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A SURVEY OF SOFTWARE BUYING FOR DECISION
SUPPORT SYSTEMS: THE IMPLICATIONS FOR MARKETERS

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A Survey of Software Buying for Decision

Support Systems: The Implications for Marketers

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ABSTRACT

The computer software market is characterized by rapid growth, fragmentation and new technologies. This paper reports a descriptive study of the software buying process in large firms. The results obtained pertain to the persons involved in the decision making process, to the sources of information used and to the importance of various selection criteria. A framework of software buying and marketing implications forms the basis for a discussion of software marketing strategies.

INTRODUCTION

Software plays an important role in the successful implementation of a decision support system (DSS). Furthermore, software costs, as a percentage of total DSS costs, have been increasing over time and this trend is expected to continue (Sanders 1982). As more emphasis is placed on software, it is necessary to concentrate on the software buying process that takes place in organizations. A common problem for companies is selecting appropriate software from the rapidly growing number of packages available. Marketing managers also face problems devising strategies and tactics in a market characterized by rapid growth, fragmentation and new technologies. To be successful, marketers require information about the software buying behavior of companies.

From a marketing perspective there are relatively few studies describing the purchasing behavior of software products. The literature has tended to be normative, rather than descriptive of firm buying behavior. One example of a descriptive study, however, is a Barron's (1985) survey. While Barron's results provide computer hardware and software firms with information that could be valuable to their marketing efforts, the information pertaining to software purchasing behavior is brief and the emphasis is on computer hardware. To improve the effectiveness of software marketing decisions it is useful to have some further knowledge of purchasing decision rules (Viyas and Woodside 1984). As Cady (1985) indicates, marketers in the information industry must find some focus for their promotional efforts, product development and pricing decisions.

In response to the need for descriptive knowledge of software buying behavior, in this paper we report a study which is descriptive of large firms and their software purchasing behavior. The purpose of the study is.

to examine the process of software buying in large North American firms. We investigate various aspects of the buying process such as the selection duration, the persons involved in the different stages of the process, the sources of information used and the importance of selection criteria. While the study is positive rather than normative, the results do suggest some implications for marketers. These are discussed in the latter part of the paper. First, we review the relevant literature and describe the research study and its results.

SOFTWARE BUYING BEHAVIOR: BACKGROUND

Software is classified into two general categories: systems software and applications software (O'Brien 1983). Systems software consists of programs which control and support the computer system and its data processing activities. Such software includes operating systems, data base management systems, utilities, and communications control. Applications software consists of programs which direct the computer to perform specific data processing activities required for the solution of business or scientific problems. Examples would be payroll, inventory, manufacturing, and statistical analysis applications. The significance of the distinction between systems and applications software is that the selection process and relevant purchasing criteria may differ for each software category. The possibility of these differences was investigated in this study.

The process of selecting software may also vary according to a number of factors such as the organizational structure of a firm, its size and the specific objectives and needs of the firm in using a DSS. Wind (1978) argues that the responsibility for many buying decisions is often shared among two or more organizational roles. Identifying members of the buying center is essential for "microsegmentation" or market segmentation within

the organization (Spekman and Stern 1979). According to Cady (1985), however, understanding the behavior of information technology purchasers is complicated by the likelihood of intraorganizational rivalries over the control of a new technical product. He writes that "contention among data-processing, word-processing, and communications departments and end users over who should control micro acquisitions, installations and usage has led to a crazy quilt of buying patterns" (Cady 1985, p. 260).

With the growth of the microcomputer, software buying influence has extended to the "end user," a large group of individuals not easily differentiated by job title or function (Donath 1985). An end user is defined as one who interacts directly with the system. It can be a manager or a staff analyst who produces output from the DSS for a manager. Perotti (1983) asserts that the significant aspect of the use of computers in DSS is that the control of the system and its functionality is in the hands of the manager or analyst and not under the control of a programmer. This underlying feature of DSS further highlights the importance of the software buying decision. Most systems are interactive in nature. Thus, the interface between the DSS and the end user is the key to having a successful system. The user language interface can have an impact on the effectiveness of the system itself if the end user of the system does not find the interfacing commands easy to use (Morton and Keen 1978). Robert D. Baskerville of Computer Sciences Corporation notes that a software company has "to sell to end users, and you have to emphasize more than the technical capability--You have to really sell the benefit" (Business Week 1984). In our research study we examined the roles of the end user and other personnel in two phases of the software buying process: the information search phase and the selection phase. Details of the research methodology are discussed next.

RESEARCH METHODOLOGY

A questionnaire was mailed to companies in the United States and Canada. The sample population consisted of the 1981 listing of the Fortune 500 and the 1982 listing of the Canadian Financial Post 500. A systematic sample was drawn by selecting every even numbered firm from the Fortune 500 list and every odd numbered firm from the Financial Post 500 list. The objective of the questionnaire was to investigate the software buying process of companies and thus achieve a better understanding of this process. A cover letter addressed to the president of each firm explained the purpose of the research and requested that the questionnaire be routed to the most appropriate department in the firm.

As many organizations would have made many software purchases, and as each decision may have had its unique set of circumstances, it was felt necessary to obtain data on how the firms made one decision to purchase a particular software. Therefore, the recipient was asked to answer the questionnaire with respect to the decision with which he or she was most familiar.

The findings are based on the replies of 200 firms. The response rate was 40 percent. Usable replies were received from 109 U.S. firms and 91 Canadian firms. Over half of the responding firms were engaged in some form of manufacturing; the remaining firms being in various other industries including financial institutions, retail and wholesale organizations, insurance organizations and firms in communications and extractive businesses. Sixty-one firms responded with information on systems software. One hundred and thirty-nine firms responded giving details of the decision process to buy applications software. The following presents specific aspects of the software purchasing process. These are the time

duration of the process, personnel acting as decision initiators, the information search phase of the software purchasing process, and the selection phase of the purchasing process.

RESULTS OF THE STUDY

Time Duration of the Buying Process The applications software purchasing process is generally longer than that for systems software. Over 75 percent of application package purchases took longer than three months. On the other hand, almost 40 percent of systems software purchases were made in two months or less. To test whether or not the length of evaluation time is related to the cost of the software, Spearman rank correlation analysis was used. The correlation coefficient was .50 (n = 181) at the .05 level of significance. This indicates a strong positive relationship between the cost of software and length of evaluation. That is, as cost increases, the evaluation time also increases.

Decision Initiators in the Software Buying Process The results of the survey indicated that different decision initiators are involved in the sample firms. With respect to systems software, the decision initiator in 38.3 percent of the firms is one of the systems personnel, while in 25.5 percent of cases a middle management executive initiates the decision. The range of decision initiators is greater for applications software: the responsibility is shared by top management (20.0 percent of firms), middle management (19.2 percent), systems personnel (18.4 percent) and end users (14.4 percent). Notice that the majority (38.3 percent) of the systems software purchase initiators come from systems personnel. The same group initiates only 18.4 percent of applications software purchases. Our results are consistent with those in the Barron's study.

The Information Search Phase of the Software Buying Process

Our study investigated two aspects of the information search phase of the software purchasing process. These are the involvement of various groups of personnel in this phase and the sources of information used for the information search prior to selection of software. Following is the discssion of our results. Table 1 indicates the mean levels of involvement of various groups of personnel in the information search for a systems software purchase and an applications software purchase. Examination of the degree of involvement suggests a difference in the level of participation by certain people in the information search for the two types of software.

Place Table 1 Here

Systems personnel are always quite involved; even more so when systems software is being researched. This high involvement of systems personnel regardless of the type of software being researched was expected. They are the most qualified to evaluate the appropriateness of the software for the firm. Top management, as expected, was not found to be very involved in the information search for systems software. They are, however, more involved when applications software is being evaluated. Middle and lower management are moderately involved in both cases, with slightly more involvement for applications software. The interesting difference lies with the degree of involvement of end users. For systems software information search, their mean level of involvement is 2.772 while for applications software information search it is 4.152.

Kruskal-Wallis one way analysis of variance was used to test whether or not there was a significant difference in the levels of involvement by the various groups in the information search for a purchasing decision,

according to the type of software. The analysis was performed for each group of personnel (systems, top management, etc.) with the level of involvement in information search for the decision as the dependent variable and the type of software (systems or applications) as the independent variable. The results are shown in the third column of Table 1.

Significant differences between the levels of involvement in information search for systems and applications software were found for top management and middle management (at the .01 level of significance), and for end users (at the .001 level of significance). These three groups are more involved in the search for information prior to purchase for the software with which they will more closely interface. Note that systems personnel and end users share approximately the same degree of involvement in the information search for applications software. This supports the findings of Perotti (1983) and Mahmoud and Malhotra (forthcoming) that end users and managers are getting more involved in software buying. In summary, there is an overall greater involvement by management and end users in the information search prior to purchase for applications software than in that for systems software.

Table 2 shows the sources of information used in the software purchasing process. There was little or no difference between the information sources used for applications or systems software information search phase.

Place Table 2 Here

What is significant, however, is the relative importance of each source of information. The highest mean scores were obtained by in-house knowledge, business colleagues and sales representatives--all human sources. Thus information obtained from personal contact is regarded as more important. Ninety-two percent of respondents describing a systems software purchase

reported consulting with other users of the software during the information search process. The corresponding figure for applications software respondents was ninety percent. We found no differences in the sources of information utilized by firms using existing suppliers and firms using new suppliers. In addition, our results showed that, regardless of who is involved in the information search, the same sources of information tend to be employed.

The Selection Phase of the Software Buying Process In examining the selection phase of the software purchasing process, our study considered first the evaluative criteria used in software selection, and second, the involvement of different groups of personnel in the selection phase. This section reports our findings. In order to determine what evaluative factors or criteria firms consider in their selection of software, respondents were asked to indicate on rating scales the extent to which they considered certain criteria. The criteria listed in the question were taken primarily from Francis et al. (1975) and Mahmoud (1983).

A comparison of the mean scores for systems and applications software reveals few differences with respect to the criteria considered for each type of software. Most of the criteria received approximately equal importance ratings for systems and applications software evaluation with the exception of the following four: language in which it is written, statistical analysis, financial analysis, and modeling. These criteria are considered more important for applications software than for systems software. The criteria of database management system and maintenance of package by vendor are considered more important by those firms responding for systems software than by those responding for applications software.

As no major differences exist between the importance of each criterion for systems and applications software selection, it is useful to analyze the relative importance of each criterion for the overall sample response. To highlight which criteria are considered most by firms when selecting software, the criteria, ranked according to mean score, are shown in Table 3.

Place Table 3 Here

All criteria are considered to some extent. The respondents had the option of specifying any other criteria that they considered. Very few did so, however. The more general criteria of up-to-date functions, ease of use, maintenance and documentation are considered the most important. It is surprising to see the low rankings of such criteria as financial analysis, modeling and graphics.

In considering the involvement of different groups of personnel in the selection phase, it is important to determine who the decision makers are. The responses were analyzed for differences between systems and applications software purchases. Finally, a comparison between the extent of involvement of certain persons in the information search phase and the extent of their involvement in the selection phase was made to ascertain if any relationship exists.

Table 1 illustrates the degree of involvement in the selection decision by the various personnel groups for both types of software. The mean involvement scores suggest that for purchases of both types of software, systems personnel are very involved in the selection decision. Top management, middle management, and end users are more involved when selecting applications software. Table 1 also shows the results of the Kruskal-Wallis one way analysis of variance employed to test for statistical

differences in the degree of involvement by the various personnel groups in the software selection decision. The independent variable was the type of software: systems or applications. The dependent variable was the level of involvement in the decision. The results indicate statistically significant differences between the level of involvement in a systems software selection decision and that in an applications software decision for three groups: top management (at the .05 level of significance), middle management (at the .01 level of significance), and end users (at the .001 level of significance). These groups are more involved in the applications software selection process because they are more direct users of this type of software than of systems software. Perotti's (1983) findings, that end users and managers are playing a more active role in software selection decisions, are consistent with our results.

To ascertain if any relationship exists between the people involved in the information search phase and those involved in the selection phase, Spearman correlation analysis was used. The Spearman rank correlation coefficient ranged from .63 to .97 for different groups of personnel. In all cases the coefficient was significant at the .001 level of significance. This suggests a strong association between those persons involved in the information search phase and the people involved in the selection phase. That is, as systems personnel for example, are more involved in the information search they are also more involved in the selection of the software.

SOFTWARE PURCHASING AND MARKETING IMPLICATIONS

The purpose of this research study was to examine some characteristics of the software buying process in a sample of large firms. Figure 1 is a

simplified framework of various aspects of the software selection process and some marketing decisions. The framework is partly based on the results of this study and illustrates how marketers could benefit from the findings. As shown in Figure 1, marketers make marketing decisions based on their knowledge of the purchasing process. Feedback from marketing personnel, the amount of information needed for the decision-making process and the firm's performance in the market place will indicate the amounts and types of marketing research to be done. Marketing research on the process of software buying will produce knowledge of value to marketers. Formulation of successful strategies depends on having this knowledge. The following provides examples of the marketing implications derived from the results of this research study.

Two variables affecting the selling approach are the time duration of the software buying process and the cost of the software. As the cost increases, the selection time also increases. This may indicate the need to work closely with a customer, to reduce cognitive dissonance for example. For the more expensive software, a "systems selling " approach may be needed. In this case, the purpose of advertising for example would be to create awareness of the software, thus generating inquiries on which the sales force can work.

Place Figure 1 Here

The identification of decision initiators also has implications for advertising. As the range of initiators for systems software is small, advertising can be more targeted. The marketer can rely on controlled coverage of prospective buyers, selecting specific media vehicles such as particular computer journals. For applications software, in contrast, the

range of personnel initiating the purchase process is wide. Here, an advertising approach in widely-read executive magazines relying on self-selection by prospective buyers may be more appropriate. Targeting and controlled coverage are more important when a software vendor markets highly specialized software to a vertical market niche, such as lawyers, bankers or specific manufacturers.

The issue of who is involved in the software purchasing process is also of particular importance to decisions about promotional efforts and sales force management. For example, the results of the study provide evidence that end users and managers as well as systems personnel are involved in the process, especially for applications software. The level of involvement varies according to the type of software considered (systems or applications). The range of personnel involved in the information search and selection phases of the software purchase for applications software means that the software vendor's sales personnel may have to contact a sizeable number of people within a firm. The key people, in particular, the end users, may not be easy to locate. The amount of contact required will vary from one organization to another, but the results on information sources suggest that personal contact is very important in the information search phase. While systems personnel have a role, further study, involving case studies perhaps, should identify just what is the role of this group vis a vis the role of end users. Top management levels are slightly involved and are more involved for applications software purchases. It is important to clarify the nature of their involvement (Bonoma and Johnston 1981).

In-house knowledge is the most salient information source. While systems personnel share the involvement in the selection of applications software with end users, the former are relied upon for their knowledge and

expertise. From a marketing point of view these personnel remain key people in the buying centre. Further research could specify in more detail the kinds of knowledge that systems personnel need in order to be influential in the purchasing process. Marketers must consider how their knowledge can be influenced. Examples of ways are through seminars, information seminars, and the wide use of the vendor's software at locations where in-house knowledge is gained, at universities perhaps. The reliance on human sources of information suggests that typical of industrial purchasing situations, personal selling has a much greater role than media advertising.

The results pertaining to evaluation criteria suggest that, from the product development and service viewpoints, the offering should be user-friendly, with good documentation and follow-up maintenance of the software. Our study further implies that there are two groups of evaluation criteria which can be labeled "general software characteristics" and "software-specific characteristics." General characteristics are those which are features of all software such as price, documentation, follow-up maintenance and ease of use. Software-specific characteristics are features particular to a certain kind of software, for example, the functions performed (graphics, financial analysis), and the compatibility with hardware. One implication of this for marketing is as follows. Marketing strategies targeted at horizontal market segments (not differentiated by the function of the firm and including a wide range of organizations and professions) should stress general software characteristics. On the other hand, strategies designed for vertical market segments (particular types of organizations and professions) should emphasize software-specific characteristics. The firms responding to our survey considered general software characteristics to be relatively more important. Further research

should be more detailed in identifying the trade-offs between general software characteristics and software-specific characteristics and the trade-offs between the criteria within each group of characteristics. For example, is there a trade-off between price and other criteria? The cost of the software ranks eleven out of eighteen criteria. It is interesting here to compare the results of Viyas and Woodside's (1984) study of supplier choice. In their study of a variety of industrial products, most buyers initially responded that product quality, delivery reliability and service were more important criteria than price. Viyas and Woodside found, however, that most contracts were awarded to the lowest bidder. The researchers explained that what the buyers meant was that once the minimal requirement on quality, delivery and service was met, the combined effect of these criteria "may outweigh price if this can be justified without inviting adverse comments from company auditors" (Viyas and Woodside 1984).

The issue of the most important evaluation criteria is clearly more complex than is suggested by our results. Shanklin and Ryans (1984) suggest that the nature of the rapid state-of-the-art developments in industries like software implies that postpurchase dissonance problems will occur. Perhaps experiencing dissonance makes it difficult for respondents to isolate more than a very small number of important purchasing criteria. The buying behavior variable of "customer experience" used by Cady (1985) in the context of the information industry may also have had some impact on the results pertaining to the selection criteria evaluated. Cady proposes that customer experience refers to the extent of personal and organizational participation in the various technologies of the information industry. Thus, customers with differing levels of "experience" have various approaches to purchasing for information systems. Another consideration is

that the relative importance of the criteria may differ according to the role of an employee who implements decision support software. Sussman (1984) for example, isolates five different roles: report user, model operator, model builder, hardware manager and software manager. From the perspective of each role, he suggests the decision criteria most crucial to a software purchase. Further investigation is needed into how criteria differ according to the various personnel involved in a decision and how these differences are resolved.

The computer software field is a dynamic one. Any marketing efforts must attempt to forecast changes in the technology which may alter elements of the selection process such as personnel involvement and evaluation criteria. Not only must these changes be monitored, but also changes in the organizational structures of firms which may affect purchasing rules. Marketing research functions need to be anticipatory rather than reactionary.

CONCLUSION

There remains much to study and to research with respect to evaluating and selecting software in general, and for DSS in particular. It would be most useful to observe firms in the decision-making process. It is recommended that, for such an observation, a variety of firms in different industry segments serve as sample cases. Firms of different sizes should be included to determine if the procedures followed by large and small organizations differ significantly. Another approach to researching the software evaluation and selection process that organizations follow is by interviewing firms that have recently purchased software. Discussions with executives could probe for more details on the purchasing process.

Interviews may reveal what problems firms encounter during the process, and

how marketers can help in the resolution of such problems. For example, what difficulties are encountered in ascertaining the organization's needs with respect to the attributes required of the software? Can the organization sort out the essential requirements from the "desirables" and produce a checklist of evaluation criteria? Another issue would be to determine what problems or inefficiencies firms encounter in their actual evaluation and testing of different software.

In summary, the survey research reported in this paper has described the software buying process in large firms. We also have suggested a number of implications for marketing software. Additional in-depth study would contribute further to the field of business marketing and would assist vendors in their marketing efforts.

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Table 1

Involvement in the Information Search and Selection Phases:
Systems Software and Applications Software

	Involvement in Information Search Phase				Involvement in Selection Phase			
	Mean Involvement Values ¹		X ² Value (significance)	X ² Value (significance)	Mean Involvement Values ¹		X ² Value (significance)	X ² Value (significance)
	Systems Software	Applications Software			Systems Software	Applications Software		
Systems Personnel	4.590	4.304	3.415 (.0646)	3.729 (.0535)	4.500	4.276	3.729 (.0535)	3.729 (.0535)
Top Management	1.930	2.440	7.495 (.0062)	6.590 (.0103)	2.140	2.735	6.590 (.0103)	6.590 (.0103)
Middle Management	2.897	3.533	7.463 (.0063)	7.003 (.0081)	3.036	3.664	7.003 (.0081)	7.003 (.0081)
Lower Management	3.053	3.161	0.672 (.4122)	0.997 (.3180)	3.036	2.950	0.997 (.3180)	0.997 (.3180)
End Users	2.772	4.152	24.127 (.0000)	18.885 (.0000)	2.554	4.052	18.885 (.0000)	18.885 (.0000)
Committee	1.962	2.600	0.278 (.5979)	0.119 (.7302)	2.039	2.650	0.119 (.7302)	0.119 (.7302)

¹ Respondents were asked to indicate on a scale of 1 to 5 the extent to which the various groups of people were involved in the information search for a software purchase and in the software selection decision. "1" represents "not involved" and "5" represents "very involved."

Table 2

Rank of the Sources of Information

<u>Rank</u>	<u>Source of Information</u>	<u>Mean Score</u>	<u>Median Score</u>
1	In-House Knowledge	4.1	4.19
2	Business Colleagues	3.6	3.40
3	Sales Representatives	3.5	3.44
4	Computer Conferences	2.8	2.81
5	Software Directories	2.9	2.90
6	Computer Journals	2.7	2.67
7	Consultants	2.6	2.54
8	Trade Shows	2.6	2.42
9	Academic Journals	1.5	1.19

1 = not important at all 5 = very important

Table 3

Rank of the Evaluation Criteria

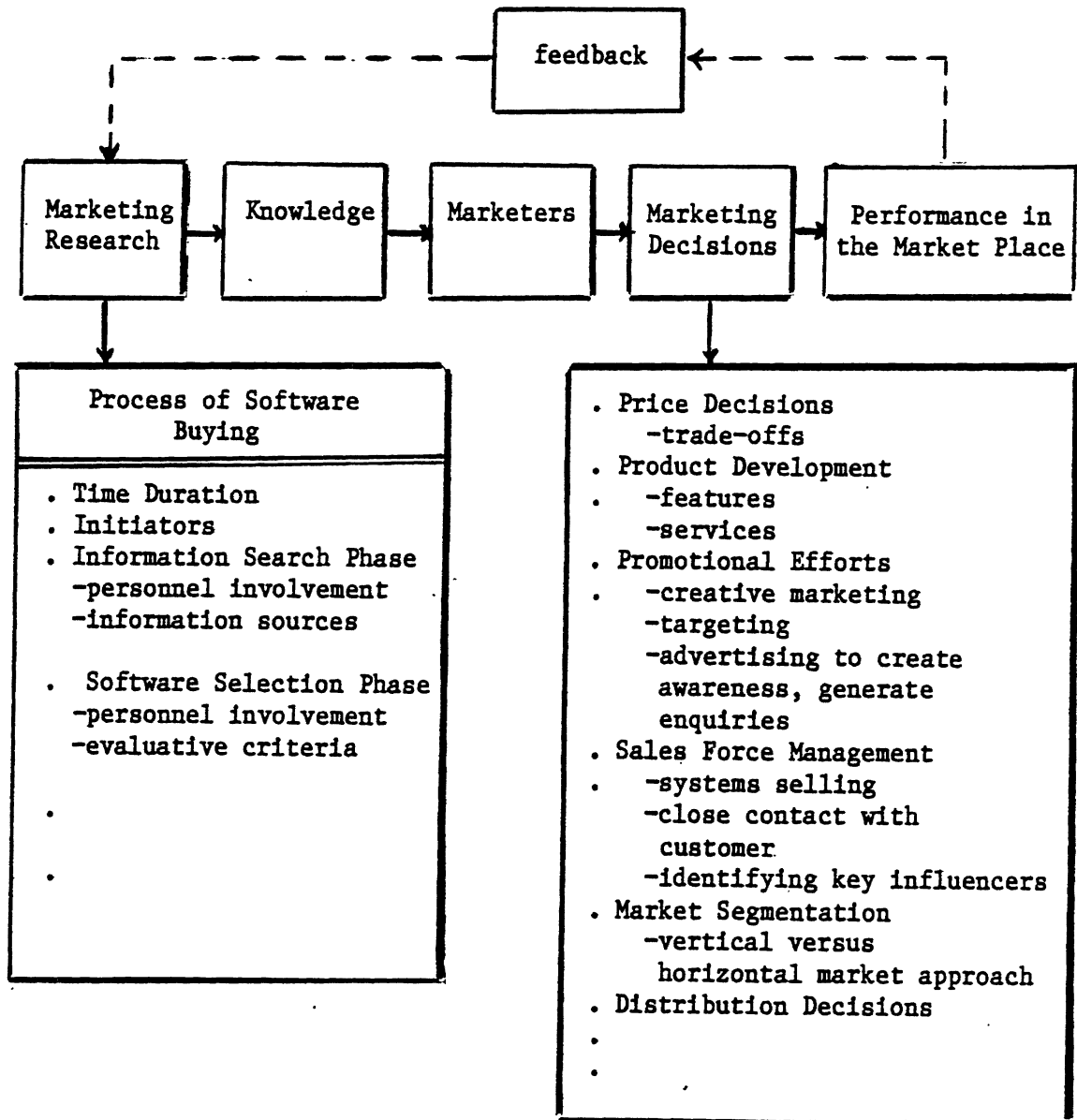
<u>Rank</u>	<u>Criteria</u>	<u>Mean Score</u>	<u>Median Score</u>
1	Up-to-date functions	4.5	4.72
2	Ease of Use	4.4	4.59
3	Maintenance of package by vendor	4.2	4.38
4	Documentation & User Manuals	4.0	4.12
5	Report Generator	3.6	3.96
6	Vendor Training	3.5	3.63
7	Query Facility	3.5	3.8
8	Multiple Modes	3.4	3.76
9	User Language Interface	3.4	3.69
10	Database Management System	3.4	3.72
11	Cost	3.3	3.25
12	Language in which it is written	3.1	3.16
13	Past satisfaction with vendor	3.0	3.14
14	Financial Analysis	2.5	2.88
15	Statistical Analysis	2.9	2.32
16	Compatibility of software with other hardware	2.4	2.35
17	Modeling	2.3	1.65
18	Graphics	1.9	1.35

1 = Did not consider at all

5 = Considered very much

Figure 1

Software Buying and Marketing Implications: A Framework



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