that of its predecessor, but covered more grounds. The results of the first survey also provided the basis for

modifying some of the the questions in the second survey. This survey was carried out in Spring 1979, again by Alloway et al, with a sample size of 944 respondents from 13 industrial firms. The number of respondents from a single company was 21 while the largest was 133. Our thesis is based totally on the data collected from the second survey.

The interview procedure involved several stages. First the following segments within the firm were identified: the DP department, the Finance department, and the Manufacturing department. Next the head of each department was interviewed. Following the interview, we selected a stratified sample of managers within each department. The main aim of the stratification was to obtain as much a diverse sample of respondents as was possible. We also tried to avoid catching a large number of respondents who might have been influenced by a common systems development experience. Finally, having selected our sample population, we administered the questionnaire individually to each manager.

The reliability of the data gathered by the questionnaire is excellent. Respondents were interviewed before and after completing the questionnaire to corroborate their responses, and to allow respondents to clarify their answers. In addition, we checked the distributions of responses to individual questions to ensure item

discrimination and well-behaved distributions. The resulting
questionnaire had a total of 314 items, which were divided
into 5 sections so that each manager only received questions
directly relevant to his or her organizational position.
Since each questionnaire was personally administered, the
response rate was nearly perfect. The typical time needed to
complete the questionnaire was 1 hour. Within the 13
companies a stratified sample of senior, junior, and middle
managers from DP, Finance, and Manufacturing were selected.
More detailed profiles of the firms surveyed are displayed in
Figures 2.1 to 2.5.

2.3 Pre-Analysis

The data which were are using in our research has never
been used before. As such, our first step was to ensure that
there were no visible errors generated in the course of
entering the data into the computer. After the missing
values were properly designated, we computed frequency
distributions for each of the relevant variables. The
frequency charts enabled us to detect any invalid responses.
There were indeed a few such responses, which we converted
into missing values as well.

2.4 Definitions

Fundamental to our analysis is the assumption that different types of systems are required for different applications. In order to be able to distinguish among the various types, we have adopted here the same terminology as was used in the questionnaires. The definitions are exactly as they were used to explain the meanings of these terms to respondents:

SHORT NAME   DESCRIPTION OF SYSTEM TYPE

Monitor   The system monitors daily detail activity producing standard reports on a <u>fixed schedule</u> (daily, weekly, or monthly).

Exception   The system processes daily detail activity but produces <u>exception</u> reports where the definition of <u>exception conditions is fixed</u>.

Inquiry   The system provides a database with <u>flexible</u> inquiry capability, enabling <u>managers</u> to design and change their own monitoring and exception reports.

Analysis   The system provides powerful <u>data analysis</u> capabilities (modeling, simulation, optimization, or statistical routines) and the appropriate database to support <u>managerial</u> decision making.

The main distinction among these categories is that the first two types, monitor and exception, fall into the category of applications traditionally called transaction processing systems. They have been the bread and butter of DP, helping to capture, store, manipulate and report the structured high volume activities of daily operations. Transaction processing systems usually generate reports for higher management by only summarizing detailed activity. There is an implicit assumption in this traditional approach to management information -- summarized daily activity, which is appropriate for first line managers, further summarized is appropriate for higher levels of management. In general this is not true. To the limited extent that his is true, transaction processors do provide some relevant information to higher level managers.

Inquiry and analysis systems, on the other hand, are generically referred to as decision or management support systems and are managerially oriented by design and purpose. For the latter two types, more emphasis is placed on flexibility, and the starting point in their design is usually the managers' needs. These systems are specifically designed to support such needs, and they might access a database which is not used for day-to-day operations.

Figure 2.1: Company Profile by Industry

- Paper, fiber, and wood products

- Rubber, plastics products

- Communications

- Food processing

- Tobacco products

- Motor vehicles

- Office equipment

- Measuring, analyzing, and control equipment

- electronics

Figure 2.2: Company Profile by Size

Sales (US$1000)	No. of firms in this range	No. of firms with parent organizations in this range
>10,000	-	4
5 - 10,000	2	2
1 - 5,000	6	5
500 - 1000	3	1
100 - 500	2	1
Total	13	13

Figure 2.3: DP Budget as a Percent of Sales

Percentage Range	No. of Firms
2% - 3%	2
1% - 2%	4
0.5% - 1%	1
0.25% - 0.5%	6
Total	13

Figure 2.4: Overall Response Rate

Function	Q'naires Administered	Q'naires Completed	Response Rate	Q'naires Used
Finance	295	250	85%	247
Manufac.	356	291	82%	282
Users	651	541	83%	529
DP	463	422	91%	415
Total	1114	963	86%	944

Figure 2.5: Respondents by Level

Level	DP	Mfg	Finance	Totals
1	20	13	14	47 (5.0)
2	34	29	23	86 (9.1)
3	87	94	75	256 (27.1)
4	274	146	135	555 (58.8)
Totals	415 (43.9)	282 (29.9)	247 (26.2)	944 (100)

3. THE NEED FOR PROJECT SELECTION PROCEDURES

We have too often heard the tales of overrun budgets for computer systems development. It is not unusual to find a systems development project that costs more than twice its initial estimated cost. Consequently, the systems development process has interested many authors. And out of their research, we have been bequeathed many books on how to develop systems "properly". These books cover a broad spectrum. Some provide advice of a general basis: how to make the use of computers profitable (Graham, 1976), or how to approach the strategy of planning for management information systems (McClean & Soden, 1977). Others are more specific, and confine themselves to discussing the administrative operations and procedures of data processing departments (Mixon, 1976), or the System Development Process (Enger, 1976).

These papers have proposed many models of the systems development process. They vary in breadth and detail. The early models conceptualized the various steps of the process into several stages (Alloway, 1978). Recent modifications to the life cycle concept have added more detailed stages by extending the process at both ends, and have separated project planning/control issues from the life cycle per se. For our purposes, it is helpful to group these stages into

larger groups - proposal development, planning, implementation, and maintenance - as shown in Figure 3.1.

Although many of these books deal thoroughly with the systems development process, very few actually spend any time discussing the actual project approval methods. Instead, most books provide details of steps and forms that need to be completed for each stage; some even go on to provide methodological help for completing these forms. The management review process is usually dismissed in a few sentences that merely state the importance of a review between the various stages. Such a lack of substantive help for key management decision is especially inadequate for the first and most important management decision -- project approval. This is quite surprising once we pause to consider the importance of that decision process. No doubt, budget overruns actually occur during implementation. Yet, an effective project approval method would help detect potential overruns. What is more important though, is that such a selection procedure is very badly needed if we are to be able to prioritize project requests for different types of systems.

Most books on systems development either consider the issue from the point of a project that has been already approved, or implicitly assume that project proposals are eventually accepted as long as they satisfy a given rate of

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┌─────────────────────────────────┐
│      PROPOSAL DEVELOPMENT        │
├─────────────────────────────────┤
│  1.  PRELIMINARY SURVEY          │
│  2.  FEASIBILITY STUDY           │
└─────────────────────────────────┘

┌─────────────────────────────────┐
│            PLANNING              │
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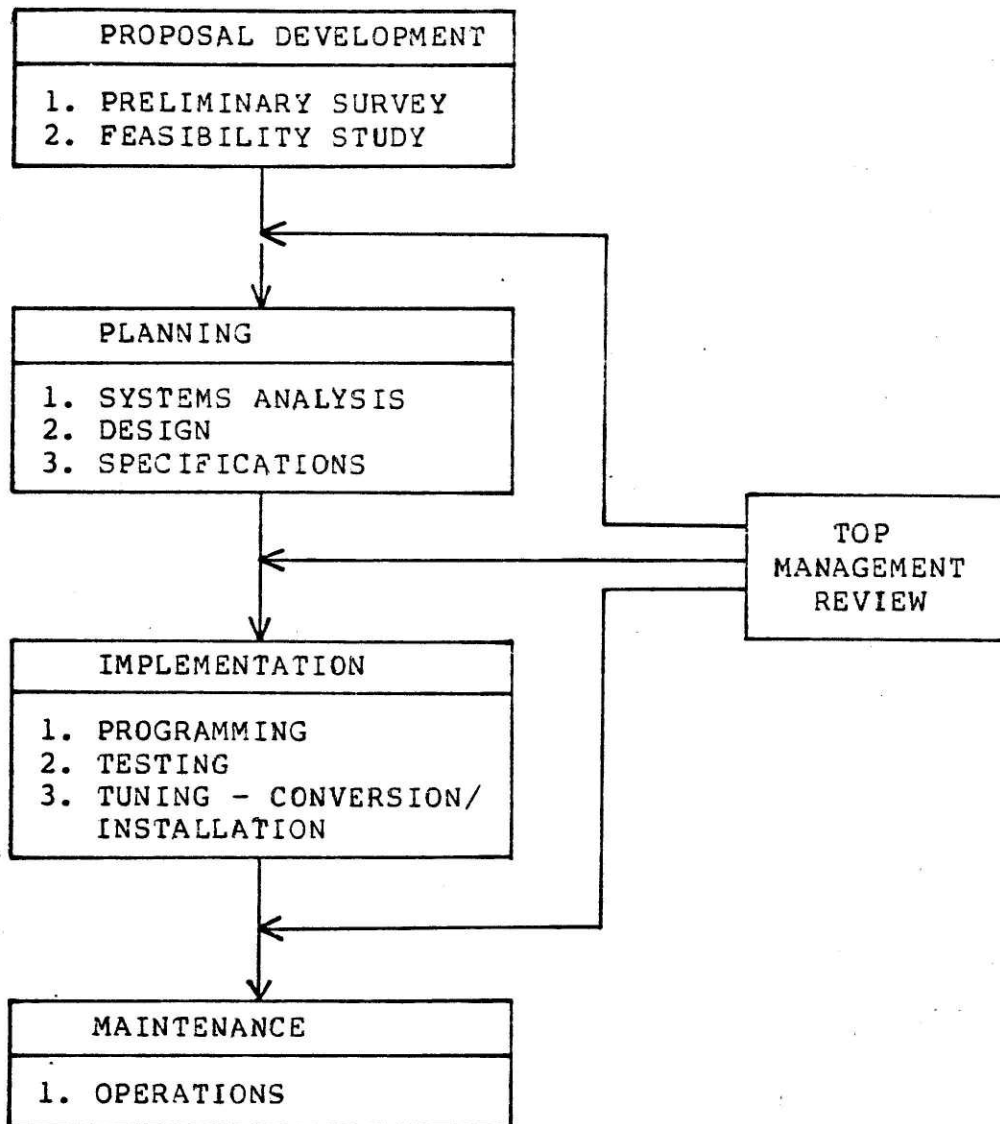
Figure 3.1: Systems Development Process

return. Hence these books confine themselves to emphasizing the importance of estimating the costs and benefits, in order to calculate payback, return on investment or discounted cash-flow. There are several reasons why we think this approach is insufficient.

First of all, they do not tell us how to estimate the costs or benefits. Secondly, we cannot and should not rate all projects on just the single dimension of return on investment (with token attention given to other factors). This is especially true of management support systems, where the benefits are often less directly quantifiable. Finally, experience has demonstrated that rates of return estimates used in proposals are often inaccurate. Hence they should be used with caution -- only as a guideline to indicate which projects would be clearly unacceptable. They cannot be used to distinguish between projects whose rates of return differ by less than the margin of uncertainty of the estimates (which is by no means insignificant).

Most of the current literature in the field assume or suggest that once a proposal has been submitted, the DP department bears the responsibility of forming a project team to conduct feasibility studies for the proposed project. Although these same books suggest that the project team should have representatives from both the DP and the user departments, we do not think that DP should bear the

responsibility of initiating the feasibility analysis. The burden of proof should be on the user department who, with the help of DP, has to perform the pre-proposal evaluation. DP would then have to check the estimates to ensure that these figures are reasonable. Proposal development is an iterative process, but at the end of the line there should be a definite check-point where the proposal is submitted, and the project is approved or rejected based on these estimates. It seems almost obvious that since systems development is expensive, an accurate and comprehensive proposal would be a wise investment indeed.

It is our contention that there is a very real need for a formal and systematic project selection procedure. We need a procedure that will evaluate proposals not only on the basis of hard benefits versus economic costs, but also take into account the presence of good qualitative benefits. Such a procedure would force user departments to include thorough analyses of both the quantitative and the qualitative benefits in their proposals before their requests could be approved. Prior to discussing such a procedure, we first need to improve our understanding of the role of the qualitative criteria relative to their quantitative counterparts.

4. ANALYSIS I

Before we can actually perform complex analyses, it is crucial that we develop a rough picture of how the results look at the macro level. We need to look at the aggregated average values for the broad categories of questions. This top-down approach enables us to proceed progressively into greater detail once we have a fair estimate of the respective roles of the issues concerned. As we proceed, we will eventually examine the data by criteria categories, by departments, by companies, etc.

The areas covered by the questions can be roughly divided into three sections: a) the project proposal requirements, b) the project approval process, and c) user and DP influence in the actual approval process. We will treat each of these sections separately.

4.1 The Proposal

The questions for this section attempted to assess the relative importance of certain technical, economic, and organizational criteria in the proposal. Respondents were asked to rate each factor on a scale of 1 to 7 according to the following explanation:

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not                                              mandatory
necessary        desirable         required       in detail

     1       2       3       4       5       6       7
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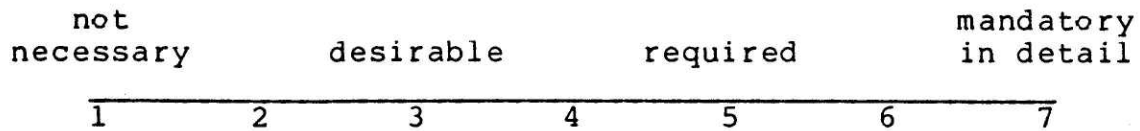
The overall summary level averages are shown in Figure 4.1A.

Figure 4.1A: Proposal Summary Level Averages

Criteria	DP	Finance	Manuf.	User	All
Technical	4.750	4.546	4.575	4.561	4.624
Economic	4.768	4.845	5.042	4.944	4.885
Organiz.	4.014	4.498	4.524	4.512	4.345
All	4.511	4.630	4.714	4.672	4.618

As shown, the overall average for all factors considered is 4.6, which is just short of "required", or 5 on our scale.

Roughly speaking for all departments combined, economic criteria are required, while the organizational considerations are generally desirable but not required (Figure 4.1B). Further inspection will indicate the following points:-

(1) For all departments, economic feasibility is rated as most important, with technical feasibility as the second most important, and organizational feasibility as least important (Figure 4.1B). There are differences in the
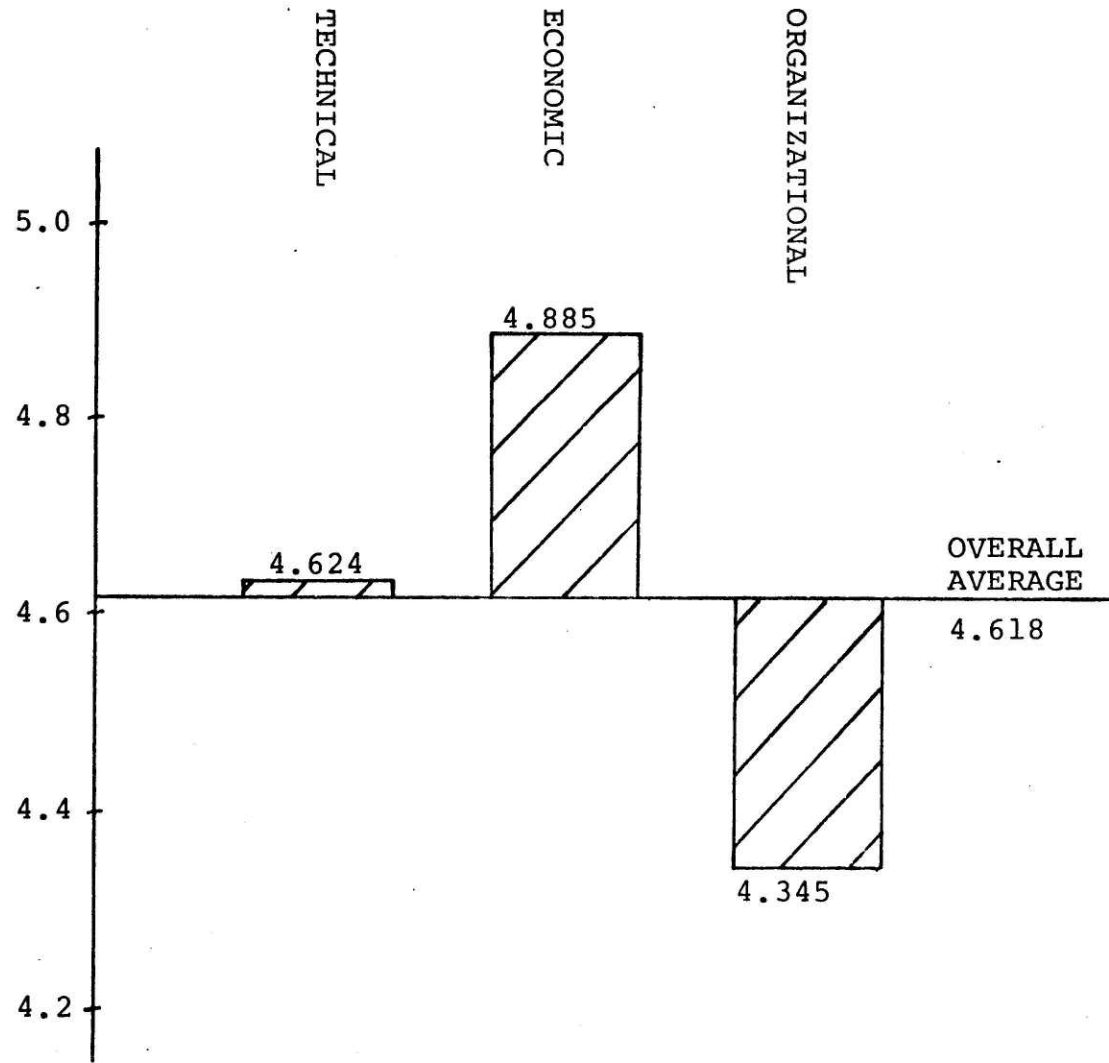
Figure 4.1B: Ratings of Proposal Criteria

importance of these factors by department, but the relative priorities are the same for all departments (Figure 4.1A).

(2) For all 15 criteria considered (Figure 4.1A), Manufacturing has the highest mean value, followed by DP and then Finance. When we consider the criteria by category, Manufacturing is the highest for both organizational and economic feasibility. This is quite unexpected since it is widely thought that Manufacturing, being newer than Finance where computerization is concerned, would be more likely to emphasize economic criteria and pay less attention to organizational criteria. Generally, new users tend to emphasize economic criteria almost exclusively. They skim for the easiest and economically most feasible projects. It is only after they have learned through adverse experiences about problems with such an approach that they start to consider other relevant factors, such as organizational issues. Therefore, these data suggest that Manufacturing has learnt its lesson, and is in fact more cautious than Finance.

(3) Looking at the DP department, the priorities are the same as for the other departments:

Economic>Technical>Organizational.

However, it is noticeable that DP's rating of the importance of organizational feasibility is significantly lower than the rating of the other departments. It is also worthwhile to note that DP's technical feasibility rating is significantly

higher than those of the other two departments.

The generally held notion that DP tends to pay more attention to technical considerations holds (but to a smaller extent than most people probably expected). Similarly, amongst the three departments, DP pays the least attention to organizational issues.

In some cases overall averages hide differences that appear upon closer inspection. For example, the closeness in overall ratings by the DP and Finance departments hide the fact that DP's higher rating for technical criteria is compensated by its lower rating for organizational feasibility. We have to exercise caution in making conclusions based on aggregated data.

More detailed inspection of the proposal criteria (Figures 4.2A and 4.2B) reveals the following additional observations:-

(1) For technical feasibility, DP is either highest or lowest in its rating. It is highest with software do-able and "DP staffing", both of which seem to reflect its concern over the DP personnel. It is also interesting to note that although it is highest in 2 factors and lowest in 3 factors, its overall average is highest amongst the departments, indicating that its assessment for the 2 factors is significantly higher than the corresponding assessments of Finance/Manufacturing. DP's rating of the importance of

Figure 4.2A: Averages of Proposal Criteria

	Variable	DP	Finance	Manuf.	User	All
A	PTECHDOBL	5.049	5.071	5.218	5.145	5.112
B	PSOFTDOBL	4.496	3.986	3.924	3.955	4.135
C	PDPSTAFF	4.989	4.589	4.368	4.478	4.649
D	POPHWIPCT	4.465	4.538	4.790	4.664	4.598
E	PPROJDSN	4.328	4.658	4.812	4.736	4.600
F	PDPDEVCO	5.049	5.046	5.243	5.145	5.113
G	PUSDEVCO	4.611	4.771	5.052	4.912	4.812
H	PDPOPCO	4.750	4.828	4.930	4.879	4.836
I	PUSOPCO	4.492	4.780	4.987	4.884	4.753
J	PHARDBEN	5.371	5.195	5.409	5.302	5.325
K	PSOFTBEN	4.333	4.452	4.632	4.542	4.472
L	PIMPCTUS	4.702	5.154	5.239	5.197	5.032
M	PCLRNRCH	2.999	3.723	3.656	3.690	3.459
N	PORGCHPLN	3.674	4.119	4.091	4.105	3.961
O	PIMPLPLN	4.367	4.837	4.823	4.830	4.675

Figure 4.2B Variable Names for Proposal Requirements

	Variable Name	Issue
A	PTECHDOBL	technically do-able
B	PSOFTDOBL	software do-able
C	PDPSTAFF	DP staffing
D	POPHWIPCT	oprations and hardware impacts
E	PPROJDSN	project design
F	PDPDEVCO	DP development costs
G	PUSDEVCO	user devlopment costs
H	PDPOPCO	DP operating costs
I	PUSOPCO	user operating costs
J	PHARDBEN	"hard" benefits
K	PSOFTBEN	"soft" benefits
L	PIMPCTUS	impact on users
M	PCLRNRCH	clerical job enrichment
N	PORGCHPLN	organizational change planning
O	PIMPLPLN	implementation planning

project design (4.328) is significantly lower than the
average rating for all departments (4.600). The fact that
the Finance department holds the middle ranking for all
technical criteria seem to indicate that there is
considerable discrepancy between the perceptions of DP and

Manufacturing regarding the importance of technical issues. Traditionally, the Finance department has been making use of the services of the DP department for a longer period. Hence they better understand the operations of the DP department.

(2) Manufacturing considered all economic factors more important than did DP and Finance! Of the three departments, DP was second in its rating of the importance of "DP development costs" and "hard benefits", and lowest in its rating of other economic criteria.

(3) Among the departments, organizational feasibility is treated most lightly by DP. In fact, for all 4 organizational criteria, DP is the department which considers them least necessary. On the other hand, the Finance division provided the highest rating for three out of the four criteria.

(4) Figures 4.3 and 4.4 indicate that the rankings by Finance and Manufacturing are quite similar while those of DP are more considerably different. The correlation statistics and significance levels for the three departments are:-

Departments	Spearman Correlation	Significance level
Finance - Manufacturing	0.943	0.0001
DP - Finance	0.731	0.0020
DP - Manufacturing	0.722	0.0024

The high correlation between the Finance and Manufacturing

Figure 4.3   Ranking of Proposal Criteria

| Criteria	DP	Finance	Manuf.	User
PTECHDOBL	13.5	13	12	12.5
PSOFTDOBL	8	2	2	2
PDPSTAFF	12	6	4	4
POPHWIPCT	6	5	6	6
PPROJDSN	3	7	7	7
PDPDEVCO	13.5	12	14	12.5
PUSDEVCO	9	8	11	11
PDPOPCO	11	10	9	9
PUSOPCO	7	9	10	10
PHARDBEN	15	15	15	15
PSOFTBEN	4	4	5	5
PIMPCTUS	10	14	13	14
PCLRNRCH	1	1	1	1
PORGCHPLN	2	3	3	3
PIMPLPLN	5	11	8	8

*Note: Larger number implies more important
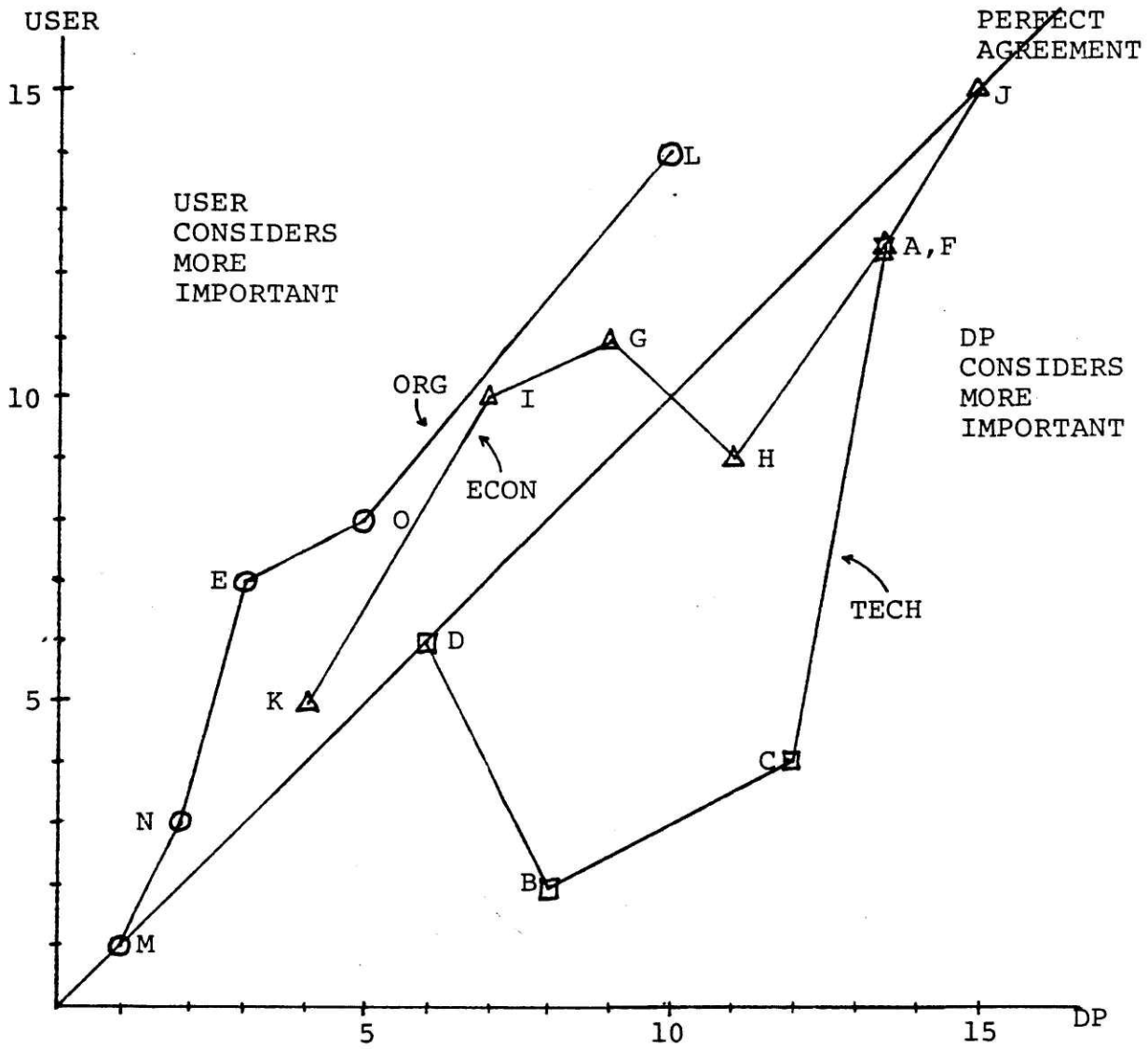
Figure 4.4: Rank Ordering of Proposal Criteria

divisions indicate that they agree almost perfectly on the relative importance of the various criteria of the proposal. The high degree of agreement between the two user departments allows us to group them together in our analysis. Also, the DP-Finance corelation is slightly higher than the DP-Manufacturing statistic. Although the difference is not large enough for us to make conclusive judgements, we have already mentioned that this difference is not unexpected. Other evidence to be presented later in this paper will confirm this observation.

4.2 Approval Criteria

In this section we ask questions regarding the various criteria used in the project approval process. The responses are ranked on the following scale:

of no importance	some importance	very important	the sole determining factor
1 2	3 4	5 6	7

The approval criteria are more difficult to categorize since they do not fall quite as neatly into our previous categories. We have, as an approximation, grouped the criteria into the

following categories:-

Technical   impact on DP resources, DP portfolio balance,
                 fit   with   DP   development   plan,
                 interest/challenge to DP staff.

Economic   return on investment, overall risk of failure,
                 qualitative or   soft   benefits,   users'
                 efficiency increase, users' effectiveness
                 increase.

Emphasis   top management emphasis, urgency of user need.

Organizational   company politics, uncertainty of objectives,
                 degree of user commitment, degree of impact on
                 users, adaptability of organization   to
                 environmental changes.

The ranking for the various criteria are displayed in Figures
4.5A, 4.5B, and 4.6. In Chapter 5 we will see that the
technical factors are evaluated first. Then depending on the
proposal format, the project is assessed on the basis of its
economic feasibility or top management emphasis. In either
case, organizational factors do not play any crucial roles.

        Within this framework, it is worthwhile to note the
following:

        (1) The overall average for all departments and criteria
is 4.256, important but not "very important". By department,
Manufacturing's 4.324 is the highest while DP's 4.191 is the
lowest.

        (2) The criteria rated higher by DP than Finance and

Figure 4.5A: <u>Averages of Approval Criteria</u>

	Variable	DP	Finance	Manuf.	User	All
A	AROI	5.033	4.830	5.023	4.927	4.962
B	ARISKFAIL	4.004	4.101	4.123	4.112	4.076
C	ACOPOLT	3.893	3.372	3.195	3.284	3.487
D	AIMPCTRES	4.194	4.384	4.254	4.319	4.277
E	ADPORTBAL	3.051	3.451	3.380	3.416	3.294
F	AUNCEROBJ	4.528	4.188	4.647	4.418	4.454
G	AQLSOFBEN	3.781	4.001	3.899	3.950	3.890
H	AMGTEMPH	5.091	5.179	5.017	5.098	5.095
I	AURGUSND	5.008	4.975	4.927	4.951	4.970
J	ADPDEVPLN	3.584	3.776	3.881	3.829	3.747
K	AUSCOMM	4.685	4.787	4.858	4.823	4.776
L	AINTCHLDP	2.615	2.736	2.999	2.868	2.784
M	AIMPCTUS	4.417	4.655	4.870	4.763	4.647
N	AUSEFFCY	4.641	4.937	5.125	5.031	4.901
O	AUSEFFCT	4.746	4.967	5.146	5.057	4.953
P	AORGENVCH	3.788	3.724	3.845	3.785	3.786
	QBENF	3.137	3.032	2.824	2.928	2.998

Figure 4.5B: Variable Names for Approval Criteria

	Variable Name	Issue
A	AROI	return on investment (cost/benefit)
B	ARISKFAIL	overall risk of failure
C	ACOPOLT	company politics
D	AIMPCTRES	impact on DP resources
E	ADPORTBAL	DP portfolio balance
F	AUNCEROBJ	uncertainty of objectives
G	AQLSOFBEN	qualitative or soft benefits
H	AMGTEMPH	top management emphasis
I	AURGUSND	urgency of user need
J	ADPDEVPLN	fit with DP development plan
K	AUSCOMM	degree of user commitment
L	AINTCHLDP	interest/challenge to DP staff
M	AIMPCTUS	degree of impact on users
N	AUSEFFCY	users' efficiency increase
O	AUSEFFCT	users' effectiveness increase
P	AORGENVCH	adaptability of organization to environmental changes

Figure 4.6 – Ranking of Approval Criteria by Department

Criterion	DP	Finance	Manuf.	User
AIMPCTRES	8	9	8	8
ADPPORTBAL	2	3	3	3
ADPDEVPLN	3	5	5	5
AINTCHLDP	1	1	1	1
AROI	15	12	13	12
ARISKFAIL	7	7	7	7
AQLSOFBEN	4	6	6	6
AUSEFFCY	11	13	15	14
AUSEFFCT	13	14	16	15
ACOPOLT	6	2	2	2
AUNCEROBJ	10	8	9	9
AMGTEMPH	16	16	14	16
AURGUSND	14	15	12	13
AUSCOMM	12	11	10	11
AIMPCTUS	9	10	11	10
AORGENVCH	5	4	4	4

Manufacturing are:

- return on investment

- company politics

- urgency of user need

The criteria rated lower by DP than Finance and Manufacturing are:

- risk of failure

- impact on DP resources

- DP porfolio balance

- qualitative or soft benefits

- fit with DP development plan

- degree of user commitment

- interest/challenge to DP staff.

These suggest that the DP department views project approval as more of an open-shut case than do users. They believe that projects are approved either because of its hard benefits -- return on investment -- or because of top management support -- company politics and urgency of user need (Figure 4.7).

(3) The biggest difference in DP versus users rating is over the role of "company politics". DP considers (bad) politics to be more important than do Finance and Manufacturing. As we shall see later, this might be due to the fact that DP managers and vice-presidents are often under pressure from user vice-presidents to approve certain
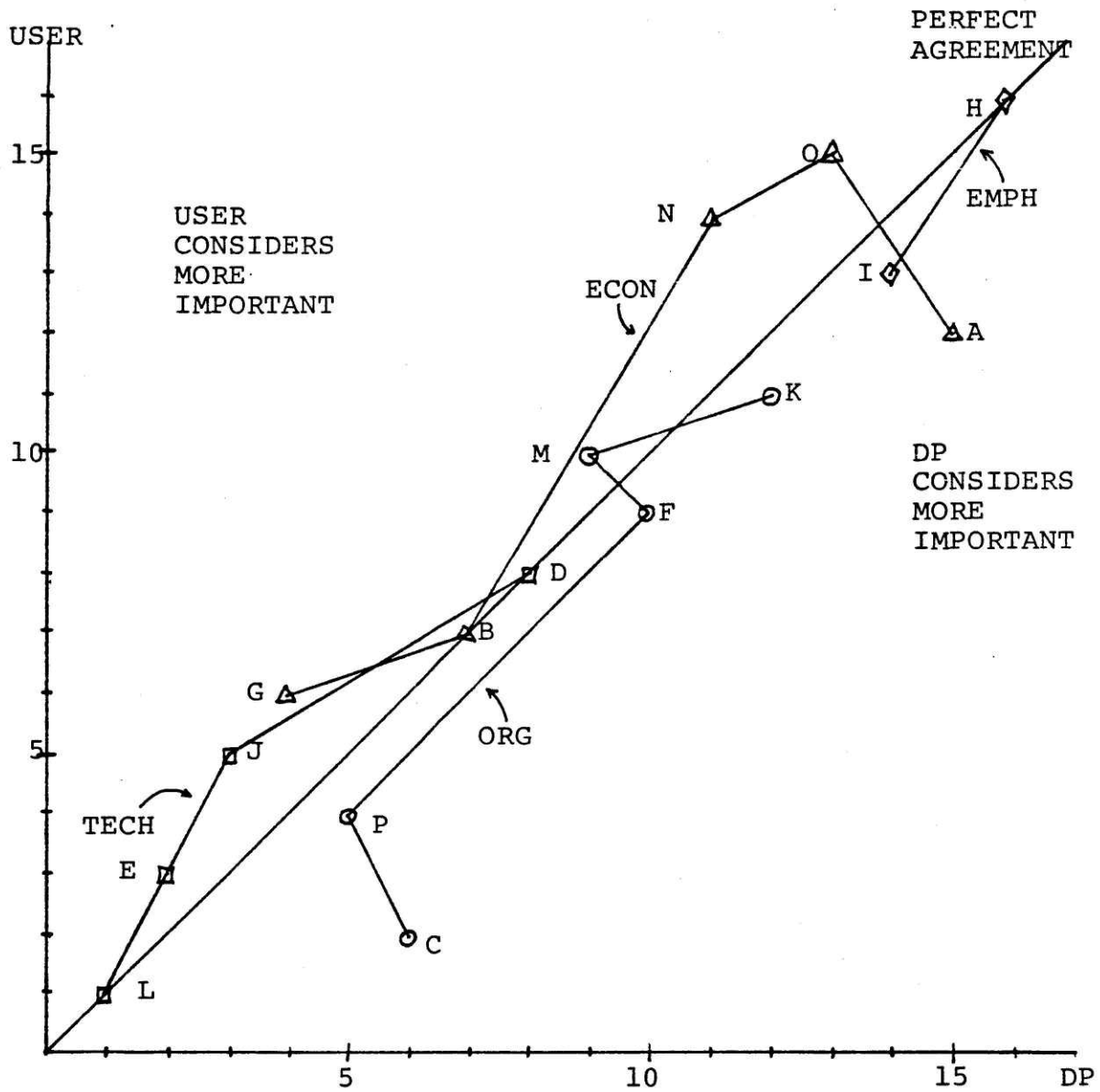
Figure 4.7: Rank Ordering of Approval Criteria

projects.

(4) Manufacturing rates organizational criteria highest of the three departments. It is interesting to note that although Finance rated organizational feasibility requirements most highly in proposals, Manufacturing rated these organizational features most highly in the approval criteria.

(5) Looking at QBENF, we noted that DP seems to think that it is easier to pass proposals through on the basis of good qualitative benefits than do Finance and Manufacturing.

(6) It is encouraging that all departments rank DP challenge as lowest, in fact DP rated it lowest compared to Finace/Manufacturing. This is contrary to the popular belief that DP divisions select their projects primarily for technical challenge.

The correlation statistics for this section of the questionnaire are very similar to those of the proposal section. The extent to which the criteria are correlated among the various departments are:-

Departments	Spearman Correlation	Significance Level
Finance - Manufacturing	0.962	0.0001
DP - Finance	0.929	0.0001
DP - Manufacturing	0.894	0.0001

Again the same pattern is clearly visible. The agreement is best between Finance and Manufacturing, and Finance undestands DP better than does Manufacturing.

4.3 Personnel Influence

Section 4.3 deals with estimating the amount of influence the various members of the approval committee have on the actual approval decision. The scale used is :-

no influence	some influence	a lot of influence	the sole decision maker
1 2	3 4	5 6	7

The set of questions in this category naturally divide themselves into three groups - the DP personnel, user personnel, corporate committee. On the average, users seem to have more say in the project approval process (4.272 vs 4.188), but the difference is quite small. It is also noticeable that amongst the departments, DP gave the lowest ranking to its influence, but the highest ranking for users. The relative rankings are displayed in Figures 4.8A to 4.10.

There is unanimous consensus that the user vice-president has the most say (Figures 4.9 and 4.10), but DP thinks user managers get the next biggest say, while Finance and Manufacturing think that the DP vice-president

does.

The most influential person, user vice-president, is rated significantly higher than the next person or group (DP vice-president for overall, user manager for DP, steering committee for Finance, budget committee for Manufacturing). He is the only person who is unanimously considered to have a lot of influence. A question that comes from this is: given that requests come from many departments, how is priority among these projects decided amongst the various user vice-presidents?

Users from both the Finance and Manufacturing departments agree that the secondary user has virtually no say in the approval process. This is quite unfortunate. By requiring the strong support of a primary user, we are making it very difficult to approve a system that is not urgently needed by one specific user, but is useful to many users.

The correlation statistics by department are as follows:-

Departments	Spearman Correlation	Significance Level
Finance - Manufacturing	0.667	0.0710
DP - Finance	0.881	0.0039
DP - Manufacturing	0.690	0.0580

Figure 4.8A: Averages for Influence

	People	DP	Finance	Manuf.	User	All
A	IDPSTEER	4.427	4.626	4.306	4.466	4.453
B	IDPVP	4.606	4.517	4.498	4.508	4.540
C	IDPMSD	4.348	4.180	4.393	4.287	4.307
D	IDPPROG	3.271	3.414	3.674	3.544	3.453
E	ICORPBUDG	4.063	4.255	4.718	4.487	4.345
F	IPRIUSVP	4.922	4.914	5.012	4.963	4.949
G	IPRIUSMGR	4.612	4.298	4.451	4.375	4.454
H	ISECUSMGR	3.427	3.325	3.487	3.406	3.413

Figure 4.8B Variable Names for Selection Committee Members

	Variable Name	Person/People
A	IDPSTEER	DP Steering Committee
B	IDPVP	DP Vice-President
C	IDPMSD	Systems Development Manager
D	IDPPROG	Programming Manager
E	ICORPBUDG	corporate budget committee
F	IPRIUSVP	primary users vice-president
G	IPRIUSMGR	primary user manager
H	ISECUSER	secondary user manager

Figure 4.9: Ranking of Approval Participants

People	DP	Finance	Manuf.	User
IDPVP	6	6	6	7
IDPMSD	4	3	4	3
IDPPROG	1	1	2	2
IDPSTEER	5	7	3	5
ICORPBUDG	3	4	7	6
IPRIUSVP	8	8	8	8
IPRIUSMGR	7	5	5	4
ISECUSER	2	2	1	1

While Finance's better agreement with DP is to be expected, the lack of concurrence between the two user departments is quite surprising. The higher significance levels is because there are fewer variables in this part of the questionnaire than there were in the previous sections.
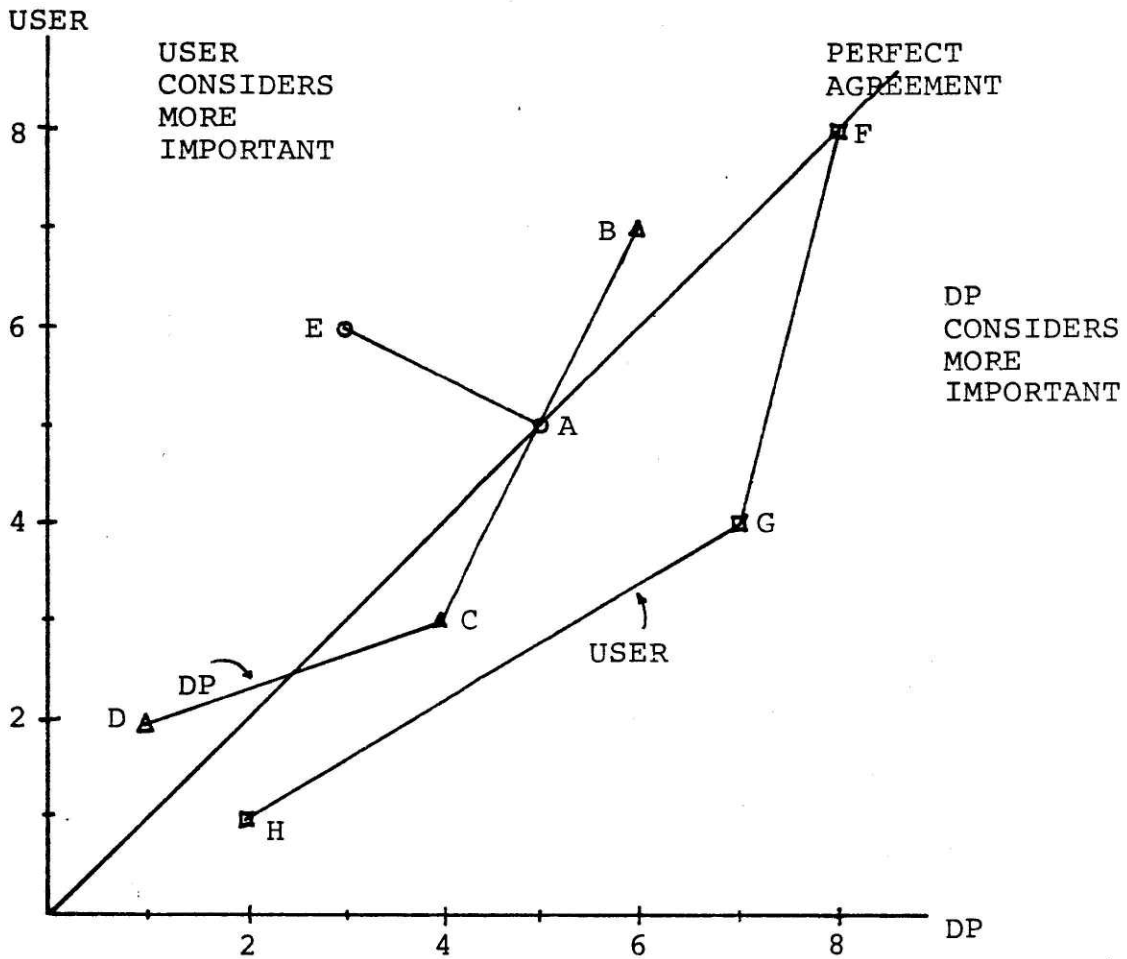
Figure 4.10: Rank Ordering of Participants

5. TRENDS IN THE DEMAND FOR NEW SYSTEMS

We have talked at length about the data that we have collected. In Chapter 6 we will show that these same data indicate that the current project approval process is biased against management support systems. The reader is likely to ask: "What is the big deal about such management support systems? Is there really such a trend towards request for MSS's? After all, most of the current computer applications in industries involve transaction processing systems." Do we have any proof that there is such an increase in the demand for MSS's? The answer is yes. Most of what follows is based on research done by R. Alloway (Alloway, 1980).

In order to show that there is a real and justified trend in the users' demand for new systems we need to prove two claims: (1) that management support systems are indeed appropriate as tools for managerial decision making, and (2) that there is a real increase in the demand for management support systems, relative to the overall changes in demand for new systems.

Figure 5.1 provides a break down by system type of the total installed base, of the numbers used by managers, and of implemented systems that the managers found appropriate for their most important tasks. The percentage distribution of systems used by managers roughly correspond to the percentage

Figure 5.1: Distribution of Application Systems by Type

	Monitor	Exception	Inquiry	Analysis	Total
Total	1995	537	375	286	3193
Installed	(63)	(16)	(12)	(9)	(100)
Manager	908	193	158	144	1403
Used	(65)	(14)	(11)	(10)	(100)
Appropriate,	324	77	73	119	593
Important	(55)	(13)	(12)	(20)	(100)
Percent of					
Mngr Used	36	40	.46	83	42

distribution of the installed base. This is quite
interesting because one would have expected a bigger
percentage of inquiry and analysis systems to be used by
managers. Yet, it is also encouraging to note that managers
are not forcing themselves to use systems which are not
appropriate for them. More important is the distribution for
the systems which users find are appropriate to helping them
in their most important functions. When we compare these
numbers against the numbers of each type used by managers,
the result is very encouraging. Of the 144 analysis systems
that managers use, 119 (or 83%) are appropriate to their most
important tasks. At the other end of the scale, 324 of the
908 monitor systems are appropriate for these user managers'
important tasks. The difference is quite obvious from the
numbers shown in Figure 5.1. Inquiry and analysis systems

are considered by users to be more appropriate for their managerial needs.

We have established that management support systems are more appropriate as managerial tools. The other factor we need to prove is that they are in fact demanded in larger quantities now than was the case previously. In order to do that we have to look at the break-down for new systems demand in our sample companies. Currently, 323 new transaction processing systems are being developed, as opposed to 234 for management support systems (Figure 5.2). As far as total demand for new systems go, however, the figures are the extreme opposite. The demand (backlog and invisible) for transaction processsing sytems is 648 compared to 1660 for MSS's. The difference in growth rates between monitor systems (193%) and analysis systems (1039%) clearly establish the need for a new approval process that has the flexibility to take into account the relative magnitudes of the demand. The invisible backlog (desired systems not yet requested of DP) for MSS's could be because the current approval criteria are biased against them and hence managers do not bother to formally request them unless they have the necessary top management support to 'override' the approval process requirements.

We have seen that there is a very real and justified increase in the demand for MSS's. Traditionally, the

Figure 5.2: New Systems Demand by Type

	Monitor	Exception	Inquiry	Analysis	Total	% Total
Being Dev.	199	124	158	76	557	100
Backlog	98	40	155	143	436	78
Invisible	287	224	715	647	1872	336
Demand	385	263	870	790	2308	414
% Growth	193	212	453	1039	414	

approval process has been biased against these systems because they lack the hard benefits that are required for approval. Unless this is changed, the invisible demand for such systems will countinue to pile up and managers will be frustrated because their needs are not fulfilled.

6. ANALYSIS II

Having examined the relative distributions of the data, the next step is for us to attempt to formulate a model that is consistent with the results of our analysis. Figures 6.1 to 6.3 show the relative rankings of the proposal, approval and influence criteria. Given the number of criteria involved, our data also indicated that only the top few would play the dominant roles. The rest would be considered only if all others were equal.

Taking into account the differences in the relative importance of the factors in the proposal requirements, the approval criteria and the different roles of managers or vice-presidents, we have selected some of the criteria, and used them for further analysis. The groupings are displayed in Figure 6.4.

For the proposal requirements, "hard benefits" is taken alone, "technical do-able" and "DP staffing" are grouped together and termed as the technical feasibility factor, the development and operating costs for DP and users are averaged to form the cost factors. "Impact on users" is also taken alone. As we can see, the most important real organizational factor - implementation planning - is not rated very highly. The "impact on users" factor deals more with the issue of importance to users than with any organizational effects.

Figure 6.1: Proposal Criteria

	DP		USER
15	Hard Benefits	15	Hard Benefits
14	Tech Do-able	14	Impact on Users
14	DP Development costs	13	Tech Do-able
12	DP Staffing	13	DP Development Costs
11	DP Operating Costs	11	User Development Costs
10	Impact on Users	10	User Operating Costs
9	User Development Costs	9	DP Operating Costs
8	Software Do-able	8	Implementation Planning
7	User Operating Costs	7	Project Design
6	Op'ns and H'ware Impacts	6	Op'ns and H'ware Impacts
5	Implementation Planning	5	Soft Benefits
4	Soft Benefits	4	DP Staffing
3	Project Design	3	Org. Change Planning
2	Org. Change Planning	2	Software Do-able
1	Clerical Job Enrichment	1	Clerical Job Enrichment

Figure 6.2: Approval Criteria

	DP		USER
16	Top Management Emphasis	16	Top Management Emphasis
15	Return on Investment	15	User Effectiveness Incr.
14	Urgency of User Need	14	User Efficiency Increase
13	User Effectiveness Increase	13	Urgency of User Need
12	Degree of User Commitment	12	Return on Investment
11	User Efficiency Increase	11	Degree of User Commitment
1Ø	Uncertainty of Objectives	1Ø	Degree of Impact on Users
9	Degree of Impact on Users	9	Uncertainty of Objectives
8	Impact on DP Resources	8	Impact on DP Resources
7	Overall Risk of Failure	7	Overall Risk of Failure
6	Company Politics	6	Qual. or Soft Benefits
5	Adaptability of Org. to Environmental Changes	5	Fit with DP Develop. Plan
4	Qual. or Soft Benefits	4	Adaptability of Org. to Environmental Changes
3	Fit with DP Development Plan	3	DP Portfolio Balance
2	DP Portfolio Balance	2	Company Politics
1	Int./Chal. to DP Staff	1	Int./Chal. to DP Staff

Figure 6.3: Personnel Influence

DP	USER
8 Primary User VP	8 Primary User VP
7 Primary User Manager	7 DP VP
6 DP VP	6 Corporate Budget Committee
5 DP Steering Committee	5 DP Steering Committee
4 Systems Development Manager	4 Primary User Manager
3 Corporate Budget Committee	3 Systems Development Manager
2 Secondary User Manager	2 Programming Manager
1 Programming Manager	1 Secondary User Manager

Similarly, for the approval criteria, "top management emphasis" and "return on investment" are treated separately. "Top management emphasis" relates to the "impact on users" criterion in the proposal. "Users' effectiveness increase" and "users' efficiency increase" are grouped together to indicate the effect of the proposed system. Finally, "urgency of user need" and "degree of user commitment" are taken together as the importance factor.

The influence ratings are interesting because they indicate that secondary users have almost no say in the matter. The deal is mainly between the user vice-president and the DP vice-president for less structured systems. For more structured systems, the user manager, manager of systems

Figure 6.4: List of Selected Important Variables

Factor	Variables

Proposal

1	Hard Benefits	Hard Benefits
2	Tech Feas.	Tech Do-able
		DP Staffing
3	Cost	DP Development Costs
		DP Operating Costs
		User Development Costs
		User Operating Costs
4	Importance	Impact On Users

Approval

1	Importance	Top Management Emphasis
2	Effect	User Effectiveness Increase
		User Efficiency Increase
3	Hard Benefits	Return on Investment
4	Urgency	Urgency of User Need
		Degree of User Commitment

Influence

1	DP	DP VP
		DP Systems Development Manager
2	User Mgt.	Primary User VP
		Primary User Manager
3		DP Steering Committee
4		Corporate Budget Committee

development, DP steering committee, and corporate budget committee have some influence. We will explain these differences in greater detail later, after we have developed our model. To take into account the different roles played by the managers or vice-presidents, the user vice-president and manager are grouped together; the DP vice-president and systems development manager represent the data processing department in the approval process, while the DP steering committee and the DP budget committee are treated separately.

6.1 Current Scenario

The following is a description of the approval process. The proposal is used to judge the proposed project along four dimensions (Figure 6.5) -- technical feasibility, hard benefits, cost and importance/urgency.

First, as a minimum requirement the proposal determines if the project is technically feasible. Then, assuming the project is technically feasible, the proposal is used to decide if the project would be likely to pass a hard benefits ROI selection criteria. Based on the first two results of the proposal, a project is either rejected, submitted for approval based on hard benefits, or put aside for informal approval bargaining between the user vice-president and the approval committee. The full table of the possible

```
                              ┌──────────────────────────┐
                              │ USER VP      DP VP        │
                              │      USER MGR             │
                              └──────────────┬───────────┘
                                             │
                                             ▼
                              ┌──────────────────────────┐
                              │        CRITERIA          │
                              ├──────────────────────────┤
                              │ 1. URGENCY OF NEED       │
              OVERRIDE ──────▶│ 2. USER COMMITMENT       │
                              │ 3. TOP MGT EMPHASIS      │
                              └──────────────────────────┘

┌──────────────────────────┐                              ┌──────────────────┐
│        PROPOSAL          │                              │ UNPRIORITIZED    │
├──────────────────────────┤                              │ BACKLOG          │
│ 1. HARD BENEFITS         │      ┌──────────────────────────┐ └──────────────────┘
│ 2. IMPACT ON USERS       │      │        CRITERIA          │
│ 3. FEASIBILITY - TECH    │ REGULAR ├──────────────────────────┤
│ 4. FEASIBILITY - COST    │──────▶│ 1. ROI                   │
└──────────────────────────┘      │ 2. EFFECTIVENESS         │
                                   │ 3. EFFICIENCY            │
                                   │ 4. URGENCY               │
                                   └──────────────────────────┘
                                             ▲
                                   ┌──────────────────────────┐
                                   │ APPROVAL                 │
                                   │ COMMITTEE                │
                                   └──────────────────────────┘

                          ┌──────────────────────────┐
                REJECT    │ NOT FEASIBLE/            │
                          │ COSTS TOO MUCH          │
                          └──────────────────────────┘
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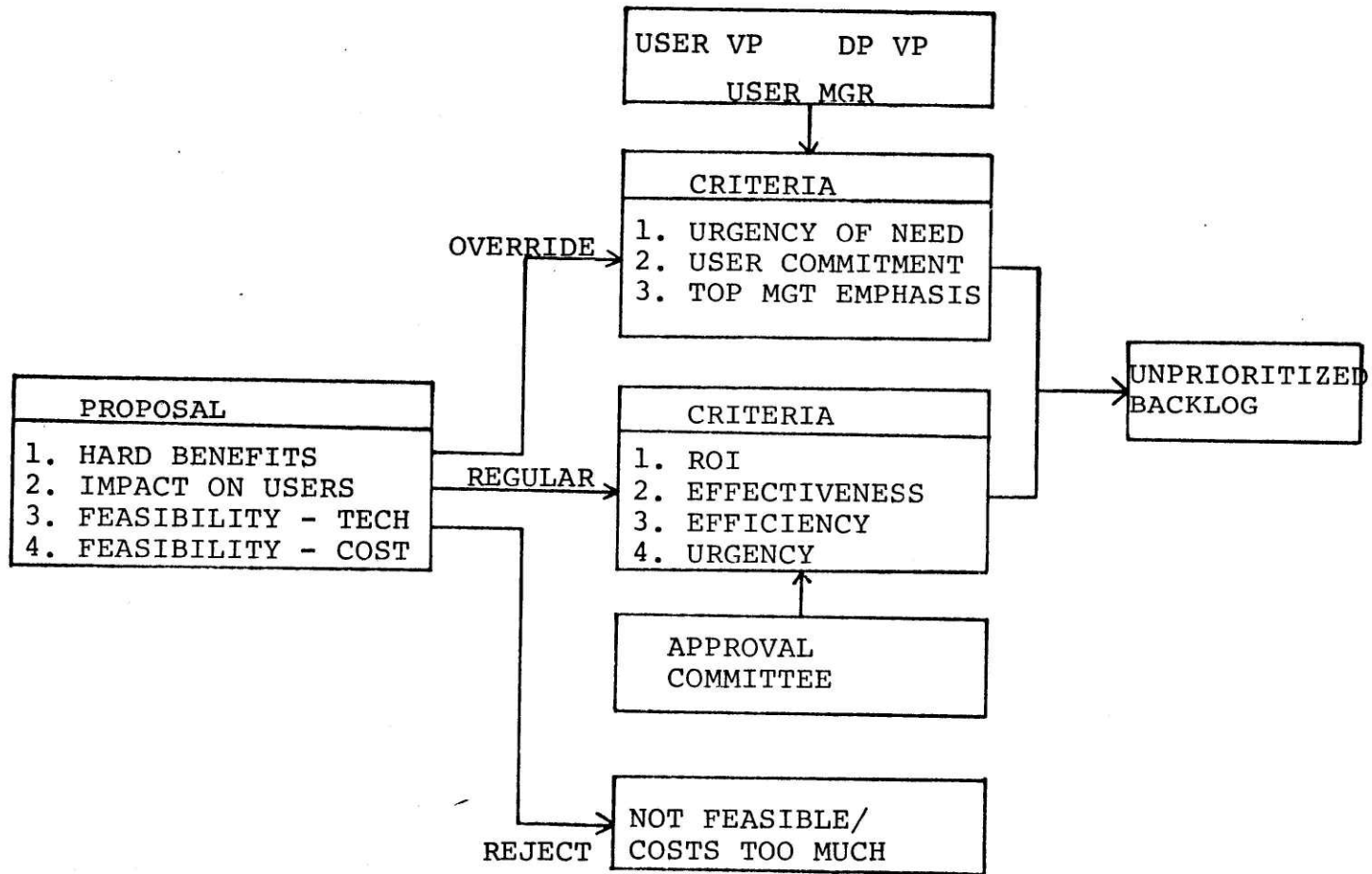
Figure 6.5: Present Approval Process

Figure 6.6: Pre-Selection Alternatives

Alternatives

	A	B	C	D
Hard Benefits		✓	✗	✗
Tech Feasibility	✗	✓	✓	✓
Cost				
Importance			✓	✗
Organiz.				
	Reject	Normal	Override	Reject

alternatives is shown in Figure 6.6. If a project is technically not feasible then it is rejected at this stage. If a project is listed to have hard benefits, it is put on one side to be submitted for the approval procedure. If a project does not have sufficient hard benefits to get it approved, it is put on another pile for some form of approval bargaining (override mode) later. Such a project is not really considered by the approval committee. Finally, if a project has neither the hard benefits nor the backing of top management, it is rejected.

The normal mode is what is often considered the standard approval procedure. The criteria used in such a mode are

Figure 6.7: Approval Alternatives

Normal Mode Alternatives

	1A	1B	1C
Hard Benefits	✓	✓	✓
Tech Feasibility	✓	✓	✓
Cost	✓	✗	✗
Importance		✗	✓
	↓	↓	↓
	Yes	No	?

Override Mode Alternatives

	2A	2B	2C	2D	2E
Hard Benefits	✓	✗	✗	✗	✗
Tech Feasibility	✓	✓	✓	✓	✓
Cost	✗	✓	✗	✓	✗
Importance	✓	✓	✓	✓✓	✓✓
	↓	↓	↓	↓	↓
	?	?	No	Yes	?

primarily the economic costs and the hard benefits, with the other factors used as supporting reasons. This formal approval procedure involves the approval committee, which usually takes one of three forms: (a) DP Steering Committee, (b) Corporate Budget Committee, or (c) DP Executive Committee. It is in this case that the other material in the proposal is taken into consideration.

In the 'override' mode, the situation is quite different. The proposal document is not really used again because it does not contain information relevant to the 'override' decision. Besides, whatever hard benefits information is in the proposal implies that the project should be rejected. The user vice-president will then have to use his influence and convince the DP vice-president that although this particular project does not have sufficient hard benefits to be justified on the basis of return on investment, it is sufficiently important for the user department and/or corporation. He has to demonstrate that this project would provide significant qualitative benefits or opportunity cost reductions. The single most important factor, however, is still the influence of the vice-president who is supporting this proposal.

There are several problems with the 'override' mode. By doing informal bargaining and power playing, this process does not fully utilize the resources and experience available

in the DP department to help formally evaluate the qualitative benefits. In addition, the decision now depends on the relative power of the user vice-president rather than on a thorough analysis of the risks, the "soft" benefits, and the probable costs. The other members of the committee - the DP steering committee, the budget committee, DP systems development manager - play secondary roles. Consequently, approval or rejection is decided depending on the power wielded by the user vice-president, and there are no objective criteria used to compare the different projects that have to be considered in 'override' mode.

Once we are into one the alternative approval processes, there are other factors that are taken into account. Let us consider first the normal approval process. Given that a project is technicaly feasible, and has hard benefits, the possible combinations of the other factors are shown in Figure 6.7. Scenario 1A is the case where the project is strictly approved on the basis of ROI, and its cost and benefits satisfy or exceed the return on investment requirement for that firm. The project is routinely approved. Scenario 1B shows a project that is not viable on the basis of return on investment criteria alone, and it has no other redeeming qualities - such as importance to the user vice-president. Such projects are routinely rejected. Scenario 1C is quite interesting. This is a proposal that

could have been passed either through the normal procedure as is the case here, or through the 'override' mode. But because were are considering this proposal in 'normal' mode, Project 1C does not satisfy the return on investment requirements and is likely to be rejected. The final deciding factor would be the extent of top management emphasis. If this project is sufficiently important the particular user vice-president might pull this project out of the rejection bin and use the 'override' mode to fight for its cause.

The basis for judgement are quite different when we consider the approval process in the 'override' mode. Project 2D is the kind of project that is typically approved through this process. It does not have sufficient hard benefits to satisfy the ROI criterion, yet its costs are not too large, and given the large top management emphasis, it is approved. Project 2C, on the other hand, is the project that is typically rejected. It has small hard benefits, quite substantial costs, and has some amount of top management emphasis. Yet the emphasis is not sufficiently large as to offset its high costs and low known returns. The other scenarios - 2A, 2B, 2E - are less certain in their outcomes. Scenario 2A shows a project that is very similar to Project 1C. It has hard benefits, but it also has large operating/development costs which cannot be justified on the

basis of its returns alone. Whether it gets approved or not depends on the amount of user advocacy it gets. Project 2B conforms to the typical project mould for projects in this category. It has some, but not much, hard benefits, but it has low costs, hence it needs some amount of managerial support, and will be approved or rejected depending on the level of support received. Finally, in Project 2E we see an interesting case. It has quite significant development or operating costs, but little hard benefits. Yet there is much management support for this project (we have an influential vice-president defending it). This project is likely to be approved for no reason other than because its advocate has a very big say in the company. It should be mentioned here that projects evaluated in the 'override' mode are not necessarily without hard benefits. Rather, the hard benefits alone are insufficient to justify the costs for these projects. In the absence of any formal assessment of the qualitative benefits, management support then becomes the main deciding factor.

As we have already seen, the existence of two modes creates problems in terms of rank-ordering new projects or even in just comparing various projects. A considerable problem is the risk of approving a project that should have been rejected, and vice versa. Project 1E immediately comes to mind when we discuss projects that probably should have

been approved but might not have been. Although everything considered it might have been a worthwhile project, since it had somehow made its way to the normal process, the hard cost-benefits are taken very seriously and the other benefits are not sufficiently considered, and it could be rejected before the user manager or vice-president gets a chance to present his case. A similar problem could arise with project 2B. It might not be approved although it is a 'good' project qualitatively, simply because the user vice-president was not sufficiently influential to affect the decision of the DP vice-president.

Project 2E would be just the opposite case. It could be a totally worthless case, but because the user vice-president is the president's son, for instance, it is approved. The lesson, then, is that having two separate processes such as currently in existence in many DP departments increases the likelihood of erroneous new project approval decisions, because the qualitative soft-benefits are not considered. Instead, decisions are based on hard benefits or the influence of the user vice-president who is playing advocate for the project.

Given the differences in the approval procedures between the two modes, the normal approval process would tend to approve projects that have hard benefits, low costs, and are generally of the transaction processing types. 'Override'

mode approved projects are usually less well defined and have less hard benefits. Instead they are likely to be management support systems, whose benefits are more qualitative because they are aids to the managerial decision making process.

6.2 Correlation Statistics

We have proposed a model, our next task is to demonstrate that our data do indeed support our model. In previous sections we have shown the relative importance of the proposal requirements, the approval criteria, and the influence wielded by the different members of the approval committee. What needs to be done is for us to show how the data are actually correlated among the various factors.

The correlation statistics were obtained with the data aggregated into different groups. All comparisons were done by company. Analysis was performed for the DP group alone, for just the users, for DP and users averaged together by company, and for DP and users treated as separate observations. The final set, with DP and users treated as separate observations, is used because it provides us with sufficient detail in the differences between the averages for users and DP. This approach also provides us with 26 observations (2 X 13) instead of the 13 that the others offered. Each observation represented the average for DP, or

the mid-value of the averages for Finance and Manufacturing, by company.

A list of all the highly correlated variables is shown in Figure 6.8A. The meanings of the new composite variables are explained in Figure 6.8B. These statistics can be grouped into several clusters which demonstrate the following:-

(1) what 'good' comprehensive proposals contain,

(2) the emphasis some members of the approval committee place on certain proposal or approval criteria, and

(3) the relationship amongst the proposal and the approval criteria.

One thing that we must be very careful of when using correlation statistics is that they tend to hide variables that are either consistently high or consistently low. Because the values of these variables are consistently low or high, they are unlikely to be correlated with other variables. In our case, some of the most important approval criteria are of this nature. In order to look more closely at the results of our analysis, we need to digress for a second and examine the implications of our correlation statistics.

The first point in our list is that "good" proposals place some emphasis on costs, hard benefits, and organizational feasibility. This is demonstrated by the way

Figure 6.8A - Highly Correlated Variables

	Variables	Correlation	Significance
1	AUSREFF - PIMPCTUS	0.763	0.0001
2	AROI - PHARDBEN	0.725	0.0001
3	AUSREFF - AIMPCTUS	0.712	0.0001
4	PIMPCTUS - AIMPCTUS	0.627	0.0006
5	ICORPBUDG - PIMPCTUS	0.617	0.0008
6	PSOFTBEN - PIMPCTUS	0.602	0.0012
7	ICORPBUD - ARISKFAIL	0.592	0.0014
8	IDPSTEER - PSOFTBEN	0.573	0.0022
9	AROI - PTECFEAS	0.564	0.0027
10	AUSREFF - PPROJDSN	0.559	0.0030
11	PIMPCTUS - PPROJDSN	0.540	0.0044
12	INFLDP - ICORPBUDG	0.535	0.0049
13	INFLDP - ARISKFAIL	0.531	0.0052
14	INFLDP - IDPSTEER	0.515	0.0071
15	IDPSTEER - AUNCEROBJ	0.510	0.0077
16	PECOCOST - PHARDBEN	0.504	0.0087
17	PECOCOST - ARISKFAIL	0.499	0.0095

Figure 6.8B - Definitions of composite variables

Variable	Average of
PECOCOST	PDPDEVCO, PDPOPCO, PUSDEVCO, PUSOPCO
PTECFEAS	PTECDOBL, PDPSTAFF
AUSREFF	AUSEFFCY, AUSEFFCT
INFLDP	IDPVP, IDPMSD
AUSPART	AURGUSND, AUSCOMM

the variables PTECHFEAS, AROI, PHARDBEN, and PECOCOST are
linked together in Figure 6.8C. While it is encouraging to
note that thoroughly prepared proposals contain analyses of
these issues, soft benefits is not highly correlated to any
of these three porposal criteria. Therefore, even the
carefully prepared proposal documents tend to neglect
qualitative or soft benefits.

The second point mentioned above becomes obvious when we
look at Figure 6.8C. Different people are interested in
different criteria. Companies where the DP steering
committee play an important role in the approval process tend
to be more concerned with the uncertainty objectives and soft
benefits. The DP steering committee is charged with guiding
the direction of the DP department, and as such would be
interested in the objectives of the various projects
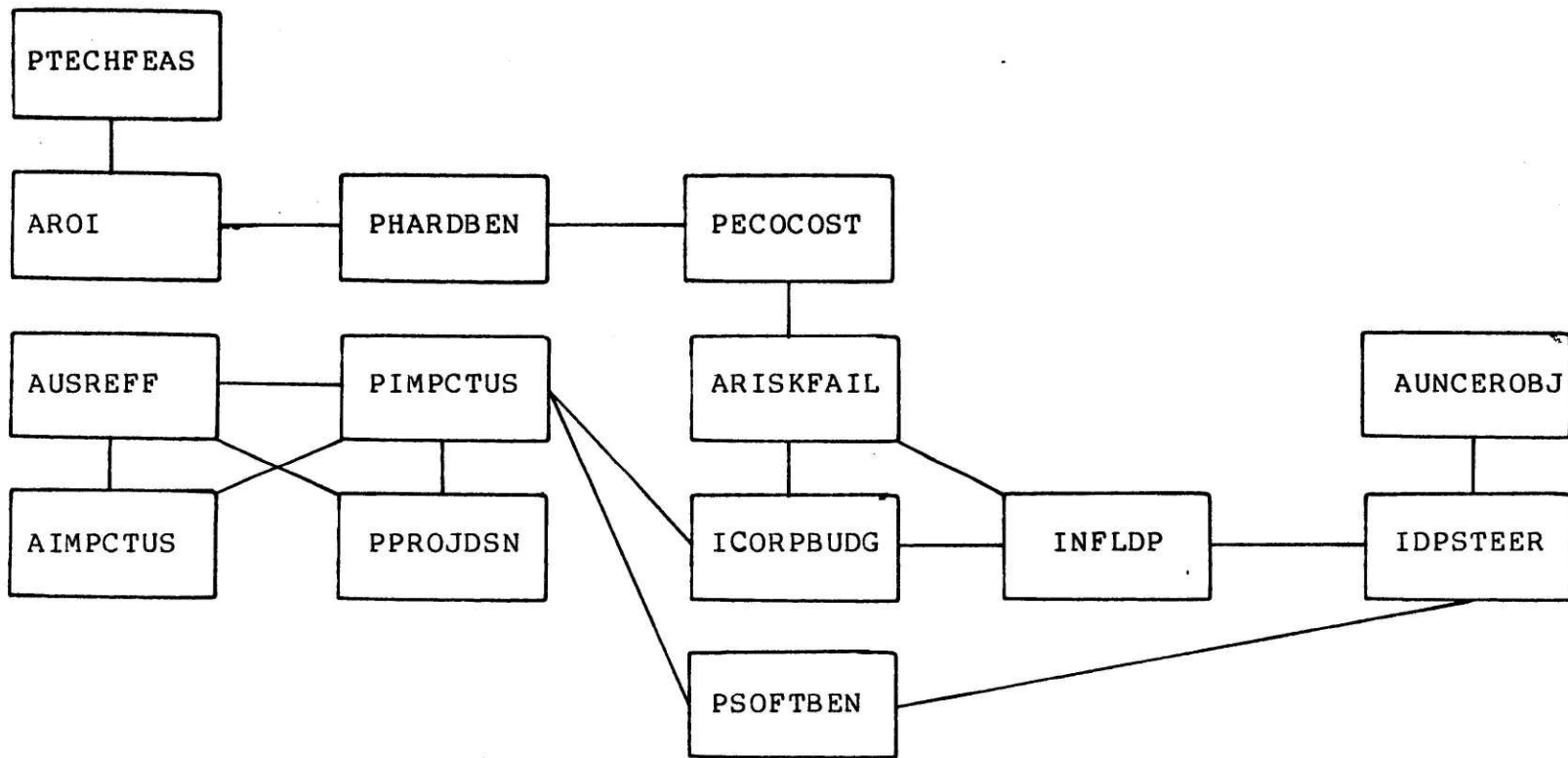
Figure 6.8C: Chart of Highly Correlated Variables

undertaken by the department. Its interest in soft benefits makes sense if we consider that when the DP steering committee plays a major role in the approval process, then the process is more formalized. The user vice-presidents will have to justify their requests for management support systems in terms of qualitative or soft benefits if there are insufficient hard benefits. Unsound business arguments for project justification (or "user-jargon") and personal power will not be sufficient to sway other user vice-presidents on the committee because of their own experience with the business and such user-jargon, and because they too are relatively influential in the company. Similarly, the corporate budget committee evaluates projects relative to other requests throughout the company. Because this committee views proposals in a global way, it is interested in how the DP department impacts the operations of the other departments. Consequently, it pays attention to factors such as "impact on users," and "overall risk of failure." Then there are the representatives from the DP department itself. They are obviously concerned about the risk of failure because they would have to do the actual development work.

The correlation figures support our model extremely well. They clearly indicate that departments which are more concerned with the hard approval criteria also put more emphasis on the corresponding factors in the proposal. The

second most highly correlated factors are "return on investment" in the approval criteria and "hard benefits" in the proposal. With a correlation coefficient of 0.725 and a significance level of 0.0001 for 26 observations, it clearly substantiates our previous claim.

The "typical" department is exactly described by the correlation statistics. This department requires proposals containing some analyses of technical doability, hard benefits, and cost. Its principal approval criteria is return on investment. As we turn to the other criteria in the diagram, another pattern emerges. Departments which pay attention to "importance to users" factors in the proposal tend to look at other "softer" criteria as well. This is indicated by the presence of four mutually correlated variables – AUSREFF, PIMPCTUS, AIMPCTUS, and PPROJDSN. These departments associate importance of the project with "project design", "increase in users' efficiency and effectiveness", and "degree of impact on users." In other words, soft benefits is often argued in terms of urgency and importance.

Another pattern that is interesting to note is that the influence of the DP personnel increases when the budget committee and the steering committee are more powerful. This is precisely what we have expected from our model. In the absence of the DP steering committee or the budget committtee, the user vice-president can more effectively use

his authority to intimidate the DP personnel. The other vice presidents from the committees would neutralize the users' power and hence increase DP's influence.

The observant reader might have noticed that nowhere in the last few paragraphs have we mentioned the variable "top management emphasis," although it is the single most important approval criterion. The reason top management emphasis" does not appear in our correlation statistics is that it is rated highly by most departments, regardless of how they rate the other criteria. The same holds for the influence of the user vice-president. The respondents agree that the user vice-president is very influential independent of what they say for the other factors, hence these two important factors are not visible in our correlation analysis.

6.3 Proposed Process

We have examined the current approval process (or processes, actually). We know what their problems are, and we now propose an alternative process that will better utilize the resources expended in the approval process and also allow us to integrate the various types of proposals. Currently, inquiry and analysis systems are approved or rejected without any real objective evaluations being done on

their claimed qualitative benefits. They are decided upon based on the influence of the requesting vice-president. There is no real role played by the DP steering committee and the corporate budget committee. They perform secondary roles in the 'override' mode process. Moreover, there is little use of the proposal because its content is not directly relevant to the assessment of qualitative benefits.

The objective of our proposed process is to move the proposal document and the approval committee to the center of the approval process for all types of systems requests (Figure 6.9). The process would have two stages. The first stage is essentially the same as the current approval procedure. A proposal has to be written to evaluate the technical feasibility of the requested project. It will also contain the cost estimate and an assessment as to whether it is primarily a cost displacement process, which will be evaluated on its hard benefits, or it is a managerial support system, whose benefits are more qualitative and less easily quantified. If the project is judged to be technically feasible, it is then put in one of the two piles, depending on what type of system is being requested. If it is to be evaluated on the basis of its hard return on investments, then the proposal will be returned to the user manager, who with the help of the DP department will perform a more extensive cost-benefit analysis and report the findings in
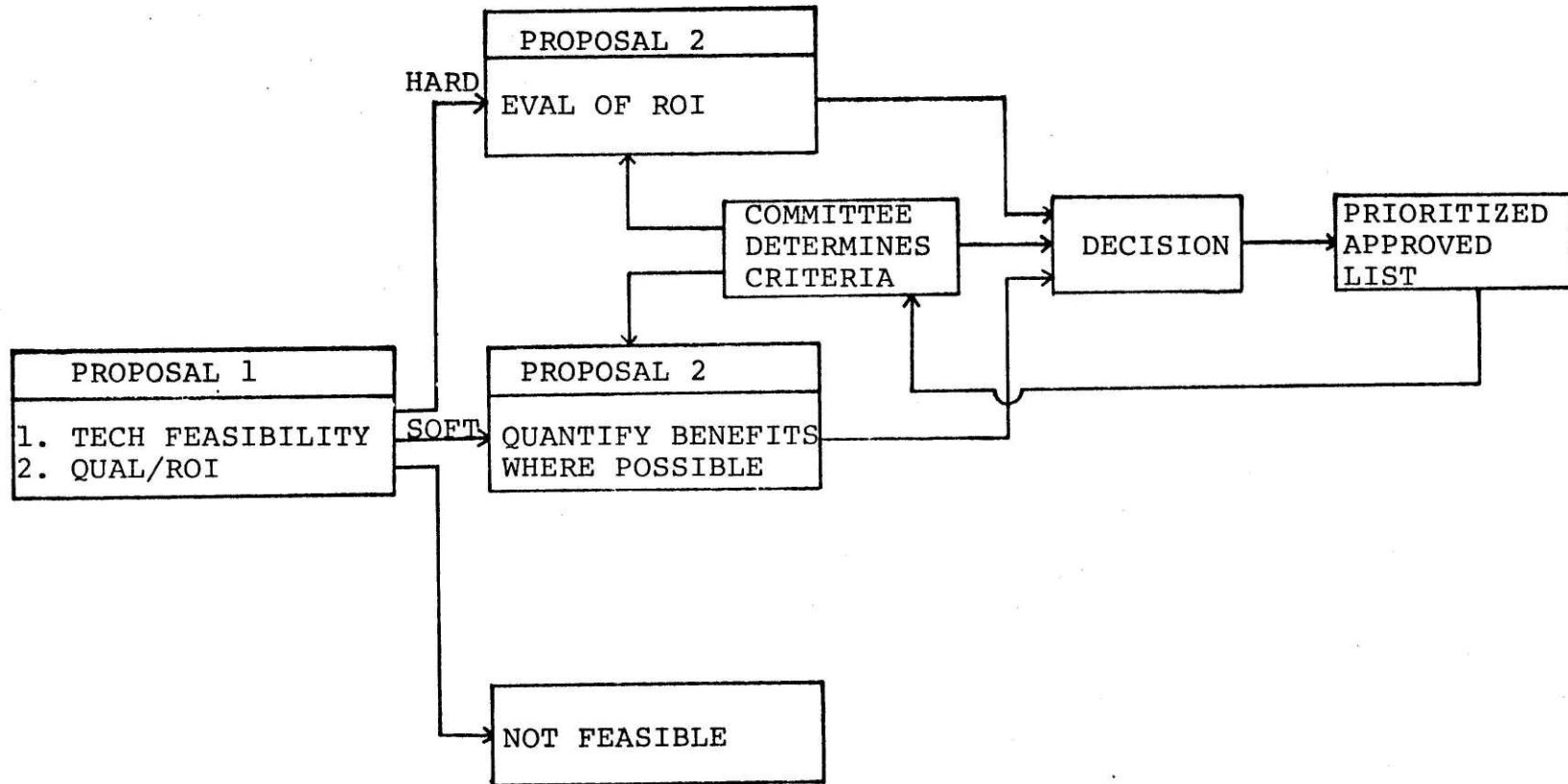
Figure 6.9: Proposed Approval Process

the form of an ROI-oriented proposal. The criteria on which it will be judged are explicitly stated by the approval committee. It is the data processing department's job to ensure that the second proposal is accurate in its estimates.

On the other hand, if the request is for a qualitative type of system, then the proposal is also returned to the requesting manager or vice-president for more detailed studies. The user and DP together will make more studies on its costs as well as its claimed qualitative benefits, and as much as possible, provide some quantitative estimates of these benefits. The criteria to be utilized will be different from the criteria used for transaction processing systems; the precise criteria required will again be determined by the approval committee. The main difference between this proposal format and the current proposal requirement is that here the user has to explicitly state whether he is requesting a transaction processing system or a management support system. Hence, DP help is provided for both, and qualitative benefits are throughly investigated.

Regardless of the type of system being approved, the second proposal would then be submitted to the approval committee. The requesting vice-president or manager may present his case, but before the whole committee. This way, different systems are evaluated along the different criteria by the same people - members of the approval committee. The

obvious advantage of having the committee approve all projects, rather than having it act as just a rubber stamp committee, is that we can now prioritize amongst the various types of systems requested. In addition, the decision is less influenced by the authority of the user vice-president, since the committee is less likely to be intimidated by the vice-president, and the requesting vice-president would have to contend with the other vice-presidents on the committee. These vice-presidents would realize that too easy approval of some projects might jeopardize the chances of approval for their own projects, hence mutual interests will ensure that there is some form of balance maintained. Furthermore, the corporate budget committee can be expected to make sure that projects are not approved beyond the budget allocated for all projects, since this would result in projects being approved but not developed.

Additional benefits of this approach is that it has a built in flexibility mechanism that provides for feedback. The committee decides on the proportions of the various systems to be approved. Should it find that some types of sytems are being too strictly assessed, it can then change the proposal criteria for those particular types of systems. This avoids the self-perpetuating trend that tends to be created by the current existing process. Users with requests for qualitative systems know that they are less likely to be

approved, hence they tend to not even bother to submit proposals for their systems. Consequently, the approval committee, not seeing any proposals for such systems, approve fewer of these systems, and the smaller number further discourages managers from requesting for such systems. This cycle could have led to an underestimation of the hidden or invisible backlog for such qualitative systems.

While we did not conduct any formal analysis on who decided which new project should be started next, the absence of any formal means to rank order the approved proposals inevitably leaves that decision to either the DP vice-president or the systems development manager. No doubt his decision will be affected by the amount of pressure that the various user vice-presidents bring to bear. Therefore, in order to shift the burden away from the DP vice-president, we would have a process whereby newly approved projects are assigned a priority, indicating where it should be placed in the backlog queue. In so doing, we not only discourage user managers or vice-presidents from exerting undue pressure on the DP vice-president, but we also ensure that projects are rank ordered more on importance and necessity rather than DP vice-president preference.

7. CONCLUSIONS

We have done a lot of analysis and made a lot of recommendations. Some of the data revealed information that had been expected, yet they are still valuable in that they confirmed our expectations. Others provided insight into details that we did not realize even existed in the first place. All were important since they provided us with some substantiated evidence.

We discovered that the approval process is actually two separate processes. Projects with hard benefits, such as transaction processing systems, are evaluated on the basis of costs and hard benefits. Management support systems which have less well defined benefits have to depend on top management support for approval. We do not deny that the hard benefits approach of evaluating cost displacement systems is appropriate. What we do claim, however, is that such an approach does not allow us to evaluate different types of systems objectively.

If we consider the possible combinations of high and low ROI and qualitative benefits (Figure 7.1), we notice that projects falling in quadrant 1 are real winners and should be very easily approved. In addition, those in quadrant 3 are often the transaction processing systems that they are accustomed to seeing. As such, they should have no real

```
                              ROI

                 HIGH                    LOW

            ┌────────────────────┬────────────────────┐
            │ 1                  │ 2                  │
            │                    │                    │
            │       YES          │         ?          │
      HIGH  │      WINNER        │      PROBLEM       │
            │                    │                    │
  QUAL      │                    │                    │
  BENF      ├────────────────────┼────────────────────┤
            │ 3                  │ 4                  │
            │                    │                    │
            │      FAIRLY        │        NO          │
      LOW   │       EASY         │       LOSER        │
            │                    │                    │
            │                    │                    │
            └────────────────────┴────────────────────┘
```

Figure 7.1: Hard-Soft Benefits Matrix

problems evaluating these. By contrast, projects in quadrant
4 are real losers without any significant ROI or qualitative
benefits. Projects that fall in quadrant 2 are the ones that
cause problems. These requests are often for management
support systems which, in the current approval method, are
evaluated in an 'override' mode with the intervention of user
vice-presidents. The existence of such a special process for
evaluating projects in quadrant 2 has several adverse
consequences. First of all, the scarce resources of the DP
department tend to be diverted into projects that have large
ROI figures or projects that are requested by influential
vice-presidents. There are no objective criteria that can be
used to allocate these resources fairly. Secondly, we do not
have any real way to compare management support systems with
cost displacement systems, or, for that matter, amongst
themselves. Consequently, it is impossible to prioritize
approved projects on the basis of urgency or importance.

In order to evaluate all types of projects fairly, we
have proposed a new approval procedure, one which will
require all projects to be evaluated objectively on a
multi-criteria basis. The actual criteria to be used for the
different types of systems should be established by the
Steering Committee. By utilizing the experience and
diversity of the members of the DP steering committee, we can
neutralize the influence of the user vice-presidents, and

evaluate projects on their merits instead. At the same time, such an objective process would allow us to prioritize the newly approved projects <u>at the time they are approved.</u> Prioritization at this point can be done on the basis of need. In the currently practised process, it is the DP vice-president's job to decide which projects should be initiated next. The first problem with this approach is that the DP vice-president may not be sufficiently acquainted with all the approved projects to know which ones should be started next. Also, this process is likely to result in user vice-presidents pressuring the DP vice-president to initiate their respective projects next. All these problems are significantly diminished by the adoption of the new approval process.

Conversion to a different process is not easily done. Managers usually tend to resist any changes to an existing system. In addition, those with the most influence in the firms are the most likely to resist this change since their influence would be diminished by the adoption of an objective approval process. However, if we are to be able to adapt to the changing needs of the users, we need an approach that is flexible and sensitive to their changing needs. The best approach to implementing the change is through the DP steering committee, since it is charged with deciding the policy direction of the DP department. Once the steering

committee is convinced, the rest should be easier, since the committee includes representatives from the various user departments. Nonetheless, a slow and cautious approach is advocated.

As a follow up to this thesis, perhaps another survey should be conducted several years from now. By then, the trend would have become more well defined.   Firms which have modified their approval requirements to accomodate to the changing needs should have more satisfied users. On the other hand, firms which have retained the traditional and outmoded process (i.e. the current process) will   find themselves burdened with an increasingly large number of disgruntled managers whose systems needs are not satisfied. That is what the future survey should attempt to verify, and we are quite confident that such a pattern will indeed emerge soon, unless the DP department modifies its project selection policy.

Our analyses also provided us with certain observations which although not directly relevant to this thesis could prove to be interesting areas for future research.   Let us briefly mention these. First, we noticed that organizational criteria were often neglected. It is our feeling that one of the most promising application of computers is in mechanizing the tedium that is common to many clerical work. The use of computers in these areas would enable many people to switch

to more rewarding kinds of work. Consequently, the issue of clerical job enrichment should not be neglected. Similarly, our results showed that secondary users are currently left out in almost all proposal negotiations. As a result, many applications that have far reaching effects are neglected because they are not sufficiently important to any single user. These and many other findings should provide ample opportunities for further research.

BIBLIOGRAPHY

(Alloway, 1978)
    "The Complete Life Cycle of CBIS Projects," Robert
    M. Alloway, M.I.T., Sloan Working Paper, May 1978.

(Alloway, 1979)
    "User Needs Survey: Preliminary Report," Robert
    M. Alloway, et al, M.I.T., Sloan Working Paper 1096-79,
    December 1979.

(Alloway, 1980)
    "User Managers' Systems Needs," Robert M. Alloway,
    M.I.T., Sloan Working Paper, April 1980.

(Enger, 1976)
    Management Standards for Developing Information Systems,
    Norman L. Enger, AMACOM (New York), 1976.

(Graham, 1976) Making Computers Pay, John Graham, John Wiley
    & Sons (New York), 1976.

(McClean & Soden, 1977)
    Strategic Planning for MIS, Ephraim R. McLean & John
    V. Soden, John Wiley & Sons (New York), 1977.

(Mixon, 1976)
    Handbook of Data Processing Administration, Operations,
    and Procedures, S.~R.~Mixon, AMACOM (New York), 1976.

APPENDIX A

Questions used in analysis, and variable names of responses.

1. This question refers to the content of proposals for new
   DP systems. Please use the following scale to indicate
   how necessary each potential segment is for a proposal to
   get approved.

```
     not                                           mandatory
  necessary        desirable        required       in detail

      1        2        3        4        5        6        7
```

technical feasibility

```
A    PTECHDOBL  technically do-able
B    PSOFTDOBL  software do-able
C    PDPSTAFF   DP staffing
D    POPHWIPCT  oprations and hardware impacts
E    PPROJDSN   project design
```

economic feasibility

```
F    PDPDEVCO   DP development costs
G    PUSDEVCO   user devlopment costs
H    PDPOPCO    DP operating costs
I    PUSOPCO    user operating costs
J    PHARDBEN   "hard" benefits
K    PSOFTBEN   "soft" benefits
```

organizational feasibility

```
L    PIMPCTUS   impact on users
M    PCLRNRCH   clerical job enrichment
N    PORGCHPLN  organizational change planning
O    PIMPLPLN   implementation planning
```

2. This question refers to the project approval process for
   new systems given completed proposals. Please rate the
   importance of each potential dimension in approving
   proposed systems.

```
                                                 the sole
   of no            some            very        determining
  importance      importance      important       factor

      1        2        3        4        5        6        7
```

```
A    AROI       return on investment (cost/benefit)
B    ARISKFAIL  overall risk of failure
C    ACOPOLT    company politics
D    AIMPCTRES  impact on DP resources
E    ADPORTBAL  DP portfolio balance
F    AUNCEROBJ  uncertainty of objectives
G    AQLSOFBEN  qualitative or soft benefits
H    AMGTEMPH   top management emphasis
I    AURGUSND   urgency of user need
J    ADPDEVPLN  fit with DP development plan
K    AUSCOMM    degree of user commitment
L    AINTCHLDP  interest/challenge to DP staff
M    AIMPCTUS   degree of impact on users
N    AUSEFFCY   users' efficiency increase
O    AUSEFFCT   users' effectiveness increase
P    AORGENVCH  adaptability of organization to
                environmental changes
```

4. Please rate the amount of influence each of the following people have on the project approval decision.

```
                                                      the sole
        no             some          a lot of        decision
     influence       influence       influence         maker

        1       2       3       4       5       6       7
```

```
A    IDPSTEER   DP Steering Committee
B    IDPVP      DP Vice-President
C    IDPMSD     Systems Development Manager
D    IDPPROG    Programming Manager
E    ICORPBUD   corporate budget committee
F    IPRIUSVP   primary users vice-president
G    IPRIUSMGR  primary user manager
H    ISECUSER   secondary user manager
```

5. There is always a mixture of quantitative and qualitative benefits to a new DP system. Consider a proposal where qualitative costs and benefits break even but the qualitative benefits look very good. Please check the most accurate descrpition of what would happen to such a proposal in your organization (QBENF).

1 We would never receive such a proposal since everyone knows it would be rejected.

2 We would reject it on formal criteria but the user could get it forced through with enough power and influence.

3 They would attempt to quantify the qualitative benefits, then it would be a struggle, but with our backing it would stand a reasonable chance.

4 After we checked out the qualitative benefits to make sure they really were very good, the proposal would be easily approved.

APPENDIX B

Detailed results of data analyses.

Average for PTECHDOBL

Company	DP	Finance	Manuf.	User	All
20	4.826	5.000	5.107	5.054	4.978
21	5.286	5.091	5.222	5.157	5.200
22	4.793	5.375	5.412	5.393	5.193
23	5.000	5.576	5.375	5.475	5.317
24	5.176	4.846	5.136	4.991	5.053
25	5.000	5.059	5.040	5.049	5.033
50	5.409	5.067	5.083	5.075	5.186
51	4.680	5.333	5.000	5.167	5.004
52	4.882	6.250	5.444	5.847	5.526
53	5.667	4.000	5.520	4.625	4.972
54	5.282	5.000	5.500	5.250	5.261
55	5.233	4.958	5.429	5.193	5.207
56	4.400	4.364	4.833	4.598	4.532
All	5.049	5.071	5.218	5.145	5.112

Average for PSOFTDOBL

Company	DP	Finance	Manuf.	User	All
20	5.591	4.054	3.625	3.839	4.423
21	3.550	3.778	2.938	3.358	3.422
22	5.000	5.000	4.057	4.529	4.686
23	5.171	4.818	4.409	4.614	4.799
24	4.938	4.571	3.955	4.263	4.488
25	4.694	4.000	3.840	3.920	4.178
50	3.750	2.000	3.000	2.500	2.917
51	2.158	3.000	2.556	2.778	2.571
52	4.188	4.000	4.000	4.000	4.063
53	3.800	6.000	5.714	5.857	5.171
54	4.455	2.682	3.818	3.250	3.652
55	6.000	4.920	4.333	4.627	5.084
56	5.154	3.000	4.769	3.885	4.308
All	4.496	3.986	3.924	3.955	4.135

Average for PDPSTAFF

Company	DP	Finance	Manuf.	User	All
20	4.795	3.947	4.870	4.408	4.537
21	4.600	4.333	5.412	4.878	4.782
22	4.857	4.409	4.306	4.357	4.524
23	4.585	4.697	3.714	4.206	4.332
24	4.941	4.357	4.500	4.429	4.599
25	5.056	5.188	4.880	5.034	5.041
50	5.050	4.000	3.700	3.850	4.250
51	5.043	4.700	3.444	4.072	4.396
52	4.938	6.000	4.600	5.300	5.179
53	6.000	3.667	4.714	4.190	4.794
54	5.684	5.174	4.676	4.925	5.178
55	5.000	5.273	4.966	5.119	5.079
56	4.308	3.909	3.000	3.454	3.739
All	4.989	4.589	4.368	4.478	4.649

Average for PDPHWIPCT

Company	DP	Finance	Manuf.	User	All
20	3.667	4.238	4.107	4.173	4.004
21	5.143	4.727	4.944	4.836	4.938
22	4.483	4.958	5.000	4.979	4.814
23	4.238	4.303	4.583	4.443	4.375
24	4.412	3.692	5.050	4.371	4.385
25	4.400	5.059	4.400	4.729	4.620
50	4.455	4.500	5.250	4.875	4.735
51	4.731	5.083	4.273	4.678	4.696
52	4.059	5.500	4.706	5.103	4.755
53	3.667	4.000	4.750	4.375	4.139
54	4.897	4.885	5.000	4.942	4.927
55	5.033	4.417	5.483	4.950	4.978
56	4.867	3.636	4.727	4.182	4.410
All	4.465	4.538	4.790	4.664	4.598

Average for PPROJDSN

Company	DP	Finance	Manuf.	User	All
20	3.652	4.619	4.519	4.569	4.263
21	5.381	4.909	5.056	4.982	5.115
22	4.207	5.000	5.000	5.000	4.736
23	4.619	4.636	4.542	4.589	4.599
24	3.529	4.615	5.150	4.883	4.432
25	4.657	4.824	4.680	4.752	4.720
50	3.909	4.938	5.182	5.060	4.676
51	4.269	5.083	4.545	4.814	4.633
52	4.235	4.667	4.875	4.771	4.592
53	3.667	4.000	4.714	4.357	4.127
54	4.410	5.038	4.424	4.731	4.624
55	4.467	4.583	5.069	4.826	4.706
56	5.267	3.636	4.833	4.235	4.579
All	4.328	4.658	4.815	4.736	4.600

Average for PDPDEVCO

Company	DP	Finance	Manuf.	User	All
20	5.174	5.048	5.111	5.079	5.111
21	4.857	4.455	5.333	4.894	4.882
22	4.724	5.000	5.114	5.057	4.946
23	5.357	5.303	5.208	5.256	5.290
24	5.529	4.615	5.250	4.933	5.132
25	4.257	5.412	4.880	5.146	4.850
50	4.864	5.118	5.250	5.184	5.077
51	4.600	5.083	5.083	5.083	4.922
52	4.824	5.500	5.222	5.361	5.182
53	5.222	5.500	5.375	5.438	5.366
54	5.923	5.259	5.647	5.453	5.610
55	5.172	5.125	5.828	5.476	5.375
56	5.133	4.182	4.857	4.519	4.724
All	5.049	5.046	5.243	5.145	5.113

Average for PUSDEVCO

Company	DP	Finance	Manuf.	User	All
20	4.600	4.619	5.034	4.827	4.751
21	4.952	4.182	4.944	4.563	4.693
22	4.241	4.792	5.111	4.951	4.715
23	5.119	5.424	5.083	5.254	5.209
24	4.176	3.231	5.050	4.140	4.152
25	4.229	4.882	4.120	4.501	4.410
50	4.545	5.000	5.250	5.125	4.932
51	4.520	5.000	5.333	5.167	4.951
52	4.471	5.500	5.947	5.223	4.973
53	4.111	5.500	5.125	5.313	4.912
54	5.692	5.148	5.706	5.427	5.515
55	4.931	4.750	5.241	4.996	4.974
56	4.357	4.000	4.733	4.367	4.363
All	4.611	4.771	5.052	4.912	4.812

Average for PDPOPCO

Company	DP	Finance	Manuf.	User	All
20	4.978	4.905	4.852	4.878	4.911
21	4.714	4.364	5.444	4.904	4.841
22	4.552	5.125	4.886	5.005	4.854
23	5.095	4.818	5.208	5.013	5.041
24	5.412	4.462	4.900	4.681	4.924
25	4.457	5.353	4.600	4.976	4.803
50	4.045	4.941	4.333	4.637	4.440
51	4.200	5.333	4.667	5.000	4.733
52	4.412	5.250	4.833	5.042	4.832
53	4.222	4.000	5.000	4.500	4.407
54	5.462	5.185	5.382	5.284	5.343
55	5.345	5.208	5.414	5.311	5.322
56	4.857	3.818	4.571	4.195	4.416
All	4.750	4.828	4.930	4.879	4.836

Average for PUSOPCO

Company	DP	Finance	Manuf.	User	All
20	4.133	4.341	5.000	4.671	4.492
21	4.667	4.364	5.222	4.793	4.751
22	4.138	5.042	4.889	4.965	4.689
23	4.810	5.061	4.875	4.968	4.915
24	4.412	4.077	4.800	4.438	4.430
25	4.629	5.176	4.600	4.888	4.802
50	3.955	4.529	4.636	4.583	4.373
51	4.480	5.417	4.917	5.167	4.938
52	4.647	5.000	4.842	4.921	4.830
53	4.000	5.500	5.000	5.250	4.833
54	5.231	5.074	5.618	5.346	5.307
55	4.862	4.833	5.500	5.167	5.065
56	4.429	3.727	4.933	4.330	4.363
All	4.492	4.780	4.987	4.884	4.753

Average for PHARDBEN

Company	DP	Finance	Manuf.	User	All
20	4.644	4.738	5.000	4.869	4.794
21	5.381	4.909	5.722	5.316	5.337
22	4.897	5.083	5.371	5.227	5.117
23	5.643	5.697	5.250	5.473	5.530
24	4.647	4.923	5.450	5.187	5.007
25	5.571	5.412	5.680	5.546	5.554
50	5.227	4.824	5.455	5.139	5.168
51	5.560	5.583	5.167	5.375	5.437
52	5.588	5.750	5.353	5.551	5.564
53	5.333	5.500	5.250	5.375	5.361
54	6.026	5.556	5.824	5.689	5.802
55	6.036	5.292	5.931	5.611	5.753
56	5.267	4.273	4.867	4.570	4.802
All	5.371	5.195	5.409	5.302	5.325

Average for PSOFTBEN

Company	DP	Finance	Manuf.	User	All
20	4.444	4.238	4.500	4.369	4.394
21	4.714	4.273	4.556	4.414	4.514
22	3.931	4.458	4.543	4.501	4.311
23	4.333	4.242	4.250	4.246	4.275
24	4.000	3.769	4.500	4.135	4.090
25	4.314	4.588	4.240	4.414	4.381
50	4.227	4.471	4.818	4.644	4.505
51	4.560	4.833	4.917	4.875	4.770
52	3.235	5.000	4.588	4.794	4.275
53	4.889	5.500	4.500	5.000	4.963
54	4.667	4.667	4.794	4.730	4.709
55	4.679	4.292	5.414	4.853	4.795
56	4.333	3.545	4.600	4.073	4.160
All	4.333	4.452	4.632	4.542	4.472

Average for PIMPCTUS

Company	DP	Finance	Manuf.	User	All
20	4.391	4.732	5.500	5.116	4.874
21	4.810	5.818	5.056	5.437	5.228
22	4.759	5.000	5.583	5.292	5.114
23	4.357	4.970	5.250	5.110	4.859
24	4.176	4.385	4.800	4.592	4.454
25	4.743	5.000	5.000	5.000	4.914
50	4.318	5.176	5.250	5.213	4.915
51	5.583	5.833	5.333	5.583	5.583
52	4.294	5.750	5.105	5.428	5.050
53	4.444	5.500	5.250	5.375	5.015
54	5.154	5.222	5.471	5.346	5.282
55	5.167	5.160	5.310	5.235	5.212
56	4.933	4.455	5.200	4.827	4.863
All	4.702	5.154	5.239	5.197	5.032

Average for PCLRNRCH

Company	DP	Finance	Manuf.	User	All
20	2.578	2.634	3.300	2.967	2.837
21	3.250	4.364	3.000	3.682	3.538
22	2.897	3.625	3.639	3.632	3.387
23	2.810	3.697	3.917	3.807	3.474
24	2.588	3.077	3.100	3.088	2.922
25	2.829	3.588	3.375	3.482	3.264
50	2.909	3.765	3.500	3.632	3.391
51	4.000	4.750	4.750	4.750	4.500
52	3.235	4.250	3.842	4.046	3.776
53	2.778	4.000	3.625	3.813	3.468
54	2.974	3.667	3.588	3.627	3.410
55	3.000	3.800	3.897	3.848	3.566
56	3.133	3.182	4.000	3.591	3.438
All	2.999	3.723	3.656	3.690	3.459

Average for PORGCHPLN

Company	DP	Finance	Manuf.	User	All
20	3.152	3.098	4.067	3.582	3.489
21	3.950	4.545	4.444	4.495	4.313
22	3.862	4.042	4.171	4.107	4.025
23	3.214	3.879	3.958	3.919	3.684
24	3.647	3.308	3.550	3.429	3.502
25	3.314	4.235	3.333	3.784	3.628
50	3.409	4.176	4.417	4.297	4.001
51	5.083	4.583	5.417	5.000	5.028
52	3.882	5.750	3.947	4.849	4.527
53	2.889	3.500	4.125	3.813	3.505
54	4.103	4.259	4.242	4.251	4.201
55	3.862	4.440	4.172	4.306	4.158
56	3.400	3.727	3.333	3.530	3.487
All	3.674	4.119	4.091	4.105	3.961

Average for PIMPLPLN

Company	DP	Finance	Manuf.	User	All
20	3.326	4.073	4.517	4.295	3.972
21	5.190	5.000	5.000	5.000	5.063
22	4.655	5.042	5.000	5.021	4.899
23	4.619	5.000	4.708	4.854	4.776
24	4.294	4.538	4.400	4.469	4.411
25	4.457	4.824	4.400	4.612	4.560
50	3.682	5.059	4.917	4.988	4.552
51	4.542	5.250	5.833	5.542	5.208
52	4.471	5.750	5.053	5.401	5.091
53	3.667	4.500	5.125	4.813	4.431
54	4.923	5.000	4.676	4.838	4.867
55	4.276	4.840	5.000	4.920	4.705
56	4.667	4.000	4.067	4.033	4.244
All	4.367	4.837	4.823	4.830	4,675

Average for AROI

Company	DP	Finance	Manuf.	User	All
20	4.511	4.405	4.567	4.486	4.494
21	4.700	5.000	5.444	5.222	5.048
22	4.633	4.960	4.944	4.952	4.846
23	5.119	4.879	5.240	5.059	5.079
24	5.059	4.286	4.636	4.461	4.660
25	5.514	5.471	5.462	5.466	5.482
50	4.955	4.563	5.077	4.820	4.865
51	4.792	5.500	4.143	4.821	4.812
52	5.471	4.750	5.238	4.994	5.153
53	5.222	5.000	5.000	5.000	5.074
54	5.256	5.148	5.412	5.280	5.272
55	5.533	5.000	5.290	5.145	5.275
56	4.667	3.833	4.846	4.340	4.449
All	5.033	4.830	5.023	4.927	4.962

Average for ARISKFAIL

Company	DP	Finance	Manuf.	User	All
20	3.638	3.581	4.233	3.907	3.818
21	3.800	5.100	3.944	4.522	4.281
22	4.267	4.440	4.528	4.484	4.411
23	4.190	4.242	4.520	4.381	4.318
24	4.059	3.714	4.238	3.976	4.004
25	3.886	4.588	3.923	4.256	4.132
50	4.136	4.176	3.846	4.011	4.053
51	4.320	4.500	4.000	4.250	4.273
52	3.647	4.000	4.050	4.025	3.899
53	3.778	3.333	3.875	3.604	3.662
54	4.692	4.333	4.400	4.367	4.475
55	4.172	4.308	4.323	4.315	4.268
56	3.467	3.000	3.714	3.357	3.394
All	4.004	4.101	4.123	4.112	4.076

Average for ACOPOLT

Company	DP	Finance	Manuf.	User	All
20	4.213	4.140	3.862	4.001	4.071
21	3.300	3.000	3.111	3.056	3.137
22	4.200	3.480	3.400	3.440	3.693
23	4.071	4.094	3.760	3.927	3.975
24	3.235	2.714	3.000	2.857	2.983
25	4.314	3.059	3.440	3.249	3.604
50	3.318	3.313	2.750	3.031	3.127
51	4.080	3.083	3.071	3.077	3.412
52	4.438	2.500	2.905	2.702	3.281
53	3.556	4.000	2.875	3.438	3.477
54	3.846	3.815	3.629	3.722	3.763
55	4.310	3.385	2.806	3.096	3.500
56	3.733	3.250	2.923	3.086	3.302
All	3.893	3.372	3.195	3.283	3.487

Average for AIMPCTRES

Company	DP	Finance	Manuf.	User	All
20	3.979	4.023	4.000	4.012	4.001
21	4.650	4.000	4.722	4.361	4.457
22	4.367	4.320	4.400	4.360	4.362
23	3.976	4.000	4.200	4.100	4.059
24	4.412	4.214	5.050	4.632	4.559
25	4.171	4.706	4.192	4.449	4.357
50	4.045	4.875	4.308	4.591	4.409
51	4.720	4.917	4.154	4.535	4.597
52	3.765	5.000	3.900	4.450	4.222
53	3.444	4.667	3.625	4.146	3.912
54	4.282	4.115	4.629	4.372	4.342
55	4.107	4.577	4.710	4.643	4.465
56	4.600	3.583	3.417	3.500	3.867
All	4.194	4.384	4.254	4.319	4.277

Average for ADPORTBAL

Company	DP	Finance	Manuf.	User	All
20	2.864	2.784	3.000	2.892	2.882
21	3.053	3.200	3.412	3.306	3.221
22	3.345	3.957	3.625	3.791	3.642
23	2.525	2.935	3.333	3.134	2.931
24	2.941	2.923	3.500	3.211	3.121
25	3.212	3.688	3.318	3.503	3.406
50	3.136	3.438	3.100	3.269	3.255
51	3.273	4.583	3.308	3.946	3.721
52	2.714	3.500	3.471	3.485	3.228
53	1.889	3.667	2.833	3.250	2.796
54	3.868	3.560	3.636	3.598	3.688
55	2.917	3.538	3.769	3.654	3.408
56	3.929	3.091	3.636	3.364	3.552
All	3.051	3.451	3.380	3.416	3.294

Average for AUNCEROBJ

Company	DP	Finance	Manuf.	User	All
20	4.596	4.262	4.679	4.470	4.512
21	4.000	4.500	4.353	4.426	4.284
22	4.345	4.480	4.771	4.626	4.532
23	4.561	4.129	4.800	4.465	4.497
24	4.625	3.857	4.429	4.143	4.304
25	4.500	4.412	4.577	4.494	4.496
50	4.727	4.235	5.154	4.695	4.705
51	4.545	4.750	4.786	4.768	4.694
52	3.733	4.000	4.579	4.289	4.104
53	5.000	4.000	4.375	4.188	4.458
54	4.939	4.259	4.690	4.474	4.629
55	4.724	4.231	4.714	4.473	4.556
56	4.571	3.333	4.500	3.917	4.135
All	4.528	4.188	4.647	4.417	4.454

Average for AQLSOFBEN

Company	DP	Finance	Manuf.	User	All
20	4.130	3.952	4.037	3.995	4.040
21	3.850	4.200	4.556	4.378	4.202
22	3.700	3.696	3.657	3.676	3.684
23	3.571	3.606	3.640	3.623	3.606
24	3.706	3.429	3.500	3.464	3.545
25	3.571	4.250	3.692	3.971	3.838
50	3.909	4.125	3.750	3.937	3.928
51	4.417	4.333	4.500	4.417	4.417
52	3.176	4.500	3.833	4.167	3.837
53	4.000	4.333	3.750	4.042	4.028
54	3.564	3.778	3.657	3.717	3.666
55	3.821	3.731	4.133	3.932	3.895
56	3.733	4.083	3.857	3.970	3.891
All	3.781	4.001	3.889	3.945	3.890

Average for AMGTEMPH

Company	DP	Finance	Manuf.	User	All
20	4.872	5.024	5.000	5.012	4.965
21	5.200	5.300	5.556	5.428	5.352
22	5.400	5.520	5.250	5.385	5.390
23	5.167	5.424	5.160	5.292	5.250
24	5.000	5.071	4.952	5.012	5.008
25	5.429	5.294	5.231	5.262	5.318
50	5.182	5.176	5.308	5.242	5.222
51	5.042	4.917	4.615	4.766	4.858
52	4.765	5.250	4.857	5.054	4.957
53	5.000	5.333	4.500	4.917	4.944
54	4.590	4.852	4.829	4.840	4.757
55	5.067	5.077	5.032	5.055	5.059
56	5.467	5.083	4.929	5.006	5.160
All	5.091	5.179	5.017	5.098	5.095

Average for AURGUSND

Company	DP	Finance	Manuf.	User	All
20	4.957	4.744	5.067	4.905	4.923
21	5.200	5.700	5.056	5.378	5.319
22	5.167	5.160	4.889	5.024	5.072
23	4.952	4.848	5.160	5.004	4.987
24	5.059	4.500	5.000	4.750	4.853
25	4.971	5.059	4.615	4.837	4.882
50	4.636	5.059	5.077	5.068	4.924
51	5.120	5.000	4.786	4.893	4.969
52	4.824	5.250	4.714	4.982	4.929
53	5.556	4.667	4.875	4.771	5.032
54	5.000	4.778	5.114	4.946	4.964
55	4.667	5.000	4 774	4.887	4.814
56	5.000	4.917	4.929	4.923	4.948
All	5.008	4.975	4.927	4.951	4.970

Average for ADPDEVPLN

Company	DP	Finance	Manuf.	User	All
20	3.149	3.442	3.500	3.471	3.364
21	4.100	3.700	4.333	4.017	4.044
22	4.033	4.440	4.029	4.235	4.168
23	3.262	3.636	3.360	3.498	3.419
24	3.706	3.083	3.850	3.467	3.546
25	4.029	3.824	4.120	3.972	3.991
50	3.091	4.294	4.154	4.224	3.846
51	3.792	4.750	3.357	4.054	3.966
52	3.294	4.000	3.500	3.750	3.598
53	2.778	3.333	3.750	3.542	3.287
54	4.026	3.500	3.743	3.621	3.756
55	3.931	3.923	4.667	4.295	4.174
56	3.400	3.167	4.091	3.629	3.553
All	3.584	3.776	3.881	3.829	3.747

Average for AUSCOMM

Company	DP	Finance	Manuf.	User	All
20	4.319	4.279	4.467	4.373	4.355
21	4.400	5.200	4.889	5.044	4.830
22	4.867	5.040	4.833	4.937	4.913
23	5.071	4.848	4.880	4.864	4.933
24	4.529	4.571	4.762	4.667	4.621
25	4.829	4.294	4.692	4.493	4.605
50	4.318	4.765	4.692	4.729	4.592
51	4.826	4.583	4.714	4.649	4.708
52	4.000	4.500	4.714	4.607	4.405
53	5.000	5.333	5.250	5.292	5.194
54	5.077	5.000	5.171	5.086	5.083
55	4.533	4.731	5.226	4.978	4.830
56	5.133	5.083	4.857	4.970	5.025
All	4.685	4.787	4.858	4.822	4.776

Average for AINTCHLDP

Company	DP	Finance	Manuf.	User	All
20	1.745	2.163	2.296	2.230	2.068
21	3.000	3.200	2.667	2.933	2.956
22	3.233	3.250	3.353	3.301	3.276
23	2.571	2.970	2.600	2.785	2.714
24	2.647	1.923	2.850	2.387	2.473
25	3.000	2.412	3.462	2.937	2.958
50	2.364	3.118	3.250	3.184	2.910
51	3.240	3.417	3.357	3.387	3.338
52	2.000	2.250	3.050	2.650	2.433
53	2.000	3.333	3.000	3.167	2.778
54	2.564	2.615	2.500	2.558	2.560
55	2.833	2.500	3.300	2.900	2.878
56	2.800	2.417	3.308	2.862	2.841
All	2.615	2.736	2.999	2.868	2.784

Average for AIMPCTUS

Company	DP	Finance	Manuf.	User	All
20	4.170	4.302	4.933	4.618	4.469
21	4.100	5.300	4.611	4.956	4.670
22	4.400	4.800	4.857	4.829	4.686
23	4.738	4.515	4.880	4.698	4.711
24	4.529	4.429	4.905	4.667	4.621
25	4.200	4.471	4.500	4.485	4.390
50	4.364	4.529	4.769	4.649	4.554
51	4.958	5.000	5.143	5.071	5.034
52	4.000	4.750	4.952	4.852	4.567
53	4.556	4.333	5.250	4.792	4.713
54	4.385	4.704	4.743	4.723	4.610
55	4.379	4.462	4.839	4.650	4.560
56	4.643	4.917	4.929	4.923	4.829
All	4.417	4.655	4.870	4.762	4.647

Average for AUSEFFCY

Company	DP	Finance	Manuf.	User	All
20	4.426	4.429	4.933	4.681	4.596
21	4.850	5.200	5.111	5.156	5.054
22	4.600	4.920	5.086	5.003	4.869
23	4.548	4.879	5.080	4.979	4.835
24	4.294	4.929	5.095	5.012	4.773
25	4.286	4.941	4.846	4.894	4.691
50	4.591	5.118	5.000	5.059	4.903
51	5.080	5.500	5.143	5.321	5.241
52	4.647	5.000	5.238	5.119	4.962
53	4.556	4.333	5.250	4.792	4.713
54	4.821	4.815	5.371	5.093	5.002
55	4.900	5.038	5.323	5.181	5.087
56	4.733	5.083	5.143	5.113	4.987
All	4.641	4.937	5.125	5.031	4.901

Average for AUSEFFCT

Company	DP	Finance	Manuf.	User	All
20	4.533	4.524	5.100	4.812	4.726
21	4.750	5.200	5.111	5.156	5.020
22	4.667	4.920	5.314	5.117	4.967
23	4.643	4.727	5.080	4.904	4.817
24	4.529	5.071	5.190	5.131	4.930
25	4.657	5.118	4.808	4.963	4.861
50	4.909	5.118	5.077	5.097	5.035
51	4.917	5.500	5.143	5.321	5.187
52	4.471	5.250	5.381	5.315	5.034
53	5.000	4.333	5.250	4.792	4.861
54	4.769	4.852	5.229	5.040	4.950
55	4.900	4.962	5.290	5.126	5.051
56	4.933	5.000	4.929	4.964	4.954
All	4.746	4.967	5.146	5.057	4.953

Average for AORGENVCH

Company	DP	Finance	Manuf.	User	All
20	3.511	3.195	3.966	3.580	3.557
21	3.150	3.500	3.529	3.515	3.393
22	4.103	4.042	4.029	4.036	4.058
23	3.463	3.697	3.960	3.828	3.707
24	3.882	3.857	3.714	3.786	3.818
25	3.618	3.294	3.400	3.347	3.437
50	3.864	4.059	4.154	4.106	4.025
51	4.318	3.667	4.231	3.949	4.072
52	3.313	3.250	4.050	3.650	3.537
53	4.000	4.000	3.000	3.500	3.667
54	3.769	3.815	3.857	3.836	3.814
55	4.103	4.040	4.258	4.149	4.134
56	4.143	4.000	3.833	3.917	3.992
All	3.788	3.724	3.845	3.785	3.786

Average for QBENF

Company	DP	Finance	Manuf.	User	All
20	3.500	3.317	3.121	3.219	3.313
21	3.000	2.900	2.824	2.862	2.908
22	3.290	3.261	2.829	3.045	3.127
23	2.732	2.735	2.542	2.639	2.670
24	3.412	2.714	2.773	2.744	2.966
25	2.861	3.000	2.520	2.760	2.794
50	3.222	3.188	3.154	3.171	3.188
51	3.261	3.333	2.929	3.131	3.174
52	3.056	3.333	2.900	3.117	3.096
53	3.778	2.667	2.556	2.612	3.000
54	2.974	2.815	2.457	2.636	2.749
55	2.931	2.880	3.103	2.992	2.971
56	2.769	3.273	3.000	3.137	3.014
All	3.137	3.032	2.824	2.928	2.998

Average for IDPSTEER

Company	DP	Finance	Manuf.	User	All
20	5.644	5.436	5.000	5.218	5.360
21	4.200	4.000	4.308	4.154	4.169
22	4.000	4.684	4.719	4.701	4.468
23	4.789	5.033	4.476	4.755	4.766
24	3.500	4.500	4.000	4.250	4.000
25	3.939	3.929	4.217	4.073	4.028
50	4.313	4.333	4.143	4.238	4.263
51	5.360	5.182	4.727	4.955	5.090
52	3.538	5.500	4.200	4.850	4.413
53	5.000	5.000	3.875	4.438	4.625
54	4.848	5.091	4.500	4.795	4.813
55	4.875	4.739	4.808	4.773	4.807
56	3.545	2.714	3.000	2.857	3.087
All	4.427	4.626	4.306	4.466	4.453

Average for IDPVP

Company	DP	Finance	Manuf.	User	All
20	4.705	4.923	4.708	4.816	4.779
21	4.077	4.286	4.750	4.518	4.371
22	4.793	5.143	4.613	4.878	4.850
23	4.105	4.333	4.400	4.367	4.280
24	4.500	3.556	4.400	3.978	4.152
25	4.636	4.083	4.625	4.354	4.448
50	4.588	4.786	4.714	4.750	4.696
51	5.038	5.417	5.167	5.292	5.207
52	4.667	4.000	4.214	4.107	4.294
53	5.000	5.333	4.625	4.979	4.986
54	5.026	5.400	4.545	4.973	4.991
55	5.192	4.458	4.840	4.649	4.830
56	3.556	3.000	2.875	2.938	3.144
All	4.606	4.517	4.498	4.507	4.540

Average for IDPMSD

Company	DP	Finance	Manuf.	User	All
20	4.333	4.436	4.542	4.489	4.437
21	5.150	5.000	5.000	5.000	5.050
22	4.800	4.125	4.606	4.366	4.510
23	3.659	3.871	4.364	4.117	3.964
24	4.235	4.231	4.500	4.365	4.322
25	4.457	3.867	4.040	3.953	4.121
50	4.250	4.429	4.556	4.492	4.411
51	4.808	4.583	4.083	4.333	4.491
52	3.353	4.000	4.294	4.147	3.882
53	3.667	3.667	3.625	3.646	3.653
54	4.342	4.080	3.848	3.964	4.090
55	4.464	4.600	5.111	4.856	4.725
56	5.000	3.455	4.545	4.000	4.333
All	4.348	4.180	4.393	4.287	4.307

Average for IDPPROG

Company	DP	Finance	Manuf.	User	All
20	3.022	2.974	3.833	3.404	3.276
21	4.167	4.200	4.125	4.163	4.164
22	4.276	4.000	4.030	4.015	4.102
23	3.049	2.968	3.227	3.098	3.081
24	4.235	4.077	3.950	4.013	4.087
25	3.647	3.333	3.760	3.547	3.580
50	2.786	3.786	3.444	3.615	3.339
51	3.600	4.000	3.273	3.636	3.624
52	2.059	3.333	3.882	3.608	3.092
53	1.444	2.000	2.625	2.313	2.023
54	2.943	2.960	2.818	2.889	2.907
55	3.679	3.840	4.593	4.216	4.037
56	3.615	2.909	4.200	3.555	3.575
All	3.271	3.414	3.674	3.544	3.453

Average for ICORPBUDG

Company	DP	Finance	Manuf.	User	All
20	4.364	3.974	5.043	4.509	4.460
21	4.824	5.111	5.063	5.087	4.999
22	4.690	4.565	4.406	4.486	4.554
23	4.053	4.935	4.905	4.920	4.631
24	3.286	2.833	3.750	3.292	3.290
25	5.000	5.000	5.160	5.080	5.053
50	3.846	3.667	4.875	4.271	4.129
51	4.542	4.917	4.917	4.917	4.792
52	3.125	4.333	4.529	4.431	3.996
53	2.875	4.333	4.750	4.542	3.986
54	4.649	4.440	5.412	4.926	4.833
55	4.654	3.875	5.185	4.530	4.571
56	2.909	3.333	3.333	3.333	3.192
All	4.063	4.255	4.718	4.486	4.345

Average for IPRIUSVP

Company	DP	Finance	Manuf.	User	All
20	4.545	4.132	4.880	4.506	4.519
21	5.000	5.222	5.176	5.199	5.133
22	5.033	4.636	5.000	4.818	4.890
23	5.200	5.063	5.000	5.031	5.087
24	5.125	5.083	5.000	5.042	5.069
25	5.061	4.800	4.720	4.760	4.860
50	4.579	5.533	5.556	5.544	5.223
51	4.808	5.167	4.615	4.891	4.863
52	4.867	5.333	4.941	5.137	5.047
53	4.667	5.333	5.875	5.604	5.292
54	5.000	4.400	5.000	4.700	4.800
55	5.464	4.720	4.852	4.786	5.012
56	4.636	4.455	4.545	4.500	4.545
All	4.922	4.914	5.012	4.963	4.949

Average for IPRIUSMGR

Company	DP	Finance	Manuf.	User	All
20	3.756	3.949	3.926	3.937	3.877
21	4.950	4.900	5.000	4.950	4.950
22	4.733	4.125	4.914	4.520	4.591
23	4.976	4.156	4.591	4.374	4.574
24	5.000	4.385	4.545	4.465	4.463
25	4.857	4.235	4.400	4.318	4.497
50	3.632	4.867	4.636	4.752	4.378
51	4.731	4.500	3.615	4.058	4.282
52	4.500	4.333	4.389	4.361	4.407
53	4.444	4.000	4.750	4.375	4.398
54	4.263	3.400	4.057	3.729	3.907
55	5.036	4.200	4.407	4.304	4.548
56	5.083	4.818	4.636	4.727	4.846
All	4.612	4.298	4.451	4.374	4.454

Average for ISECUSER

Company	DP	Finance	Manuf.	User	All
20	2.814	2.974	2.929	2.951	2.906
21	3.895	4.100	3.882	3.991	3.959
22	3.533	3.375	4.257	3.816	3.722
23	3.902	3.344	3.545	3.445	3.597
24	4.000	3.231	3.455	3.343	3.562
25	3.457	3.235	3.360	3.298	3.351
50	2.579	3.067	3.308	3.187	2.984
51	3.654	3.583	3.000	3.292	3.412
52	3.063	4.000	3.667	3.833	3.576
53	3.000	3.000	3.250	3.125	3.083
54	3.000	2.400	2.800	2.600	2.733
55	3.821	3.458	3.692	3.575	3.657
56	3.833	3.455	4.182	3.818	3.823
All	3.427	3.325	3.487	3.406	3.413

APPENDIX C

QUESTIONNAIRES

Part II

USER NEEDS SURVEY QUESTIONNAIRE

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Spring, 1979

Assistant Professor of Management

Center for Information Systems Research

and

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Respondent ___ __ __ __ ___ __

Section A

Name _____

Title _____ Years _____

Department _____ Years _____

Organization _____ Years _____

2. Total number of years you have been working: Years _____

   Of this total, how many years of <u>heavy</u> experience with computers? _____

   And how many years of <u>light</u> experience with computers? _____

3. If you have a college degree, year of graduation: Bachelors_____ Masters_____

4. In your <u>formal</u> education (including continuing education programs) how extensive was your exposure to computers? Please check the best description below.

A____ computers were inappropriate in my area of study

B____ introductory course to programming

C____ used computers as a supplemental tool in other courses

D____ several computer courses

E____ majored in computers <u>or</u> very extensive use as a tool

5. This question refers to your general opinion of computers. Please use the following scale to indicate the extent of your agreement with each statement. Post a number from the scale next to each statement.

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A____ The computer is limited to doing the same work faster.

B____ The computer is inappropriate for semi-structured, judgmental activities.

C____ The computer accentuates the alienation and devaluation of industrial man.

D____ The computer makes jobs more interesting and challenging.

E____ The computer increases the productivity of workers and clerical personnel.

F____ To be blunt about it, I simply don't like computers.

G____ The computer is confined to large volume, clerical, cost savings applications.

H____ Properly used, computers can increase the effectiveness of senior managers.

I____ In my job the learning threshold with computers is greater than its potential benefits.

6. Please indicate the extent of your previous experience in each of the following areas. Post the appropriate number from the scale below next to each area in the following list.

no experience		some experience		a lot of experience		extensive experience
1	2	3	4	5	6	7

A____ use of a DP system type 1 (monitor)

B____ use of a DP system type 2 (exception)   please refer to

C____ use of a DP system type 3 (inquiry)   Definitions Page

D____ use of a DP system type 4 (analysis)

E____ participation in development of a DP system type 1 (monitor)

F____ participation in development of a DP system type 2 (exception)

G____ participation in development of a DP system type 3 (inquiry)

H____ participation in development of a DP system type 4 (analysis)

I____ systems analysis and design

J____ user programming (flexible reports or analysis routines)

K____ implementation planning for new DP systems

L____ training other users in use of a new DP system

7. Emotionally speaking, what most frustrates you about DP and computer systems (even though you may understand why the situation occurs)?

no bother		hassle		frustrating		extremely frustrating
1	2	3	4	5	6	7

A____ the "red tape" involved in getting little systems created

B____ the "red tape" involved in getting system proposals approved

C____ the low priority DP gives to new systems for our department

D____ the delay (due to backlog) before new systems get started

E____ the bugs in systems when first installed

F____ the continual maintenance changes to existing systems

G____ trying to get proposals based on qualitative benefits approved

H____ the attitude and/or jargon of DP people

I____ the communication gap between ourselves and DP

J____ the lack of control over DP charges for running current systems

K____ the high cost and long development time for new DP systems

L____ the lack of direct personal access to flexible computer power

M____ inadequate systems documentation (user understandable, complete, current)

8. All of the job characteristics listed below have probably occurred at some point in time on your job. However, we are interested in the general nature of your job. Please post the number from this scale which best indicates how typical each characteristic is of your job.

not at all typical		somewhat typical		typical		completely dominant
1	2	3	4	5	6	7

A____ a few key decisions where "best" is not clear to anyone

B____ high uncertainty in defining overall success in my job

C____ well-defined responsibility boundaries which everyone knows

D____ identifying and defining a problem is a matter of judgment

E____ interdepartmental coordination where conflicting goals produce trade-offs

F____ generating alternative solutions to a problem requires considerable innovation

G____ changes outside the firm require changes to decisions or procedures

H____ choosing the best alternative solution to a problem involving trade-offs

I____ assessment of the competition and long range planning is mandatory

J____ each factor is known but there are so many they are completely overwhelming

K____ many decisions involving known factors where best decisions can be calculated

9. This question asks about actual and desired levels of involvement of DP and user personnel in the process of new systems development in your organization. Using the following scale, first post actual levels of involvement for all stages, then post desired levels.

no involvement		some involvement		a lot of involvement		total involvement
1	2	3	4	5	6	7

actual involvement		Stages	desired involvement	
DP	user		DP	user
____	____	needs recognition	____	____
____	____	proposal development	____	____
____	____	project approval & priority	____	____
____	____	functional specifications	____	____
____	____	detailed specifications	____	____
____	____	programming & systems test	____	____
____	____	implementation & training	____	____
____	____	evaluation & maintenance	____	____
____	____	running operational systems	____	____

10. In your opinion what <u>should be the priority level</u> in the DP department for each of the following?

irrelevant		possibly useful		important		very critical
1	2	3	4	5	6	7

A____ communication with managerial users

B____ efficiency of hardware utilization

C____ hardware and systems downtime

D____ training programs for users in general DP capabilities

E____ data security and privacy

F____ quality of DP systems analysts

G____ the attitude of DP personnel toward users

H____ technical competence of the DP staff

I____ the new system request backlog

J____ developing more systems of type 1 (monitor)

K____ developing more systems of type 2 (exception)   please refer to

L____ developing more systems of type 3 (inquiry)   <u>Definitions Page</u>

M____ developing more systems of type 4 (analysis)

N____ involvement of senior user managers in DP policy formulation and evaluation

O____ responsiveness to user needs

P____ DP strategic planning and allocation of resources to key business areas

Q____ increasing the proportion of DP effort expended in creating new systems

R____ technical sophistication of new systems

S____ improving new systems development (time, cost, quality, disruptions)

T____ user oriented systems analyst who <u>know</u> user operations

U____ DP support for users in preparing proposals for new systems

V____ appropriate DP budget size or growth rate

W____ availability and timeliness of report delivery to users

X____ running current systems (costs, ease of use, documentation, maintenance)

Y____ report contents (relevance, currentness, flexibility, accuracy)

Z____ DP profitability (from chargeouts for services)

11. Please circle the number on the following scale most representative of your annual salary.

$10,000		$30,000		$50,000		$70,000
1	2	3	4	5	6	7

Section B

1. This question refers to the content of proposals for new DP systems. Please use the following scale to indicate how necessary each potential segment is for a proposal to get approved.

not necessary		desirable		required		mandatory in detail
1	2	3	4	5	6	7

technical feasibility	economic feasibility	organizational feasibility
A____ technically do-able	F____ DP development costs	L____ impact on users
B____ software do-able	G____ user development costs	M____ clerical job enrichment
C____ DP staffing	H____ DP operating costs	N____ organizational change planning
D____ operations and hardware impacts	I____ user operating costs	O____ implementation planning
E____ project design	J____ "hard" benefits	
	K____ "soft" benefits	

2. This question refers to the project approval process for new systems given completed proposals. Please rate the importance of each potential dimension in approving proposed systems.

of no importance		some importance		very important		the sole determining factor
1	2	3	4	5	6	7

A____ return on investment (cost/benefit)   I____ urgency of user need
B____ overall risk of failure   J____ fit with DP development plan
C____ company politics   K____ degree of user commitment
D____ impact on DP resources   L____ interest/challenge to DP staff
E____ DP portfolio balance   M____ degree of impact on users
F____ uncertainty of objectives   N____ users' efficiency increase
G____ qualitative or soft benefits   O____ users' effectiveness increase
H____ top management emphasis   P____ adaptability of organization to environmental changes

3. If you could demonstrate hard dollar cost savings for a new DP system, what level of Return on Investment would be necessary to get easy approval?

_____%

4. Please rate the amount of influence each of the following people have on the project approval decision.

no influence		some influence		a lot of influence		the <u>sole</u> decision maker
1	2	3	4	5	6	7

A____ DP steering committee   E____ corporate budget committee

B____ DP (vice president)   F____ primary user (vice president)

C____ systems development (manager)   G____ primary user (manager)

D____ programming (manager)   H____ secondary users (managers)

5. In general, how much influence do you think the user departments <u>actually have</u> and <u>should have</u> on the following decisions? Post your answers in the columns below.

no influence		some influence		quite a bit of influence		a great deal of influence
1	2	3	4	5	6	7

<u>actual</u> <u>should</u>

____ ____   establishing guidelines for the approval of proposed systems

____ ____   establishing priorities among all new system development projects

____ ____   determining priorities among projects for their own departments

____ ____   determining the goals of projects when they are the primary user

____ ____   setting project budget/schedules when they are the primary user

____ ____   helping set goals/budgets/schedules when a <u>secondary</u> user

____ ____   choice of DP personnel assigned when they are the primary user

6. We are interested in the availability of <u>general</u> DP education courses <u>for users</u> and how supportive (arrangements and financial) your DP department is in providing access to courses. Using the scale below, please indicate the <u>current</u> nature of the education program supported by your DP department here _____

Now please indicate the type of DP education program for users you think DP <u>should</u> support and, using the same scale, post your response here _____

no courses available		few courses no support		several courses some support		extensive program actively supported
1	2	3	4	5	6	7

7. What is the relative _importance_ of the following skills for a DP _systems analyst_?

completely irrelevant		useful		very important		single most critical skill
1	2	3	4	5	6	7

A____ ability to work intimately with senior user managers

B____ broad view of company goals and operations

C____ cost consciousness, hardware and operational efficiency

D____ expertise in design of system type 1 (monitor)

E____ expertise in design of system type 2 (exception)   please refer to

F____ expertise in design of system type 3 (inquiry)   Definitions Page

G____ expertise in design of system type 4 (analysis)

H____ ability to work with ill-defined objectives and resolve conflict productively

I____ in-depth knowledge of user department's operations

J____ behavioral sensitivity to systems impacts on hands-on users

K____ project management skills (planning and control)

L____ strong user orientation, working with users, deliver systems users really like

M____ skills in organizational design, assessing system impacts on user departments

N____ dedication, hard work, and hustle

O____ estimating and rigid adherence to project costs and schedules

P____ leadership ability, administration experience, sensitivity to political issues

Q____ implementation planning, education, motivation, and training of users

R____ basic technical and software competence

S____ specialized expertise in programming

T____ specialized expertise in database management systems

U____ specialized expertise in operating systems and telecommunications

V____ attention to, and quality of, documentation

8. There is always a mixture of quantitative and qualitative benefits to a new DP system. Consider a proposal where quantitative costs and benefits break even but the qualitative benefits look very good. Please check the most accurate description of what would happen to such a proposal in your organization.

____ We would never submit such a proposal since everyone knows it would be rejected.

____ It would be rejected on formal criteria but we could get it forced through.

____ We would attempt to quantify the qualitative benefits, then it would be a struggle, but with DP's backing we would stand a reasonable chance.

____ After DP checked out the qualitative benefits to make sure they really were very good, the proposal would be easily approved.

9. Consider a typical DP project with the original estimates for development budget, development schedule, and net benefits per month posted below. Please post any revisions and the actual final results you consider typical.

	original estimate	first revision	second revision	actual final
budget (in $000)	100 ----->	----->	----->	
schedule (in months)	10 ----->	----->	----->	
benefits ($000 per month)	10 ----->	----->	----->	

10. Do you agree with the following statements about the differences between the "original estimate" and "actual final" totals that you posted above?

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A____ They are quite acceptable--indicative of good performance.

B____ They are reasonable given the uncertainties in the original estimate.

C____ They are due to user problems or inadequacies.

D____ They are due to DP problems or inadequacies.

E____ Revisions are justified--designs revised as we learn more about problems.

11. Do you have access to an on-line terminal? _____ (if no, skip to next question).

Do you use the terminal personally (or via an intermediary)? _____

How many sessions per week? _____ Average duration per session? _____(in hours)

You take an action triggered by a session how many times per week? _____

12. How many computer-printed reports do you receive per month? _____

Of this total, please post the number per month for each disposition listed.

____ wastebasket, without looking   ____ peruse the contents, then file

____ scan, then wastebasket   ____ study and analyze the contents

____ file, without looking   ____ peruse the contents, pass on

You take an action triggered by a report how many times per month? _____

Overall, what percent of the data in these reports is not useful to you? _____%

13. Are you against companies marketing the following <u>directly to you</u>?

strongly for		for		against		strongly against
1	2	3	4	5	6	7

A____ personal computers (e.g., microprocessor based, dedicated systems)

B____ computer hardware (e.g., minis or terminals)

C____ computer time (e.g., timesharing or batch)

D____ specialized application packages (e.g., cash management or MRP)

E____ generalized inquiry systems (e.g., Easytrieve, Mark IV, GIS, Ramis II)

F____ generalized analysis systems (e.g., Troll, Express, or IDMS)

G____ programming languages for users (e.g., APL, Basic or PASCAL)

H____ database management systems (e.g., Total, Cullinane, Image, IMS)

I____ office automation systems (e.g., word processing or electronic mail)

14. A. Please list the four systems you <u>most frequently</u> use in the left hand column below (for example, Accounts Payable or Bill of Materials).

   B. For each system you listed, use the scale below to indicate your opinion of:

   <u>Frequency</u>: your frequency of use (where many times every day is very high)

   <u>Importance</u>: the importance of the system to your department

   <u>Quality</u>: the overall quality of the system

   <u>Participation</u>: extent of your participation in its development or implementation

very low		low		high		very high
1	2	3	4	5	6	7

   C. Please refer to the Definitions Page. In the last two columns post <u>actual</u> DP system type (1 to 4) and the type it <u>should</u> be to meet your needs.

Systems Names	Frequency	Impor- tance	Quality	Partici- pation	actual type	should type
1. _____	____	____	____	____	____	____
2. _____	____	____	____	____	____	____
3. _____	____	____	____	____	____	____
4. _____	____	____	____	____	____	____

15. Every manager has dozens of tasks and decisions for which he/she is responsible. However, there are usually just a few which are <u>critical</u>.

   A. Could you please briefly describe your top four which are or could be supported by some type of system in the first column.

   B. Please refer to the Definitions Page and indicate the type of system support you <u>actually</u> have. Post type 1 to 4 under "actual"; use 0 for none.

   C. Please indicate for each: what type of system support you <u>should</u> have by posting type 1 to 4 under "should." (refer to the Definitions Page)

   D. If you listed any of these systems in the <u>preceding</u> question (14), please post the corresponding number under "Systems Names" from question 14 in the last column below.

	DP System Type		Xref
	actual	should	to Q14
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____

16. Consider all the systems you have or would like to have. Please indicate by DP system type (1 to 4) <u>how many</u> are in each category below.

	DP system type (see Definitions Page)			
	1 monitor	2 exception	3 inquiry	4 analysis
A. Already in use	_____	_____	_____	_____
B. Being designed, programmed, or implemented now	_____	_____	_____	_____
C. Project is approved but not yet begun (in backlog)	_____	_____	_____	_____
D. In proposal preparation or approval process	_____	_____	_____	_____
E. No proposal prepared, but necessary before five years	_____	_____	_____	_____
F. No proposal prepared, but desirable before five years	_____	_____	_____	_____

Section C

1. Please rate your own department on the following characteristics using this scale.

very low		moderate		high		very high
1	2	3	4	5	6	7

A___ reliance on DP for daily operations   H___ use of DP systems by managers

B___ workload placed on DP operations   I___ technical competence in DP areas

C___ cooperation in developing new systems   J___ willingness to use DP services

D___ capability to use DP services   K___ number of new systems requested

E___ participation in new system development   L___ patience dealing with DP problems

F___ sophistication of new systems requested   M___ project management skills for new systems development

G___ ability to define your systems needs clearly   N___ participation in defining goals and priorities for DP

2. This question refers to the support provided by DP to users for new systems proposal development. Indicate the degree of current availability of each aspect. Use the same scale for the level of support you think DP should provide to users.

no support		some support		quite a bit of support		extensive support
1	2	3	4	5	6	7

current	should		billed
___	___	recognizing potential areas for new DP systems	___
___	___	developing cost/benefit estimate of a new system	___
___	___	developing qualitative benefits of a new system	___
___	___	assessing technical feasibility of a new system	___
___	___	assessing organizational impacts of a new system	___
___	___	working the politics of proposal/budget approval	___

Do you think that these proposal development services should be billed to the user department? Use this scale to post your answers above under "billed."

no!		maybe		probably		yes!
1	2	3	4	5	6	7

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3. For each of the following statements please indicate the extent of your agreement.

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A_____ I'd rather forego a necessary system than get our DP department involved.

B_____ Users need an unbiased interdepartmental consultant.

C_____ There is a significant communications gap between DP and users.

D_____ In general DP systems are a waste of money, time and effort.

E_____ The things systems can do are unimportant compared to the real needs of my job.

F_____ We do not request as many new systems as we should because of DP's backlog.

G_____ DP gives too much priority to existing systems over developing new ones.

H_____ I am frustrated by the low priority DP gives to new systems for our department.

I_____ I seek out opportunities to get DP involved in helping to solve our problems.

J_____ In spite of the problems, systems are a necessary and important part of our department, performing major work and continuing to grow.

K_____ DP systems are important tools for improving the performance of our department.

L_____ I'll cooperate if required with a DP system scheduled to be implemented in my department but I have more important things to do.

M_____ In our company all DP should be centralized.

N_____ A user department should be allowed to establish its own DP shop whenever it is cost justified and determined to be better by users.

4. The existence, function and strength of DP Steering Committees is the subject of this question. Please indicate the actual and desired status of the DP Steering Committee in your organization.

non- existent		weak		strong		very strong
1	2	3	4	5	6	7

actual desired

_____ _____ reviewing DP's charter, objectives, and performance

_____ _____ approval and priority setting for new systems development

_____ _____ participation level of senior user managers

5. Do you agree with the following statements about the allocation of responsibilities between DP and user departments?

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A. Physical distribution and reporting relationship for DP operations (running existing systems and hardware):

_____ should be physically decentralized but report to the DP department

_____ should be physically decentralized and report to user departments

B. Reporting relationships of systems development personnel (business systems analysts, systems analysts, and programmers):

_____ each user department should have a designated liaison to DP

_____ DP should have a designated liaison for each user department

_____ each user department should have business systems analysts

_____ each user department should have systems analysts

_____ each user department should have programmers

_____ DP should (also) have a complete staff of system development personnel

C. Organizational responsibility for project management of new systems development:

_____ DP should be responsible for projects with heavy user participation

_____ users should be responsible for projects drawing on DP personnel as necessary

_____ DP should be responsible for all common systems (multiple user departments)

_____ interdepartmental committees should be responsible for all common systems

D. Whether or not operations, systems development personnel, and project management are centralized or decentralized, the central DP department should:

_____ be responsible for consolidated reporting and corporate staff needs

_____ provide independent internal consulting to users

_____ be responsible for corporate policy formulation and guideline development

_____ establish project approval criteria

_____ be responsible for common database contents, structure and integrity

_____ establish DP audit requirements and standards

_____ be responsible for keeping current with the technology and new practices

_____ integrate/create 3-5 year system plans

_____ coordinate human resource planning and development for DP personnel

_____ provide internal consulting to decentralized DP groups

6. Do you agree or disagree with the following statements concerning outside DP services (service bureaus, consultants, or software houses)?

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A____ If we had a really important system to develop we'd be better off to go to an outside service.

B____ The DP department in our organization should be the sole source of all computer related services for users.

C____ User departments should be allowed to have systems created by an outside service without the permission and guidance of the DP department.

D____ In competitive bids your DP shop should be the favored vendor over outside services.

E____ For systems created by an outside service, users should have the choice of running them outside, on their own computer, or on DP's computer.

F____ For systems created by DP, users should have the choice of running them outside, on their own computer, or on DP's computer.

G____ Our DP department may not be perfect but they are better than any outside service.

7. Should the DP department offer the following supplemental services?

definitely not		we should consider it		limited service		yes, definitely
1	2	3	4	5	6	7

A____ consultation on effective use of outside services

B____ consultation on acquisition of hardware or software packages

C____ development of office automation systems

D____ proposal development support

E____ user languages and access to computer power

F____ designated operations liaison for each user department

G____ clerical input processing "contracts" for designated systems

H____ support for dedicated minis or personal computers

I____ guidelines·for project management or system development for users

J____ manual work studies, paper flow analysis, clerical work studies

K____ microfilm, microfiche

L____ specialized group of analysts for quick and dirty, little systems

Please turn page.

C-5

8. Success has two components: priority and performance. A previous question asked about priorities. Please rate the <u>performance</u> of the DP department on these factors irrespective of priorities.

very poor		inadequate		good		excellent
1	2	3	4	5	6	7

A____ technical sophistication of new systems

B____ DP strategic planning and allocation of resources to key business areas

C____ responsiveness to user needs

D____ involvement of senior user managers in DP policy formulation and evaluation

E____ the new system request backlog

F____ technical competence of the DP staff

G____ the attitudes of DP personnel toward users

H____ quality of DP systems analysts

I____ data security and privacy

J____ development of system type 1 (monitor)

K____ development of system type 2 (exception)   please refer to

L____ development of system type 3 (inquiry)   <u>Definitions Page</u>

M____ development of system type 4 (analysis)

N____ training programs for users in general DP capabilities

O____ hardware and systems downtime

P____ efficiency of hardware utilization

Q____ the proportion of DP effort expended in creating new systems

R____ DP profitability (from chargeouts for services)

S____ report contents (relevance, currentness, flexibility, accuracy)

T____ running current systems (costs, ease of use, documentation, maintenance)

U____ availability and timeliness of report delivery to users

V____ appropriate DP budget size or growth rate

W____ DP support for users in preparing proposals for new systems

X____ user oriented systems analysts who <u>know</u> user operations

Y____ new system development (time, cost, quality, disruptions)

Z____ communication with managerial users

9. Considering the priorities <u>and</u> performances on <u>all</u> relevant factors, would you please rate the <u>overall success</u> of the DP department. Circle a number.

very poor		inadequate		good		excellent
1	2	3	4	5	6	7

THANK YOU VERY MUCH.

Part I

USER NEEDS SURVEY QUESTIONNAIRE

Robert M. Alloway

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Spring, 1979

Center for Information Systems Research

and

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Respondent _____ ____ ___ __ _____ __

Section A

Name _____	Approximate Number of Years in ....
Title _____	Years _____
Department _____	Years _____
Organization _____	Years _____

2. Total number of years you have been working: Years _____

   Of this total, how many years of <u>heavy</u> experience with computers?   _____

   And how many years of <u>light</u> experience with computers?   _____

3. If you have a college degree, year of graduation: Bachelors _____ Masters _____

4. In your <u>formal</u> education how extensive was your exposure to the following topics? Please post a number from this scale next to each topic in the column titled "formal."

none		some		a lot		very extensive
1	2	3	4	5	6	7

continuing	formal	
_____	_____	computer science or electrical engineering
_____	_____	operating systems and telecommunications
_____	_____	systems design and programming
_____	_____	on-line systems
_____	_____	database management systems
_____	_____	DP management issues
_____	_____	management science or operations research
_____	_____	organizational behavior and design
_____	_____	general business management
_____	_____	finance & accounting (all aspects)
_____	_____	manufacturing (all aspects)

In your <u>continuing</u> education programs (including courses, seminars and workshops) how extensive was your exposure to the topics above? Please use the same scale to post your responses in the column headed "continuing."

5. Post the number from this scale which best represents your agreement with the
following statements about the general attitude of user <u>managers</u>.
They believe...

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A____ the computer is limited to doing the same work faster.

B____ the computer is inappropriate for semi-structured, judgmental activities.

C____ the computer accentuates the alienation and devaluation of industrial man.

D____ the computer makes jobs more interesting and challenging.

E____ the computer increases the productivity of workers and clerical personnel.

F____ the learning threshold with computers is greater than its potential benefits in their jobs.

G____ the computer is confined to large volume, clerical, cost-saving applications.

H____ that, properly used, computers can increase the effectivness of senior managers.

I____ To be blunt about it, they simply don't like computers.

6. What most frustrates user managers (even though they may understand why the
situation occurs)? They are frustrated by...

no bother		hassle		frustrating		extremely frustrating
1	2	3	4	5	6	7

A____ the "red tape" in getting <u>little</u> systems created.

B____ the "red tape" involved in getting system proposals approved.

C____ the low priority DP gives to new systems for their department.

D____ the delay (due to backlog) before new systems get started.

E____ the bugs in systems when first installed.

F____ the continual maintenance changes to existing systems.

G____ the difficulty getting proposals based on qualitative benefits approved.

H____ the attitude and/or jargon of most DP people.

I____ the communications gap between DP and themselves.

J____ their lack of control over DP charges for running current systems.

K____ the high cost and long development time for new DP systems.

L____ their lack of direct personal access to flexible computer power.

M____ inadequate systems documentation (user understandable, complete, current).

7. This question asks about <u>actual</u> and <u>desired</u> levels of involvement of <u>DP</u> and <u>user</u>
   personnel in the process of new systems development in your organization. Using
   the following scale, first post <u>actual</u> levels of involvement for all stages, then
   post <u>desired</u> levels.

no involvement		some involvement		a lot of involvement		total involvement
1	2	3	4	5	6	7

actual involvement		Stages	desired involvement	
DP	user		DP	user
_____	_____	needs recognition	_____	_____
_____	_____	proposal development	_____	_____
_____	_____	project approval and priority	_____	_____
_____	_____	functional specifications	_____	_____
_____	_____	detailed specifications	_____	_____
_____	_____	programming and systems test	_____	_____
_____	_____	implementation and training	_____	_____
_____	_____	evaluation and maintenance	_____	_____
_____	_____	running operational systems	_____	_____

8. Please indicate the extent of your experience in each aspect of the four DP system
   types (see Definitions Page) by completing the matrix below using this scale.

none		some		a lot		extensive
1	2	3	4	5	6	7

Definitions Page for DP System Types

type 1 monitor	type 2 exception	type 3 inquiry	type 4 analysis	
_____	_____	_____	_____	needs recognition
_____	_____	_____	_____	proposal development
_____	_____	_____	_____	project approval and priority
_____	_____	_____	_____	functional specifications
_____	_____	_____	_____	detailed specifications
_____	_____	_____	_____	programming and systems test
_____	_____	_____	_____	implementation and training
_____	_____	_____	_____	evaluation and maintenance
_____	_____	_____	_____	running operational systems

9. In your opinion what <u>should be the priority level</u> in the DP department for each of the following?

irrelevant		possibly useful		important		very critical
1	2	3	4	5	6	7

A____ communications with managerial users

B____ efficiency of hardware utilization

C____ hardware and systems downtime

D____ training programs for users in general DP capabilities

E____ data security and privacy

F____ quality of DP systems analysts

G____ the attitudes of DP personnel toward users

H____ technical competence of the DP staff

I____ the new system request backlog

J____ developing more systems of type 1 (monitor)

K____ developing more systems of type 2 (exception)   please refer to

L____ developing more systems of type 3 (inquiry)   <u>Definitions Page</u>

M____ developing more systems of type 4 (analysis)

N____ involvement of senior user managers in DP policy formulation and evaluation

O____ responsiveness to user needs

P____ DP strategic planning and allocation of resources to key business areas

Q____ increasing the proportion of DP effort expanded in creating new systems

R____ technical sophistication of new systems

S____ improving new systems development (time, cost, quality, disruptions)

T____ user oriented systems analysts who <u>know</u> user operations

U____ DP support for users in preparing proposals for new systems

V____ appropriate DP budget size or growth rate

W____ availability and timeliness of report delivery to users

X____ running current systems (cost, ease of use, documentation, maintenance)

Y____ report contents (relevance, currentness, flexibility, accuracy)

Z____ DP profitability (from chargeouts for services)

10. Please circle the number on the following scale most representative of your annual salary.

$10,000		$30,000		$50,000		$70,000
1	2	3	4	5	6	7

Section B

1. This question refers to the content of proposals for new DP systems. Please use
the following scale to indicate how necessary each potential segment is for a
proposal to get approved.

not necessary		desirable		required		mandatory in detail
1	2	3	4	5	6	7

technical feasibility	economic feasibility	organizational feasibility
A____ technically do-able	F____ DP development costs	L____ impact on users
B____ software do-able	G____ user development costs	M____ clerical job enrichment
C____ DP staffing	H____ DP operating costs	
D____ operations and hardware impacts	I____ user operating costs	N____ organizational change planning
	J____ "hard" benefits	O____ implementation planning
E____ project design	K____ "soft" benefits	

2. This question refers to the project approval process for new systems given
completed proposals. Please rate the importance of each potential dimension in
approving proposed systems.

of no importance		some importance		very important		the sole determining factor
1	2	3	4	5	6	7

A____ return on investment (cost/benefit)   I____ urgency of user need

B____ overall risk of failure   J____ fit with DP development plan

C____ company politics   K____ degree of user commitment

D____ impact on DP resources   L____ interest/challenge to DP staff

E____ DP portfolio balance   M____ degree of impact on users

F____ uncertainty of objectives   N____ users' efficiency increase

G____ qualitative or soft benefits   O____ users' effectiveness increase

H____ top management emphasis   P____ adaptability of organization
                                         to environmental changes

3. If you could demonstrate hard dollar cost savings for a new DP system, what level
of Return on Investment would be necessary to get easy approval?   _____ %

4. Please rate the amount of influence each of the following people have on the project approval decision.

no influence		some influence		a lot of influence		the sole decision maker
1	2	3	4	5	6	7

A ___ DP Steering Committee   E ___ corporate budget committee

B ___ DP (Vice-President)   F ___ primary user (Vice-President)

C ___ Systems Development (Manager) G ___ primary user (Manager)

D ___ Programming (Manager)   H ___ secondary user (Manager)

5. In general, how much influence do you think the user departments actually have and should have on the following decisions? Post your answers in the columns below.

no influence		some influence		quite a bit of influence		a great deal of influence
1	2	3	4	5	6	7

actual   should

___   ___   establishing guidelines for the approval of proposed systems

___   ___   establishing priorities among all new system developments projects

___   ___   determining priorities among projects for their own departments

___   ___   determining the goals of projects when they are the primary user

___   ___   setting project budgets/schedules when they are the primary user

___   ___   helping set goals/budgets/schedules when they are a secondary user

___   ___   choice of DP personnel assigned when they are the primary user

6. We are interested in the availability of educational courses (DP and non-DP topics) and how supportive (arrangements and financial) your department is in providing access to such courses. Using the scale below, please indicate the current nature of the education program available in your department here _____

Now please indicate the type of educational program you think should be available by posting your response from the scale below here _____

no courses available		few courses no support		several courses some support		extensive program actively supported
1	2	3	4	5	6	7

7. What is the relative <u>importance</u> of the following skills for a DP <u>systems analyst</u>?

completely irrelevant		useful		very important		single most critical skill
1	2	3	4	5	6	7

A____ ability to work intimately with senior user managers

B____ broad view of company goals and operations

C____ cost consciousness, hardware and operational efficiency

D____ expertise in design of system type 1 (monitor)

E____ expertise in design of system type 2 (exception)   please refer to

F____ expertise in design of system type 3 (inquiry)   <u>Definitions Page</u>

G____ expertise in design of system type 4 (analysis)

H____ ability to work with ill-defined objectives and resolve conflict productively

I____ in-depth knowledge of user department's operations

J____ behavioral sensitivity to systems impacts on hands-on users

K____ project management skills (planning and control)

L____ strong user orientation, working with users, deliver system users really like

M____ skills in organizational design, assessing system impacts on user departments

N____ dedication, hard work, and hustle

O____ estimating and rigid adherence to project costs and schedules

P____ leadership ability, administrative experience, sensitivity to political issues

Q____ implementation planning, education, motivation, and training of users

R____ basic technical and software competence

S____ specialized expertise in programming

T____ specialized expertise in database management systems

U____ specialized expertise in operating systems and telecommunications

V____ attention to, and quality of, documentation

8. There is always a mixture of quantitative and qualitative benefits to a new DP system. Consider a proposal where quantitative costs and benefits break even but the qualitative benefits look very good. Please check the most accurate description of what would happen to such a proposal in your organization.

___ We would never receive such a proposal since everyone knows it would be rejected.

___ We would reject it on formal criteria but the user could get it forced through with enough power and influence.

___ They would attempt to quantify the qualitative benefits, then it would be a struggle, but with our backing it would stand a reasonable chance.

___ After we checked out the qualitative benefits to make sure they really were very good, the proposal would be easily approved.

9. Consider a typical DP project with the original estimates for development budget, development schedule and net benefits per month posted below. Please post any revisions and the actual final results you consider typical.

	original estimate	first revision	second revision	actual final
budget (in $000)	100 ----->	----->	----->	
schedule (in months)	10 ----->	----->	----->	
benefits ($000 per month)	10 ----->	----->	----->	

10. Do you agree with the following statements about the differences between the "original estimate" and "actual final" totals that you posted above?

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A____ They are quite acceptable--indicative of good performance.

B____ They are reasonable given the uncertainties in the original estimate.

C____ They are due to user problems or inadequacies.

D____ They are due to DP problems or inadequacies

E____ Revisions are justified--designs revised as we learn more about the problems.

11. Are you against companies marketing the following directly to user managers?

strongly against		against		for		strongly for
1	2	3	4	5	6	7

A____ personal computers (e.g., microprocessor based, dedicated systems)

B____ computer hardware (e.g., minis or terminals)

C____ computer time (e.g., timesharing or batch)

D____ specialized application packages (e.g., cash management or MRP)

E____ generalized inquiry systems (e.g., Easytrieve, Mark IV, GIS, Ramis II)

F____ generalized analysis systems (e.g., Troll, Express, or IDMS)

G____ programming languages for users (e.g., APL, Basic or PASCAL)

H____ database management systems (e.g., Total, Cullinane, Image, IMS)

I____ office automation systems (e.g., word processing or electronic mail)

12. Place an "X" next to the best descriptor of your current job in the list below.

Along which path do you want your career to develop? For your desired career path post a 1, 2, and 3 for the first, second, and third steps to the list of jobs below. The list has been split into two groups (within DP and other) but you may select any combination you prefer.

within DP department

A____ programmer

B____ systems analyst, same user area

C____ systems analyst, another user area

D____ user liaison

E____ technical staff

F____ consultant

G____ project manager, same user area

H____ project manager, another user area

I____ manager, technical staff

J____ manager, operations

K____ manager, planning staff

L____ manager, systems development

M____ vice president

in any user department

N____ liaison with DP

O____ systems analyst

P____ consultant

Q____ staff, member

R____ staff, manager

S____ staff, vice president

T____ line, member

U____ line, manager

V____ line, vice-president

W____ top management

in another company

X____ any user department

Y____ within DP department

Z____ consultant

13. Consider for a moment the career path you have just designated above. Do you agree or disagree with the following statements? Post a number from this scale next to each statement below.

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A____ I haven't decided yet what career path I really want.

B____ I am flexible--just as happy with a career path which differs from above.

C____ I am determined to achieve step 3 in my career path.

D____ I am determined to achieve step 2 in my career path.

E____ I am determined to achieve step 1 in my career path.

F____ Achieving step 1 is realistic for me within this organization.

G____ I expect to achieve step 1 within 12 months.

17. Obviously, a systems analyst should be all things to all people. But "when push comes to shove" there are just a few criteria on which your performance is really evaluated. Please indicate the true importance of each criteria below for <u>explaining promotions</u> in your DP department.

completely irrelevant		moderately important		important		extremely important
1	2	3	4	5	6	7

A____ ability to work intimately with senior user managers

B____ broad view of company goals and operations

C____ cost consciousness, hardware and operational efficiency

D____ expertise in design of system type 1 (monitor)

E____ expertise in design of system type 2 (exception)   please refer to

F____ expertise in design of system type 3 (inquiry)   <u>Definitions Page</u>

G____ expertise in design of system type 4 (analysis)

H____ ability to work with ill-defined objectives and resolve conflict productively

I____ in-depth knowledge of user department's operations

J____ behavioral sensitiviy to systems impacts on hands-on users

K____ project management skills (planning and control)

L____ strong user orientation, working with users, deliver systems users really like.

M____ skills in organizational design, assessing systems impacts on user departments

N____ dedication, hard work, and hustle

O____ estimating and rigid adherence to project costs and schedules

P____ leadership ability, administrative experience, sensitivity to political issues

Q____ implementation planning, education, motivation, and training of users

R____ basic technical and software competence

S____ specialized expertise in programming

T____ specialized expertise in database management systems

U____ specialized expertise in operating systems and telecommunications

V____ attention to, and quality of, documentation

18. How clear is it <u>which dimensions</u> you are evaluated on <u>and</u> their <u>relative priority</u>?

a true mystery		fuzzy		reasonably clear		crystal clear
1	2	3	4	5	6	7

19. How often do you get constructive feedback from your boss? _____per month

20. How often are you <u>formally</u> evaluated by your boss? _____ times per year

155 —

Section C

1. Please rate each user department on the following characteristics using this scale.

very low		low		high		' very high
1	2	3	4	5	6	7

Finance   Manufacturing

____   ____   A. reliance on DP for daily operations

____   ____   B. workload placed on DP operations

____   ____   C. cooperation in developing new systems

____   ____   D. capability to use DP services

____   ____   E. participation in new system development

____   ____   F. sophistication of new systems requested

____   ____   G. ability to define their systems needs clearly

____   ____   H. use of DP systems by managers

____   ____   I. technical competence in DP areas

____   ____   J. willingness to use DP services

____   ____   K. number of new systems requested

____   ____   L. patience dealing with DP problems

____   ____   M. project management skills for new systems development

____   ____   N. participation in defining priorities and goals for DP

2. How extensive is the support provided by DP to users for proposal development? Indicate current availability and the level of support DP should provide.

no support		some support		quite a bit of support		extensive support
1	2	3	4	5	6	7

current   should   billed

____   ____   recognizing potential areas for new DP systems   ____

____   ____   developing cost/benefit estimate of a new system   ____

____   ____   developing qualitative benefits of a new system   ____

____   ____   assessing technical feasibility of a new system   ____

____   ____   assessing organizational impacts of a new system   ____

____   ____   working the politics of proposal/budget approval   ____

Do you think that these proposal development services should be billed to the user department? Use this scale to post your answers above under "billed."

no!		maybe		probably		yes!
1	2	3	4	5	6	7

3. Do you agree with the following statements about the allocation of responsibilities between DP and user departments?

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A. Physical distribution and reporting relationship for DP operations (running existing systems and hardware):

____ should be physically decentralized <u>but</u> report to the DP department

____ should be physically decentralized <u>and</u> report to user departments

B. Reporting relationships of systems development personnel (business systems analysts, systems analysts, and programmers):

____ each user department should have a designated liaison to DP

____ DP should have a designated liaison for each user department

____ each user department should have business systems analysts

____ each user department should have systems analysts

____ each user department should have programmers

____ DP should (also) have a complete staff of system development personnel

C. Organizational responsibility for project management of new systems development:

____ DP should be responsible for projects with heavy user participation

____ users should be responsible for projects drawing on DP personnel as necessary

____ DP should be responsible for all common systems (multiple user departments)

____ interdepartmental committees should be responsible for all common systems

D. Whether or not operations, systems development personnel, and project management are centralized or decentralized, <u>the central DP department should</u>:

____ be responsible for consolidated reporting and corporate staff needs

____ provide independent internal consulting to users

____ be responsible for corporate policy formulation and guideline development

____ establish project approval criteria

____ be responsible for common database contents, structure and integrity

____ establish DP audit requirements and standards

____ be responsible for keeping current with the technology and new practices

____ integrate/create 3-5 year systems plans

____ coordinate human resource planning and development for DP personnel

____ provide internal consulting to decentralized DP groups

4. Do you agree or disagree with the following statements concerning outside DP services (service bureaus, consultants, or software houses)?

strongly disagree		disagree		agree		strongly agree
1	2	3	4	5	6	7

A____ If users had a really important system to develop they'd be better off to go to an outside service.

B____ The DP department in our organization should be the sole source of all computer related services for users.

C____ User departments should be allowed to have systems created by an outside service without the permission and guidance of the DP department.

D____ In competitive bids the DP shop should be the favored vendor over outside services.

E____ For systems created by an outside service, users should have the choice of running them outside, on their own computer, or on DP's computer.

F____ For systems created by DP, users should have the choice of running them outside, on their own computer, or on DP's computer.

G____ Our DP department may not be perfect but we are better than any outside service.

5. Should the DP department in your organization offer the following supplemental services?

definitely not		we should consider it		limited service		yes definitely
1	2	3	4	5	6	7

A____ consultation on effective use of outside services

B____ consultation on acquisition of hardware or software packages

C____ development of office automation systems

D____ prososal development support

E____ user languages and access to computer power

F____ designated operations liaison for each user department

G____ clerical input processing "contracts" for designated systems

H____ support for dedicated minis or personal computers

I____ guidelines for project management or system development for users

J____ manual work studies, paper flow analysis, clerical work studies

K____ microfilm, microfiche

L____ specialized group of analysts for quick and dirty, little systems

6. This question concerns the quality of relationships between various groups in DP---the amount of cooperation, ease of working relationships, mutual understanding of problems and objectives. (We realize you may not be directly involved in all of these relationships). Please complete the entire grid using this scale:

full unity of effort is achieved		somewhat better than average relations		somewhat of a breakdown in relations		couldn't be worse
1	2	3	4	5	6	7

Where no relationship exists (e.g., finance users do not interface with DP technical staff or applications maintenance is not a separate group), use an X.

7. Please rate the overall quality of each department or group listed below.

very poor		inadequate		good		excellent
1	2	3	4	5	6	7

A ___ applications maintenance   F ___ systems analysts

B ___ inut, KP, output   G ___ business systems analysts

C ___ hardware operations   H ___ programmers

D ___ technical staff   I ___ finance users

E ___ planning staff   J ___ manufacturing users

8. Success has two components: priority and performance. A previous question asked about priorities. Please rate the performance of the DP department on these factors irrespective of priorities.

very poor		inadequate		good		excellent
1	2	3	4	5	6	7

A____ technical sophistication of new systems

B____ DP strategic planning and allocation of resources to key business areas

C____ responsiveness to user needs

D____ involvement of senior user managers in DP policy formulation and evaluation

E____ the new system request backlog

F____ technical competence of the DP staff

G____ the attitudes of DP personnel toward users

H____ quality of DP systems analysts

I____ data security and privacy

J____ development of system type 1 (monitor)

K____ development of system type 2 (exception)   please refer to

L____ development of system type 3 (inquiry)   Definitions Page

M____ development of system type 4 (analysis)

N____ training programs for users in general DP capabilities

O____ hardware and systems downtime

P____ efficiency of hardware utilization

Q____ the proportion of DP effort expended in creating new systems

R____ DP profitability (from chargeouts for services)

S____ report contents (relevance, currentness, flexibility, accuracy)

T____ running current systems (costs, ease of use, documentation, maintenance)

U____ availability and timeliness of report delivery to users

V____ appropriate DP budget size or growth rate

W____ DP support for users in preparing proposals for new systems

X____ user oriented systems analysts who know user operations

Y____ new system development (time, cost, quality, disruptions)

Z____ communication with managerial users

9. Considering the priorities and performances on all relevant factors, would you please rate the overall success of the DP department. Circle a number.

very poor		inadequate		good		excellent
1	2	3	4	5	6	7