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OUTSIDE I/S SERVICES

Should users be prohibited, allowed or encouraged to "go outside" for their information services?

Robert M. Alloway

September 1982

CISR WP# 94

Sloan WP #1359-82

Center for Information Systems Research

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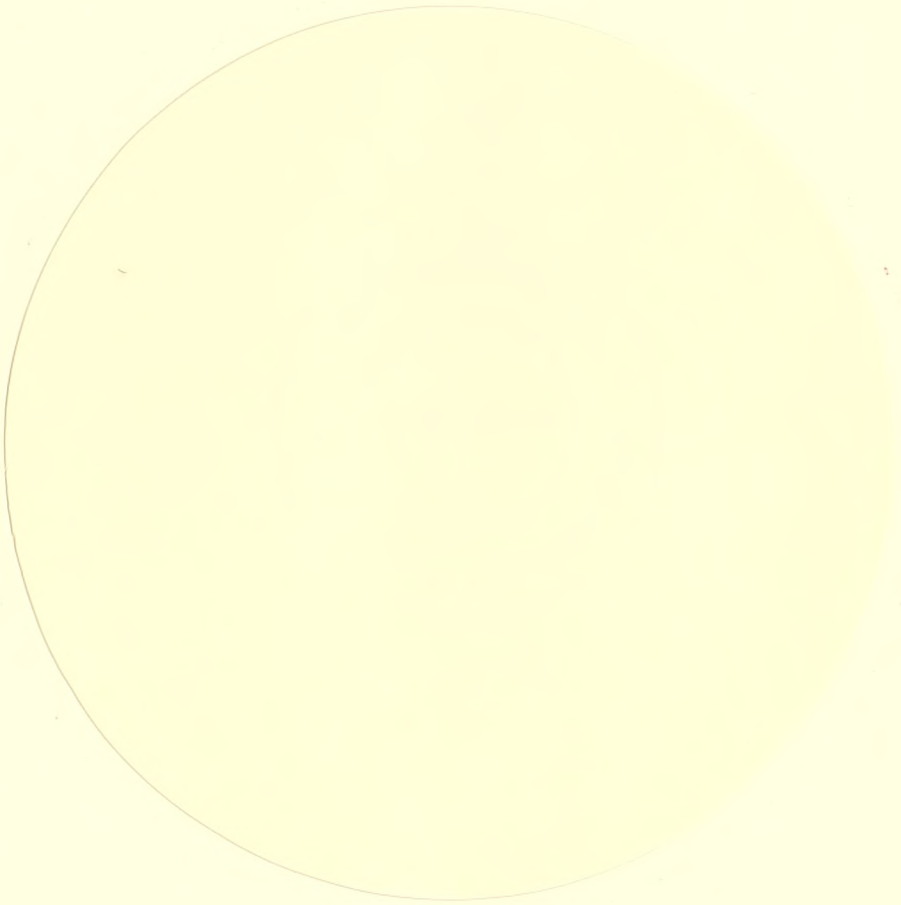

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INTRODUCTION

A recent survey of managers using computer-based information systems reveals some apparently conflicting opinions about obtaining information systems (I/S) services outside of their companies.

The majority of senior user managers felt strongly that their companies' I/S departments should *not* be their sole source of computer services. Yet, an even larger percentage did not *prefer* to use outside sources to develop their more important information systems.

Senior user managers were less than enthusiastic about the overall success of their I/S departments. Nonetheless, they preferred their I/S departments over outside vendors in competitive bidding.

User managers did not think their I/S departments were better than outside sources; however, when using an outside supplier, they strongly endorsed required technical assistance from their I/S departments.

Given these contradictory statements, what corporate policy should be established concerning the use of outside vendors?

SOURCE OF DATA

These contrasting attitudes were revealed in the User Needs Survey, a multi-company study conducted by Dr. Robert M. Alloway at the Center for Information Systems Research. The survey investigated the I/S needs of user managers, and their attitudes towards, and experience with, their I/S departments. Also studied were I/S department managers' views of their own departments and of user needs. The study was motivated by the desire to better understand the managers who are end-users of computer-based information systems and the issues involved in fulfilling their information needs.

One thousand managers from I/S, Finance, and Manufacturing departments of nineteen companies participated in the survey.

The companies formed a representative sample of the industrial sector. They differed in industrial classification, revenues, and corporate structure. Their I/S departments differed in size, structure, reporting relationship within the company, and proportion of budget to company's total revenues. See Figure 1.

The participating managers were chosen to fairly represent both managerial levels and job functions within their departments.

The User Needs Survey questionnaire was carefully designed and implemented to insure relevant, high quality data.[1]

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[1] For more information about the purposes and methodology of the User Needs Survey, see Alloway, Robert M., Bullen, Christine V., and Quillard, Judith A., "Overview of the User Needs Survey Research Project", CISR Working Paper 73, June 1981.

INDUSTRY CLASSIFICATION

- Paper, fiber and wood products
- Rubber, plastics products
- Chemicals
- Aerospace
- Communications
- Food processing
- Tobacco products
- Textiles
- Motor Vehicles
- Office equipment
- Control equipment
- Electronics

I/S BUDGET PERCENT OF REVENUES

Percentage Range	Number of Firms
2% - 3%	4
1% - 2%	5
0.5% - 1%	4
0.25% - 0.5%	6
	19

FIRM SIZE

Revenue Range	Number
$ 5 billion - $ 10 billion	2
$ 1 billion - $ 5 billion	6
$500 million - $ 1 billion	4
$100 million - $500 million	4
under $100 million	3
	19

NUMBER OF RESPONDENTS

Mgmt Levels	I/S	Mfg	Finance	Totals
1	26	18	18	62 (5.9%)
2	37	40	35	112 (10.6%)
3	96	115	84	295 (27.9%)
4	289	159	141	589 (100%)
Totals	448	332	278	1058 (100%)
	(42.3%)	(31.4%)	(26.3%)	

Figure 1. User Needs Survey Sample.

For the purpose of investigating corporate policy issues regarding the use of outside I/S services, the opinions of only the 111 senior user managers were selected.

Figure 2 lists seven key statements concerning internal and external source of I/S services and the percentages of senior user managers agreeing with them.

Only 44% of the senior user managers felt that their I/S departments were better than outside services. Despite this lack of enthusiasm, 74% of the senior user managers stated that they would not be better off to go outside to get a really important system. Evidently users do have some confidence in the basic competence of their I/S departments.

However, 65% of the user managers rejected I/S as their sole source of information systems. They do not want to be locked into a sole source for this or any other ingredient critical to their success. But, in competitive bidding between their I/S departments and outside vendors, 67% of the senior managers would favor their own I/S departments. In general, users find it more desirable to deal with I/S department members because they are already familiar with the company's existing systems, its needs, and its procedures.

Eighty-four percent of senior user managers felt that, if they decided to go outside for information systems, I/S department guidance should be *required*. Users recognize that they need their I/S department's technical expertise in evaluating and selecting outside competitive bids for I/S services.

Finally, senior user managers desired their I/S departments to retain responsibility for running information systems, whether internally created (69%) or obtained from outside sources (57%).

Senior user managers had a generally positive view of their I/S departments:

1. They preferred their I/S departments as developers of important systems.

2. They favored their I/S departments in competitive bidding with outside suppliers.

3. They desired I/S department guidance in obtaining information systems from outside sources.

4. They were satisfied to let their I/S departments run all systems, whether developed inside or outside.

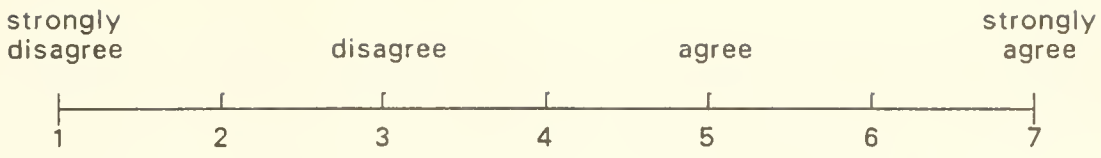
Nevertheless, these same senior managers

5. rated the success of their I/S departments as mediocre

6. rated their I/S departments below outside sources

7. insisted on access to outside suppliers.

With such ambiguous feedback, how can corporate management decide whether users should be prohibited, allowed, or encouraged to go outside for information systems?



		Percent of Managers *
1.	Our I/S department may not be perfect but it is better than any outside service.	44% agree †
2.	We would be better off to go outside for really important information systems.	74% disagree
3.	Our I/S department should be the sole source of all computer related services for users.	65% disagree
4.	Our I/S department should be the favored vendor over outside sources in competitive bidding.	67% agree
5.	User departments should not be allowed to have systems created by an outside service without I/S department guidance.	84% agree
6.	For systems created by an outside service, users should have the choice of running them outside, on their own computer, or on an I/S department computer.	69% disagree
7.	For systems created by the I/S department, users should have the choice of running them outside, on their own computer, or on the I/S department computer.	57% agree

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* The data on these responses was taken from "Alternatives for Data Processing", an unpublished Master's thesis written by Otis J. Ambrose under the supervision of Dr. Robert M. Alloway at M.I.T.'s Sloan School of Management.

† Agreement is defined as a response of five or greater. Disagreement is defined as a response of three or less.

Figure 2. Management Opinions on Outside I/S Services.

EXPLANATORY FACTORS: I/S DEPARTMENT STRENGTHS AND WEAKNESSES

Analysis reveals that each of the preceeding opinions reflects specific I/S department strengths and weaknesses and that the users' views are actually internally consistent. Pinpointing these strengths and weaknesses will enable us to recommend how and when users should use outside suppliers for information systems.

There are five explanatory factors:

1. I/S strengths in transaction processing;
2. I/S strengths in technical and operational areas;
3. I/S weaknesses in managerial support systems;
4. User appropriateness of managerial support systems;
5. User demand for new systems.

Although they are interrelated, each factor will be discussed separately, then the apparent conflicts in senior user opinions will be resolved drawing upon these explanatory factors.

Before proceeding, it is necessary to describe the classification of systems used in the User Needs Survey. Computer systems were grouped into two main categories -- transaction processing systems and managerial support systems. These categories were further subdivided into four types of systems -- monitor, exception, inquiry, and analysis.[2] The four system types are defined below.

Transaction Processing Systems

monitor — the system *monitors* daily detail activity producing standard reports on a *fixed* schedule (daily, weekly, or monthly).

exception — the system processes daily detail activity but produces *exception* reports where the definition of *exception conditions is fixed*.

Managerial Support Systems

inquiry — the system provides a database with *flexible* inquiry capacity enabling *managers* to design and change their own monitoring and exception reports.

analysis — the system provides powerful *data analysis* capabilities (modeling, simulation, optimization, or statistical routines) and the appropriate database to support *managerial* decision making.

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[2] See Alloway, Robert M. and Quillard, Judith A., "User Managers' System Needs", CISR Working Paper #86, April 1982, for a complete discussion of system types.

I/S Strengths in Transaction Processing

Strengths and weaknesses were clearly revealed when I/S and user managers rated their I/S departments on the twenty-six success criteria specified in the User Needs Survey. For the purpose of measuring the overall success of I/S, the opinions of all 1058 user and I/S managers were analyzed. Figure 3 lists the twenty-six criteria in descending order of average success.[3] I/S departments were weak in creating some types of information systems and strong in developing others. Both I/S and user managers agreed that I/S departments were good in developing monitor systems (Criterion 1) and acceptable in producing exception systems (Criterion 9). In contrast to strengths in transaction processing, they rated I/S departments as inadequate in developing inquiry and analysis systems (Criteria 22 and 25).

I/S Strengths in Technical and Operations

The success ratings in Figure 3 have been divided into four quartiles. The criteria in the top quartile, the area of highest success, pertain to technical matters -- technical competence of I/S staff, technical sophistication of new systems, etc. Development of monitor systems heads the list. Criteria in the second quartile relate to the general category of operations -- report contents, report timeliness, running current systems, etc. Operations is the second most successful I/S function, and development of exception systems appears within this quartile.

I/S Weakness in Managerial Support Systems

The third quartile consists of I/S management issues -- department planning, resource allocation, and responsiveness to user needs. The lowest quartile is clearly composed of criteria relating to the development of managerial support systems.

The interrelationships of the various criteria in the fourth quartile are clear. Increasing the supply of inquiry and analysis systems would help reduce the new systems request backlog. However, this reduction would also require improving the new sytems development process, involvement of systems analysts who know user operations, and training users in general I/S capabilities. Historical carryforward helps to perpetuate the I/S weakness in creating managerial support systems. Eighty percent of all implemented systems are transaction processing systems, hence I/S personnel have relatively little experience in creating managerial support systems.[4] Familiarity with transaction processing systems and unfamiliarity with managerial support systems tend to cause users and I/S staff to propose the development of transaction processing systems when often managerial support systems would be more appropriate. Failure to define correctly the type of system needed also results in loss of opportunity to gain experience in developing managerial support systems. Thus, I/S personnel and users are caught in a vicious cycle.

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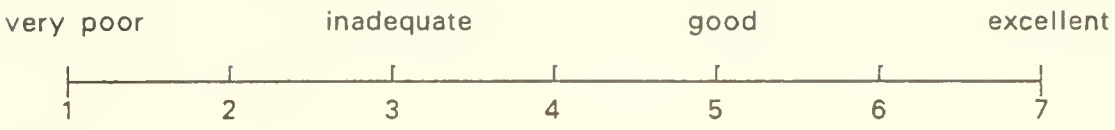
[3] See Alloway, Robert M., and Quillard, Judith A., "Top Priorities for the Information Systems Function", CISR Working Paper 79, September 1981.

[4] The exact figures are -- 63% monitor, 16% exception, 12% inquiry, and 9% analysis. See "User Managers' Systems Needs," op cit.



SUCCESS	CRITERIA	DESCRIPTION
5.01	1	Developing more Monitor systems
4.99	2	Technical competence of the I/S staff
4.85	3	Quality of I/S systems analysts
4.80	4	Data Security and privacy
4.71	5	Technical sophistication of new systems
4.56	6	Report contents
4.56	7	Availability and timeliness of report delivery to users
4.56	8	Efficiency of Hardware utilization
4.54	9	Developing more exception systems
4.52	10	The attitude of I/S personnel toward users
4.43	11	Running current systems
4.32	12	Hardware and systems downtime
4.28	13	I/S profitability
4.26	14	I/S support for users in preparing proposals for new systems
4.25	15	Appropriate I/S budget size or growth rate
4.24	16	Communication with managerial users
4.22	17	Technical competence of the I/S staff
4.19	18	I/S strategic planning and allocation of resources to key business areas
4.13	19	Responsiveness to user needs
3.98	20	Improving new systems development
3.97	21	User oriented systems analysts
3.94	22	Developing more inquiry systems
3.78	23	Involvement of senior user managers in I/S policy
3.72	24	The new system backlog
3.57	25	Developing more analysis systems
3.27	26	Training programs for users in general I/S

Figure 3. I/S Success ratings by criteria.

User Appropriateness of Managerial Support Systems

Not only is the creation of managerial support systems an I/S department weakness, but in addition, the proportion of managerial support systems within the total systems demand is increasing. One reason for the increase is that managerial support systems, particularly analysis systems, are more appropriate for users' critical tasks than transaction processing systems.

Our survey demonstrated that analysis systems are the most appropriate type for managers' important tasks, however, they form the smallest portion of the systems actually implemented for those tasks.[5]

We asked users to list by name systems that they used for their most important tasks, activities or decisions. These systems were then classified by type and evaluated for their appropriateness to the tasks for which they were used. The results are shown in Figure 4. Out of a total of 991 systems implemented to support critical tasks only 129 were of the analysis type. However, 119 of these systems, or 92%, were appropriate for those tasks. Contrast these figures with those for monitor systems. They constitute almost two-thirds of the systems implemented for critical tasks, 608 out of 991. However, only 53% of the monitor systems are appropriate. The 52% appropriateness rating for exception systems is almost the same, whereas inquiry systems show a pattern closer to that of analysis systems -- 69% of the inquiry systems implemented for critical tasks were appropriate.

User demand for New Systems

The final element in the picture is overall systems demand. Total demand for information systems (the systems request backlog plus current need) far exceeds the I/S departments' capacities to supply; total demand is 274% of the information systems now being developed. See Figure 5, which shows new systems demand by type. These further confirm that the greatest gap is in managerial support systems development. The total demand for monitor and exception systems is 193% and 212% greater than capacity (systems currently being developed). In contrast, demand exceeds supply by 331% for inquiry systems and 524% for analysis systems.

RECONCILIATION OF APPARENT CONTRADICTIONS IN USERS' VIEWS

We can now resolve the apparently contradictory statements by senior user managers about obtaining I/S services outside of their companies by relating each statement to the I/S strength or weakness it reflects.

Only 44% of the senior user managers felt that their I/S departments were better than outside sources. User managers were unenthusiastic about their I/S departments' success, especially in the development of more inquiry and analysis systems. Aggravating the weakness in managerial support systems development is the large systems request backlog and the increasing proportion of these systems in user

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[5] For the purpose of analyzing the appropriateness of the four systems types for managers' most critical tasks, the opinions of all 610 user managers were analyzed.

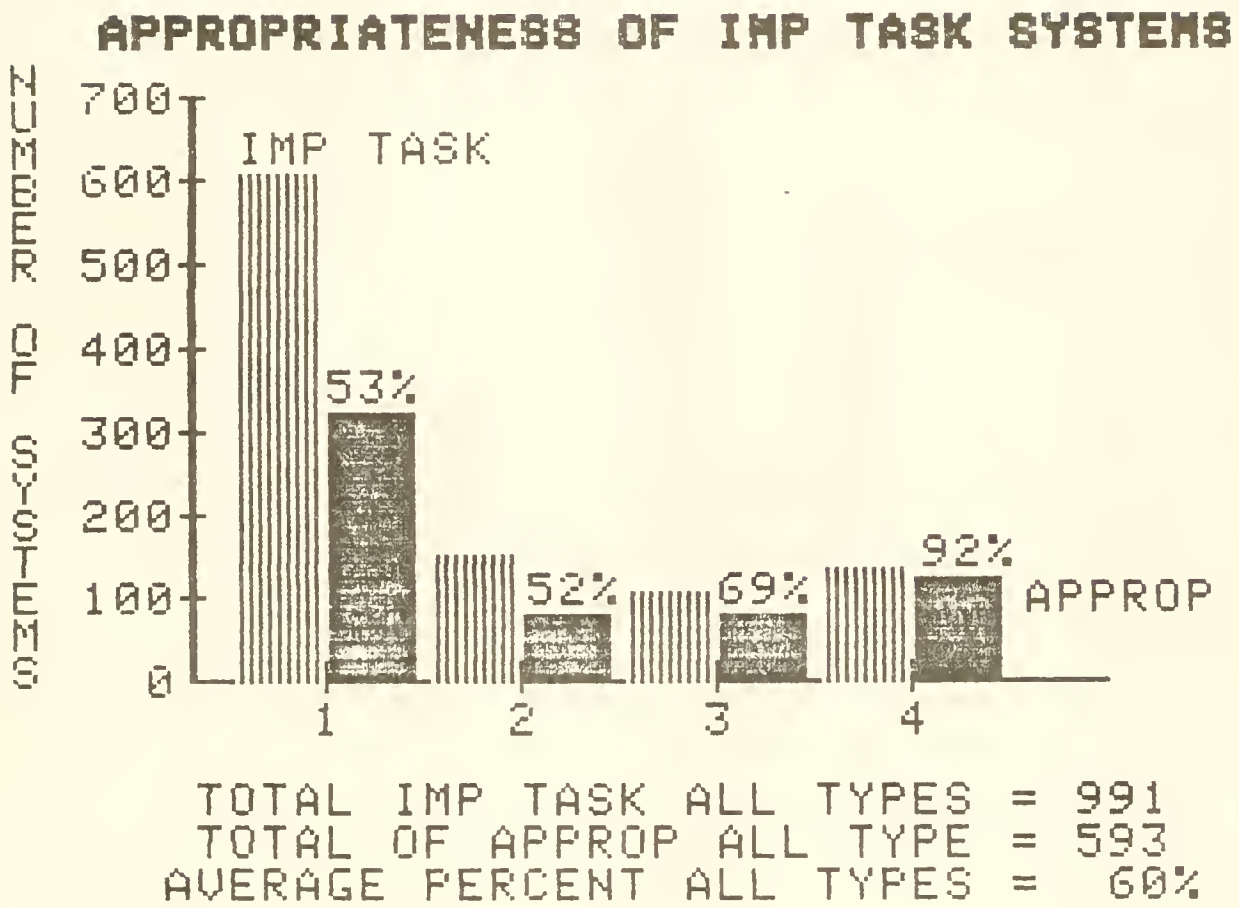

Figure 4. Appropriateness of Important Task Systems.

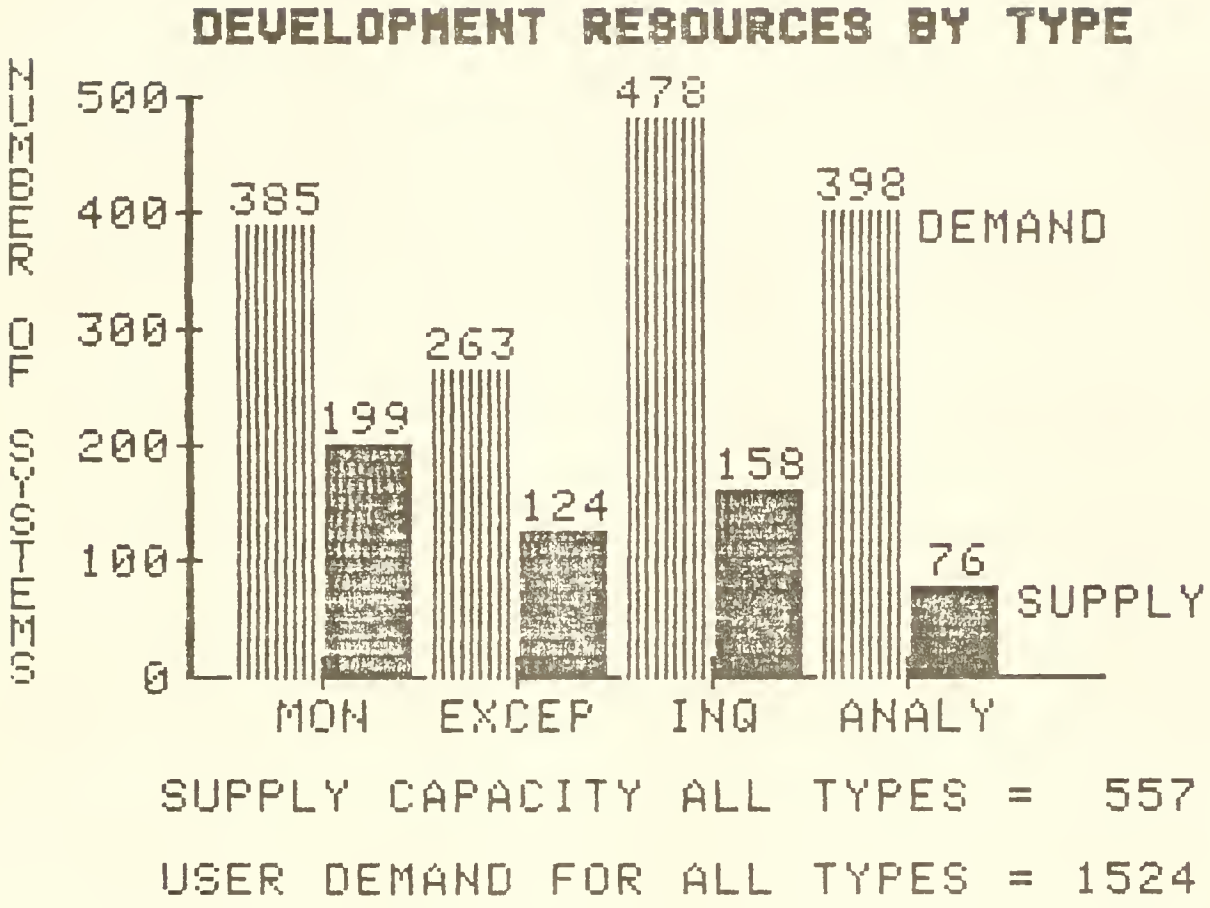

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Figure 5. Supply and Demand differences by Systems Type.

demand. Demand exceeds supply by 331% for inquiry systems and 524% for analysis systems.

On the other hand, users were not completely negative about their I/S departments because of their strengths on technical and operation criteria including the development of transaction processors, monitor and exception systems.

Indeed, most of the senior managers said that they would not be better off to go outside for their more important systems. They said this because most of the systems that appropriately supported their critical tasks were monitor systems, and their I/S departments' greatest strength is in developing more monitor systems.

The reasons that a sizeable majority of user managers nevertheless wanted access to outside suppliers are the enormous excess of system demand over I/S department capacity to supply and the increasing proportion of demand for managerial support systems, in which I/S departments have their least proficiency.

User managers did favor their I/S departments in competitive bidding with outside sources because of I/S department technical and operational competence (including success in developing transaction processing systems) and because of I/S's familiarity with company needs, procedures, and systems.

Recognized I/S technical expertise was again the reason that user managers did not want to go to outside sources without I/S department guidance. In negotiations with outside I/S suppliers, it is definitely helpful to have an I/S technical expert on your side.

Finally, senior user managers wished their I/S departments to run all implemented systems, whether obtained inside or outside, because of I/S's demonstrated success in operations.

The responses of the senior user managers are indeed internally consistent. The different views accurately represent different aspects of systems needs and their I/S departments' recognized strengths and weaknesses. We removed the source of apparently conflicting opinions when we related these issues to success by systems type. Then we could see that user managers were not contradicting themselves when they said they would no be better off going outside for important systems but they still wanted access to outside suppliers: they were happy with I/S development of monitor systems, an I/S strength, but they needed outside suppliers for managerial support systems, highly appropriate for important managerial tasks, but an I/S department weakness.

RECOMMENDATIONS AND THEIR BENEFITS

With the apparent contradictions explained, the practical question of outside services still remains -- who should develop which systems, what should be done about the backlog, and particularly managerial support systems. Should I/S departments concentrate on their strengths, producing monitor and exception systems, and leave the development of inquiry and analysis systems to outside suppliers? No, that would be self-defeating in the long run. Managerial support systems will form the majority of future systems development; therefore, I/S departments must achieve expertise in developing them. In the meantime, the demand must be fulfilled.

The question remains -- which systems should be created internally and which externally? Fortunately, the answer requires only the familiar "make-or-buy" analysis. A scheme for make-or-buy decisions is shown in Figure 6.

The system demand range in Figure 6 extends from the most standard transaction processing systems to unique managerial support systems. This diagram is a rough representation of systems characteristics -- the most standard systems usually are structured transaction processing systems, and unique systems usually are semi-structured managerial support systems. By "structured" is meant an ordered set of procedures, each of which can be tested for validity. Not all the procedures in a semi-structured set can be so tested.[6] A payroll system is an example of a standard, highly structured transaction processing system. A sales forecasting system is an example of a semi-structured managerial support system; though the purpose of such a system is clear, the selection and relative weights of the various factors cannot be proven correct. Furthermore, each sales forecasting system is unique to its company. To be more precise -- the majority of transaction processing systems are structured, but some are unique. The majority of managerial support systems are semi-structured and unique but some are standard.

It would make sense to buy "off-the-shelf" software packages to fill highly structured systems requirements for the most standard systems (usually transaction processing systems). Purchase of software packages which require minimum customization would be both faster and cheaper. I/S personnel would be freed to devote time otherwise spent "reinventing the wheel" to gaining competence in managerial support systems development.

At the other end of the demand range are very unique systems. These should also be obtained outside. It makes no sense for the I/S department to develop competence in a once-only application area. The time gained can again be shifted to more significant parts of the workload, and users will get what they need without going through the in-house backlog delays.

Looking at the middle of the range, the largest volume of demand for both transaction processing and managerial support systems are not especially standard nor unique. These systems should be developed in-house. However, demand exceeds supply by such a large margin that many of these systems should also be procured outside -- simply for peak-load relief. An additional source of peak-load relief is user-developed systems. It is estimated that up to 40% of the easier Exception, Inquiry and Analysis systems can be developed by users with appropriate support and facilities provided by the I/S department.

That leaves the bulk of systems development, both transaction processing and managerial support systems, to be developed in-house by I/S. The transaction systems portion of in-house development can be done most efficiently there, whereas, the managerial support systems portion is retained in order for I/S departments to build expertise.

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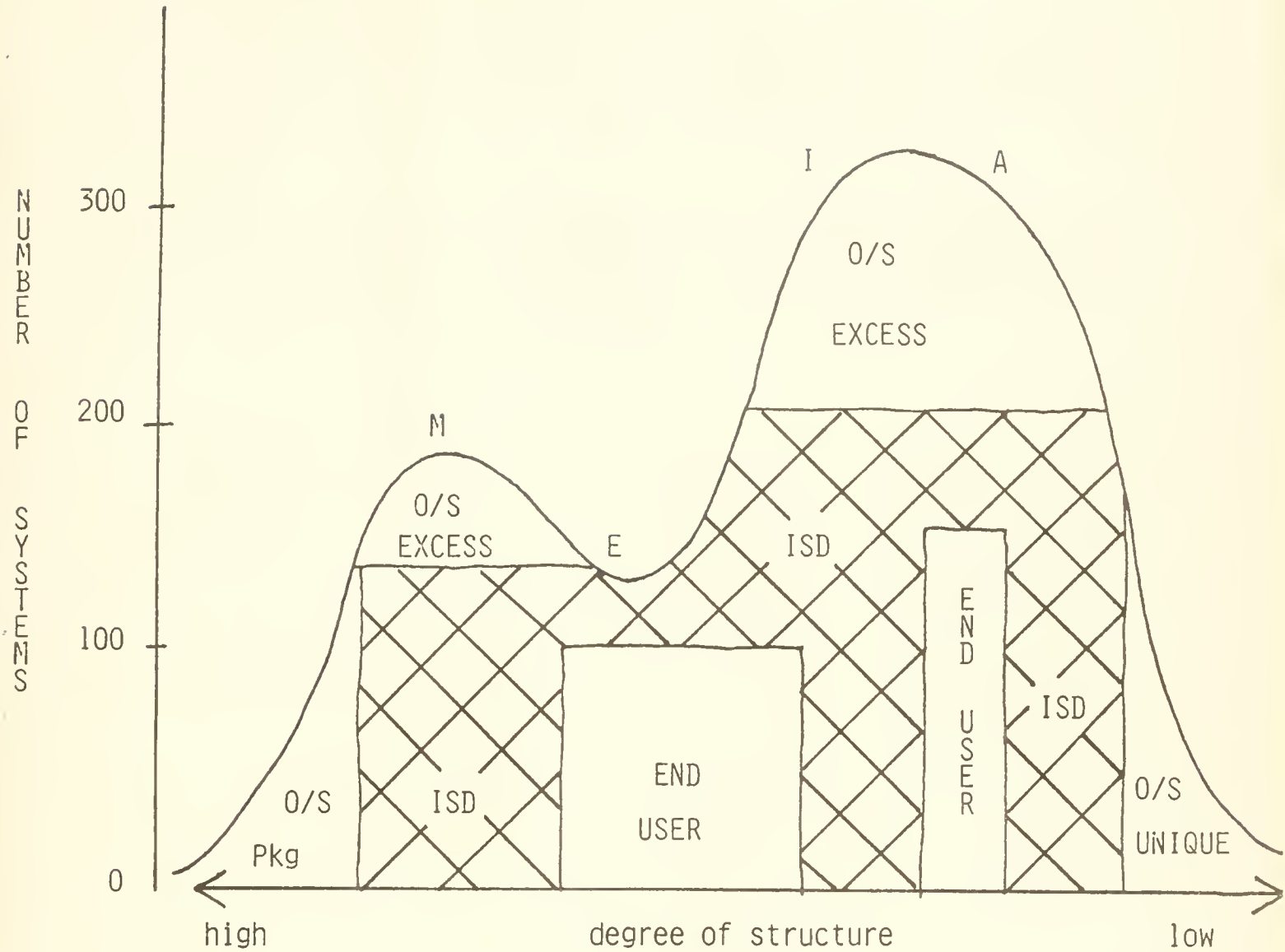
[6] Keen, P.G.W. and Scott Morton, M.S. Decision Support Systems: An Organizational Perspective , Addison-Wesley, 1978.



*Number of Systems Users Demand minus I/S Capacity to Supply Equals Supply Shortfall

Figure 6. Recommended Sources by Systems Type.

Expansion of the I/S Department Consulting Function

The foregoing assumes that decisions on where and how systems are to be obtained must involve the I/S department. I/S is responsible for the appropriateness, quality, and compatibility of *all* the company's systems wherever they are developed. Furthermore, users should not be allowed to go to outside sources without I/S department guidance. As shown in the success ratings, they recognize the I/S staff's technical expertise.

Consequently, the I/S department must expand its internal consulting function. For each new systems request, the I/S department must determine the type of system needed and recommend make-or-buy. Lack of informed judgement might well result in a wrong "make-or-buy" decision as well as creation of an inappropriate system (of which there are already too many). When the decision is to buy, the I/S department must help users to evaluate outside bids.

Advantages for the I/S Department

By acting as an internal systems procurement consultant the I/S department can:

- Choose to do those projects that will build the I/S department's expertise.
- Transfer to outside sources those projects it can do least effectively.
- Speed up delivery of systems in general, reducing the backlog.
- Reduce the backlog and associated delays by facilitating user-developed systems.
- Ensure compatibility with existing systems and adherence to the I/S department's systems architecture by providing technical guidance to users and technical specifications to outside vendors.
- Lower maintenance costs by use of software packages for structured transaction processing applications.
- Improve performance in managerial support systems development (currently a key weakness).

All these actions will enhance the success and reputation of the I/S department among users and throughout the company. Furthermore, users' exposure to outside sources will enable them to better appreciate the proficiency of the own I/S departments.

Advantages for Users

Clearly users should, as they desire, obtain some of their information systems from outside sources. However, they should do so only in consultation with the I/S department. I/S guidance will help assure that users obtain appropriate systems and will insure compatibility with internally developed systems. As a result of I/S guided purchases, users will get a higher proportion of inquiry and analysis systems

than the I/S department can now supply. With the I/S department running all implemented systems, whether internally or externally developed, users will avoid operational dependence on outside vendors over whom they have no control. Furthermore, with I/S responsible for all computer operations (which does not imply physical centralization of computer equipment) greater privacy and security can be insured.

CONCLUSION

The senior user managers in the nineteen corporations which participated in the User Needs Survey clearly expressed their opinions on the issues of outside I/S services. On the surface these opinions appeared to be contradictory, leaving management with no clear policy position. However, when the strengths and weaknesses of I/S are considered as explanatory factors, senior users managers' opinions are seen as practical and consistent attempts to have their systems needs fulfilled. On this basis, a realistic and effective corporate policy for outside I/S services can be formulated to the benefit of both I/S and users.

Companies should not only allow but encourage user departments to seek information systems from outside sources with *required* I/S department consulting and support. The results will be to develop in-house I/S expertise in areas where it is needed by relieving I/S of work more effectively done outside; to strengthen the I/S department's delivery of services it can perform competitively with outside vendors; and to develop the I/S department's consulting function, which is strongly desired by its users. The growth in consulting will ultimately decrease friction between the I/S department and users because I/S will be thoroughly involved in setting the criteria for obtaining systems from outside vendors. Furthermore, the establishment of a consulting relationship between the I/S department and users will necessarily promote managerial communication, facilitate needs recognition, and decrease the number of inappropriate systems.

3-23-83

Date Due