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THE DECISION MAKING PROCESS OF SMALL BUSINESS FOR MICROCOMPUTERS AND SOFTWARE SELECTION AND USAGE

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Essam Mahmoud
University of Michigan-Flint

Naresh Malhotra
Georgia Institute of Technology

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Revised Version

The Decision Making Process of Small Business For Microcomputers and Software Selection and Usage

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by

Essam Mahmoud * Naresh Malhotra**

*Essam Mahmoud is Associate Professor of Management Science and Systems at the University of Michigan-Flint, Flint Michigan, 48502 (Tel: 313-762-3160)

**Naresh Malhotra is Associate Professor and Coordinator of Marketing, College of Management, Georgia Institute of Technology, Atlanta, Georgia, 30332 (Tel: 404-894-4358)

ABSTRACT

In this paper we investigate the selection process of microcomputers and software applications in small businesses as well as the usage of their computer facilities. We report on an empirical study of small businesses in five selected states. One finding is that owners, managers and users are most involved in the selection of microcomputers and software. The study also identifies the most important criteria considered in the selection process. Based on the results of the study, we develop a systems approach for small businesses to use in selecting the most appropriate microcomputer and software.

The Decision Making Process of Small Business For Microcomputers and Software Selection and Usage

INTRODUCTION

Microcomputers have grown dramatically in power and capacity, and this growth is expected to continue[13]. In the past two years alone, the number of microcomputers in use by U.S. businesses has increased from 2.6 million to 4.6 million. By the 1990's, that number could reach 13 million[6]. The sales value of microcomputers reached $8 billion in 1983 and is growing at the rate of 50% a year. The market for computer peripherals is showing similar growth. For example, the market for floppy disks was $200 million in 1983 and is expected to be $1 billion by 1988[7]. Computer graphics is a growth market too. More managers are now using computer graphics to make better business decisions and save time[44, 45]. The software market, in general, is expanding rapidly. In 1983, more than 30,000 titles of software were available[4]. In that year, the total market for software supplied by all U.S. companies was $14 billion. By 1988, software sales are expected to be $50 billion [16, 32]. Especially, microcomputer sales have grown so rapidly that customer purchases of business/ professional micro-software totaled $936 million in 1983 and it was estimated that by the end of 1984 purchases would reach $1.6 billion[23].

Today, computer-based models are being used increasingly to anticipate manufacturing needs, market shifts, and new products; determine personnel policies, and make decisions on investment alternatives, joint venture and takeovers[20]. These models can achieve tasks such as financial

forecasting, production planning, manpower allocations, and market projections. However, the reliability of computer modeling depends greatly on the design of software, the soundness of the data being used, and the competency of the person using the model. Beach [4] indicated that the trend is for "integrated software" to be applied to more specific and functional applications, rather than to have overall general purpose software packages.

The number of small businesses using microcomputers is increasing[25, 33]. Microcomputers are useful and can provide several benefits to small business such as: decreasing costs, increasing productivity, improving efficiency, improving customer service, and enabling managers to have access to greater amounts of relevant decision data[47]. More specifically, Hughes [19] stated microcomputers can help sales managers at all levels deal with pressure and overcome problems. They help managers forecast the performance of their sales forces and become more productive. Microcomputers also assist the field sales managers in teaching time management, evaluating selling skills and teaching representatives to run their territories and profit centers.

The trend toward the increased usage of microcomputers in small businesses is expected to continue into the foreseeable future. The cost of software is relatively expensive, however, and small businesses cannot afford to select the wrong software or hardware. Managers of small businesses who are seriously considering whether to entrust their operations to a computer are faced with a barrage of advertising literature describing simple, complete, and inexpensive computer systems[32]. Hence, the selection of either microcomputers or software is becoming more difficult. It would be useful if a formal selection procedure was available for small

businesses to follow in the purchasing of computer hardware and software. There is no easy formula for the choice of either microcomputers or software because the choice is ultimately dependent on each small business situation. The literature on the topic is growing and can provide help in choosing the hardware and software. For example, Keen and Woodman[22] emphasized the importance of using a proper approach in acquiring microcomputers. It is essential to develop an overall plan for their use before purchasing microcomputers. This is also true when selection of software is considered. The hardware and software selection decision is the key to successful implementation and, as such, small businesses could benefit greatly by having a structured procedure to assist them through the selection process.

The objectives of the study, therefore, are to describe the decision making processes of small businesses selecting microcomputers and software, and to investigate the types of usage of microcomputers and software by small businesses. Understanding the selection process and usage will aid in the development of a structured selection procedure which small businesses could follow to facilitate the choice procedure.

The paper is organized as follows. First, we review the related literature and then we report an empirical study which investigated the usage and choice processes of small businesses for microcomputers and software. Finally, we present our conclusions which include a suggested choice procedure.

REVIEW OF LITERATURE

The literature on hardware/software selection is growing fast. However, it reveals scattered information about the evaluation and the selection of

software for Decision Support Systems. The most relevant literature in this area is the selection of statistical and forecasting packages, accounting packages, financial packages and general factors for evaluating DSS. Various studies can be found in this area by Francis and Heiberger[15], Muller[34], Levitan[24], Mahmoud[26], Roots[39], Sussman[43], Keen and Woodman[22], Agresti[1], Boardman[5], Heintz and Berst[18], and Crain[10]. Nesbit[35] discussed some general aspects in selecting and evaluating micro software. Raysman[37] considered the involvement of managers in the process of selecting hardware/software. Arizala and Silagi[3] discussed general factors that users should address before buying computers. In the area of small businesses, Karasik[21] discussed in general some principles that small businesses should consider in selecting their computers. Sanders et al[40] noted some of the major costs to be considered when buying a software package. Freidelman[16] also discussed steps in buying packaged software for micros and minis. Six criteria for selecting microcomputers were proposed by Siegel[42]. Martin and McClure[30] stated 11 steps to be considered in selecting a computer package. Allen[2] discussed four steps in the microcomputer buying process. These studies, however, do not cover all aspects for a particular application. The information provided up until now has been too general. There are few descriptions of what is actually happening in the selection-process especially in small businesses. We need to understand this more clearly before presenting normative guidelines; this is the rationale for the present study.

METHODOLOGY

Data were collected by sending out a questionnaire to small businesses

in five states (West Virginia, Pennsylvania, Ohio, Maryland, and Virginia). The sampling frame consists of a listing of small businesses developed by the Small Business Development Center at West Virginia University. A random sample of 100 small businesses was drawn. The purpose of the questionnaire was to investigate the hardware/software selection decision-making process of small businesses and thus achieve a better understanding of this process. The questionnaire was designed particularly to identify the type of microcomputers used by businesses and the criteria considered in selecting hardware/software, the people involved in the selection process, the level of satisfaction, the usage of software, the length of time spent on selection, types of data bases by small businesses and the steps followed by small businesses to obtain computers. Data were coded and statistically analyzed using SAS and LOTUS 1-2-3 packages. The results were analyzed using cross-tabulations and Thurstone's Case V analysis by Green and Tull,[17] and Malhotra[29]. Case V was selected for analysis not merely because it is a sophisticated procedure, but primarily because, as can be seen from Figures 1 to 5, it presents the results in a clear and simple way which can be easily understood by managers. The Case V analysis takes as input, individual level data, and develops a group level interval scale in which the stimuli are assigned a value ranging from 0 to 1. In relative terms, the most important factor is assigned a value of 1.00 whereas the least important factor is assigned a value of 0.00. It should be emphasized that a factor assigned a value 0.00 should not be interpreted as having no importance. The correct interpretation is that this factor is relatively the least important. The technical details are presented in the Appendix.

RESULTS

The following findings are based on the completed questionnaires that were received from 31 businesses that were using or planning to use microcomputers. The response rate was 31 percent. Of the 31 usable responses, twenty two of the respondents (71%) indicated that they were currently using microcomputers and 29% indicated that they were planning to use them (see Table 1). Five questionnaires were returned by the postal service. An additional sixteen questionnaires received indicated that the firms did not have computers. While some of these sixteen respondents indicated that they hoped to have some eventually, they said that they did not anticipate purchasing any in the near future. One reason was that very small businesses could not justify the cost. For example, one respondent reported that he used a retail accounting firm rather than buy his own computer. Another respondent mentioned that it was cheaper to do his work manually. Other reasons include lack of familiarity, and lack of expertise with the computers. The tendency to exhibit inertia and resist change may be more prevalent in small businesses.

Table 1 About Here

In the following sections a comparative analysis of the results with respect to hardware/software selection will be presented.

Hardware/Software Used

Among those respondents who are currently using computers, IBM brands were the most commonly used. Nine out of the 22 (41%) respondents who are currently using micros for their businesses are using IBM brands. The rest

of the respondents indicated that they are using different types of microcomputers such as Apple II, RainBow 100, HP, Compaq, Commodore and others. The majority of the respondents who are planning to use microcomputers indicated that they are planning to use IBM, Apple or NCR. In particular, 38% of those planning to use microcomputers specified the IBM type that they would like to use. Nineteen percent of those who have already been using IBM and planning to use another computer would like to have an IBM microcomputer. It is obvious that IBM microcomputers are the most popular. These findings are similar to those of Miller[33], that IBM brands took first place for the PC most frequently used in a business environment. This was based on a survey conducted by the Fortune magazine for 2300 of its subscribers.

Respondents indicated that they have been using a variety of software and word processing software. The use of spreadsheets, typically LOTUS 1-2-3, was the most popular. Common areas where programs were being used included accounts payable, accounts receivable, check reconciliation. Custom user programs, data base management, financial modeling, general ledger, inventory control, payroll processing and word processing.

Personnel Involved In The Selection Of Hardware/Software

To determine who makes the hardware selection in small businesses we provided those surveyed with a list of possible choices and asked them to rate the degree to which different personnel were involved in the selection decision on a scale from 1 (low) to 5 (high). The results are presented in Table 2 and Figures 1 and 2. It can be seen from these data that, for those currently using computers, the highest mean score was given to the end user followed by the manager and then the owner. Like Verity[45] we feel that

many times in small businesses these people are one person. Committees received the lowest score for both currently using or planning to use computers. These findings reflect the nature of small businesses as opposed to larger firms. For those planning to use microcomputers consultants were perceived to be more involved than by those who were currently using computers. We believe that those planning to use computers feel that they need more outside help in their selection. This may, at least in part, reflect their lack of familiarity and expertise. However, we suspect that when a small business seriously considers the use of microcomputers, more of its personnel get involved and become knowledgeable.

Table 2 and Figure 1 indicate that the personnel most involved in the selection process of hardware/software were end users and managers. Those who were planning to use a computer had different responses from those who were currently using micros. The first three categories of personnel currently using computers and most involved in the selection of micros were the end users, the manager, and the owner. In those firms planning to use microcomputers, the three categories of personnel to be most involved in the selection decision were the owner, the manager and consultant. Notice that end user involvement ranks moved from first to fourth. This result is also similar to the results for personnel involved in the software selection process. The first three personnel most involved in the selection of software were end users, managers, and consultants for those respondents having micros and using software. On the other hand, the first three personnel to be involved for those planning to buy software were manager, employees, and end users.

Table 2 About Here

Applying the Wilcoxon rank sum test [47] revealed that there is a significant difference, at the 0.05 level, in the rank order of personnel involved in the selection decision between those who are currently using micros and those who are planning to buy them. The same was true with respect to the personnel involved in the selection process of software for firms currently using software and firms planning to use it.

In conclusion, end users are very much involved in the selection process of microcomputers/software in the small businesses that are currently using computer technology. Shapin[41] and Allen[2] emphasized the importance of end users' involvement in the decision process of selecting their computer systems. Also, in this study, managers or owners are very involved in the selection process of hardware/software for those who currently using or planning to use micros. This result is supported by Miller[33] who found that in small companies 95% of the top management is involved. Raysman[37] further emphasized the importance of managerial involvement.

Criteria For Selecting Microcomputers

To determine the criteria that are used in selecting microcomputers, we provided those surveyed with a list of different criteria and also provided space for them to add others. These criteria were developed by exploratory research. This phase involved a review of the academic and trade literature, interviews with microcomputer representatives and a pretest sample of businesses. The relative importance of factors involved is given in Figure 2. Note that, of those currently using computers, the most important three factors were reliability, vendor's support, and memory. Those who indicated that they planned to use computers felt that ease of use was the most important factor, followed by reliability second,

and training third. This shows that the responses were influenced by the stage of computer use in which a business was at the time. It appeared that those planning to use computers were more cautious regarding the new technology than those who were currently using computers. This is supported by Carper[9]. Perhaps those currently using computers are facing a need for increased memory space which they had not anticipated at the time of the initial purchase. Brand loyalty was rated the lowest. This may be due to those surveyed probably not having had enough experience to establish loyalty to any specific brand. It can be seen from Figure 3 that cost and brand loyalty are relatively the least important for both current and potential users. Cost, may not be that important as most business look upon expenditure on microcomputers as an investment. A recent study showed that, for companies that had continually up-graded their equipment to keep pace with technological advances, data processing costs in 1980 were only two percent of equivalent costs in 1965 [38]. Likewise brand loyalty is not very important as the decision making process involves considerable deliberation. To summarize, reliablity of the machine and vendor's support followed by memory are the most important criteria for selecting microcomputers by small businesses who are currently using micros. Among many articles in the literature, Carper[9] argued that businesses would like to have a reliable machine and good vendor's support so they can avoid the downtime of computers which can be very costly both in terms of dollars and lost time. Memory size was also one of the important criteria especially for those who are currently using the system. Many businesses fear that their computers will not keep up with the growth of their businesses. The importance of memory size also may be due to managerial experience with a particular software or application which

requires a certain memory. The memory issue should be resolved by 1986 with the introduction of super chips[8].

Criteria For Selecting Software

Figure 3 indicates the rank order of the criteria considered in selecting software. Of the small businesses currently using a computer, vendor's support was the most important criterion for selecting software followed by ease of use and documentation. Martin and McClure[30] emphasized the importance of documentation. Language was rated the least important criterion for selecting software by those currently using a computer or those planning to use computers. The majority of the respondents were using software packages with menu-driven facilities and therefore they were not concerned about the computer language in which the package was written. Follow up telephone interviews conducted with selected respondents confirmed this.

The small businesses planning to use a computer are most concerned with ease of use in selecting their software. This can be seen in Figure 3. Manual and documentation, and vendor's support were also rated highly. Potential users rate vendor support relatively lower as compared to current users. However, applying Wilcoxon's rank sum test revealed no significant difference at the 0.05 level in the rank order of the criteria by those currently using software and by those planning to use software.

Length of Selection Process

Table 3 shows the amount of time that small businesses which are currently using computers spent on selecting hardware/software. The amount of time varied among the respondents for both hardware and software.

Fifty-seven percent of the respondents spent less than three months on hardware selection; thirty-three percent of the respondents devoted over six months to the selection. For software, fifty-two percent of the respondents spent less than three months on the selection process; forty-eight percent of the respondents spent more than three months. Hence, the patterns for hardware and software are fairly similar.

A similar study by Mahmoud and Vance[28] showed that banking institutions tend to spend more time than these small business respondents on selecting their applications software. Seventy percent of the banking institution respondents indicated that they spent 3 months or more on software selection. Mahmoud and Rice[27] in a study of software selection by Fortune 500 and Financial Post 500 firms also found that over 75 percent of application package purchases took longer than three months. Petre[36], however, indicated that computer selection process normally lasts between one to four months. One explanation for our results may be that many small businesses do not have the time, manpower, or funds to spend on a lengthy software selection process. One can also take the view that different businesses perceive decisions differently, therefore, some businesses spend more time on particular decisions than others.

Table 3 About Here

Hardware/Software Satisfaction

Table 4 indicates that the majority of those who are using either microcomputers or software are satisfied. While the level of satisfaction of software is less than that for hardware, 81% of the respondents are

satisfied with their software. Similarly, a survey by Datamation[11] of 82 mainframe and microcomputer software packages from 42 vendors, found that 73% of the users gave the packages an overall satisfaction rating of 6 or higher on a scale of 1 to 10. Those respondents who were either somewhat dissatisfied or very dissatisfied indicated that the quality of the micros were not the best for the price that they paid. One respondent who was dissatisfied with the software stated that he had not found a good program for inventory yet; another indicated that the documentation was very poor. Martin[31] commented "documentation is the pivot on which effective computer usage turns." Levels of satisfaction with software may well be related to the quality of that software. Sanders et al.[40] found that 27% of software packages require little or no modification while the remaining 73% need some or great modification. It should be noted that the level of satisfaction may be a reflection of the quality of the decisions which were made when selecting and testing either the microcomputer or software needed for the business.

Table 4 About Here

Hardware/Software Usage in Small Businesses

In this section, we report the results pertaining to software and database usage in small businesses.

We asked the respondents to indicate the functions that their software allowed their businesses to perform and to rate the importance to their business operations of these functions.

Figure 4 indicates the most important functions for which small

businesses utilize their software or for which they are planning to utilize their software. The five most important functions are accounting, inventory analysis, financial reports, data base management and word processing. Graphics scored the lowest for current usage of software. Follow-up discussions with two respondents revealed that the reason is due to the current cost of graphical capabilities which does not justify its potential use for many small businesses. There are, however, many benefits that organizations could gain from the graphical capabilities of software as Wetherbe and Rademacher[46], Takeuchi and Schmidt[44], and Fienberg[14] indicated, such as saving time and improving the efficiency of the decision maker. Graphics did score relatively higher for those planning to use their software (see Figure 4). Given the high price of graphical capabilities coupled with its infrequent use and lower relative importance for small businesses, however, we believe that those planning to purchase software will find graphics of less importance when it comes to the actual process of buying their own machines and software. An application of the Wilcoxon rank sum test revealed that there is a significant difference at the level of significance $\alpha = 0.05$ between the importance ranks reported by firms currently using software and those planning to use software.

The most common data bases that respondents who currently have computers have been using and maintaining in their businesses in order of their relative importance, were in the areas of accounting, employee information, financial information, inventory control, mailing lists, and sales and market data (Table 5). However, those businesses which were planning to use the microcomputer/software reported that they would use the data bases in the following areas in order of importance: accounting, inventory control,

financial information, mailing lists, employee information, and sales and market data. None of the second group of firms plan to use data bases relating to production. This may be because the respondents may not have been involved in any type of production.

In summary, accounting is the major data base application, preferred by both groups of respondents. One should notice the growing preference among small businesses to do their own accounting rather than relying on accounting firms. This finding is supported by Miller(33).

Table 5 About Here

The firms in this study were asked to briefly list the main factors that they considered when purchasing hardware or software. Each of the responding firms was randomly assigned a number. The following are examples of information provided by respondents:

Co. No. 18:
- identification of present needs
- identification of future needs
- investigation of compatability of proposed equipment with existing system
- cost justification
- consideration of extended applications of proposed equipment
- availability of funds

Co. No. 14:
- consideration of compatability of new components with existing hardware/software
- quality evaluation
- cost evaluation
- ease of maintenance

Co. No. 4:
- analysis of need
- compatability consideration
- use analysis

A SYSTEMS APPROACH TO MICROCOMPUTERS AND SOFTWARE SELECTION

We propose the following systems approach to the selection and usage of microcomputer and software. This approach is based on our review of the literature and the results of our empirical investigation. The suggested model is presented in Figure-5. Any system has five essential elements. These are input, processing, output, objectives, and feedback. In the following we briefly describe these elements in one context of our proposed model.

The input into the selection process of microcomputer and software consists of a determination of the computing and decision support needs of the specific small business. The relevant considerations at this stage are the functions to be performed, the specific operations to be carried out and the characteristics of the users. Our empirical investigation suggests that the following personnel should be involved in the determination of needs: end users, managers, owners, other employees, and consultants. This process should result in a specification of the hardware and software requirements of the small business.

The processing function in our systems model consists of an evaluation of the available hardware and software (Figure 5). The evaluation of hardware should involve a consideration of price, type of microprocessor, bit configuration, memory capacity (RAM and ROM), size and capacity of disk drive, operating system, availability of hard disk, screen display, color, interface, and other input/output devices. The relative importance of the personnel who are involved is given in Table 2 and Figure 1. The criteria which were adopted for selecting hardware is specified in Figure 2.

It is possible to conceive of the software, as constituting a hierarchy (12). At the core of this hierarchy is the operating system, typically

consisting of a fixed operating system and a variable input/output system. At the next level we have the utilities software compromising format, copy, directory, user command interface and the like. Then we have the language processors which include Basic, Fortran, Cobol, Pascal, etc. Small businesses are likely to be more involved in the selection of applications software. They probably rely on computer vendors for advice on operating systems. Finally, there are applications software such as spreadsheet, word processing, etc. The relative importance of the decision making roles in software selection is depicted in Table 2. The criteria which should be applied are specified in Figure 3. It is important to note that these criteria are only applicable to applications software. However, some of these criteria could be applicable to the other three types of software. It should also be noted that it is important at the processing phase to check the availability of software needed first before deciding on the hardware. This will prevent small businesses in particular from the problem of software incompatability.

The hardware and software evaluation processes should normally result in installation and then conversion to microcomputers. Installation will generally involve some site preparation. This includes physical site planning provision of the necessary supplies. Then acceptance, testing, and the process of checking out hardware and software, should be performed. Conversion to microcomputers should be preceded by training of the users as well as those charged with the responsibility of maintenance. When orientation and training are not handled carefully, valued employees may quit and even sabotage new equipment. The data entry operators also should be thoroughly trained before initializing the data base. Once data is entered, parallel testing should be performed. This is the period when the manual and

microcomputer systems function together for comparison purposes. The purpose of the parallel test is to verify system performance. Once confident about performance, a switch or cut-over to computer operations is appropriate.

The performance of microcomputers and software should be continuously monitored and compared with the objectives. This information should then be used as feedback into the system to take corrective action. Part of ongoing monitoring involves audit and security control. Keeping a written log of problems, both for hardware and software, can help resolve maintenance problems.

CONCLUSION

The above analysis of the decision making process of small businesses for microcomputers and software selection and usage, reveals certain characteristics. These are the following. The personnel most involved in the selection of hardware or software are the owner, manager, and end users. Given that we are examining small firms, it appears that there is considerable involvement by a number of personnel. The criteria considered most important by these personnel are reliability, vendor's support and memory. Vendor's support was also the most important criterion considered in software selection. The level of satisfaction with hardware and software purchased was high and comparable with the results of other studies. Software is most often used for accounting, inventory analysis, and financial reports. Data bases are also most commonly developed for accounting information.

An interesting difference in the results between firms currently using computers and those planning to use computers was the selection criteria thought to be important. Firms not yet using computers were more concerned

with the ease of usage and training criteria. Clearly, the barriers for small businesses purchasing computers are not only cost related, but are psychological also. This is further borne out in the result pertaining to personnel involved in the selection-decision; firms planning to purchase computers for the first time are more likely to use consultants. It would be useful to follow a small number of firms through their selection process to investigate how the criteria considered and personnel involved change at different stages of the purchase process. This would facilitate comparisons of perceptions of the usefulness of computers to the small business at various level of "readiness to purchase." Unfortunately we were not able to have information on the past decisions of current users; for example, did current users use consultants or even plan to use consultants? Are the purchasing behavior and selection criteria of these early adopters different from those of late adopters? The use of a cross-sectional study means that it is difficult to measure all of this information.

In our research we have used the Wilcoxon rank sum test and Case V analysis to investigate some differences between the current users and the firms planning to use computers. We have, therefore, shown at least two methods of studying the variations between our two groups of firms. In the future, it would be useful to consider the differences between more groups of firms at various decision stages. For example, some firms "planning to buy" may have already actively collected information, contacted vendors and be at a later stage of readiness than some others which have only just started to passively assimilate information from advertisements.

Table 1: Response Summary

	n	%
1. Currently using microcomputers	22	71
2. Planning to use microcomputers	9	29
Total usable responses	31	100
3. Not considering purchasing microcomputers in near future.	16	
Total responses received	47	

Table 2

Involvement of Personnel In the Selection of Hardware/Software On Scale 1(low) to 5(high)

	Hardware				Software			
	Currently Using		Planning to Use		Currently Using		Planning to Use	
Personnel Involved	Mean Score	Rank	Mean Score	Rank	Mean Score	Rank	Mean Score	Rank
End Users	4.42	1	4.50	4	4.50	1	4.60	3
Manager	4.30	2	4.75	2	4.20	2	5.00	1
Owner	4.07	3	5.00	1	3.75	4	4.00	5
Employees	3.77	4	3.50	5	3.20	5	5.00	1
Consultants	3.55	5	4.60	3	3.82	3	4.33	4
Committee	2.40	6	1.00	6	2.00	6	1.00	6
Others								
Computer Sales Person	4.0							

Table 3

Length of Time Spent on Selecting Hardware/Software

	Hardware		Software	
	n	%	n	%
less than 1 month	6	28.6	5	23.8
1-3 months	6	28.6	6	28.6
3-6 months	2	9.5	4	19.0
More than 6 months	7	33.3	6	28.6
	21	100	21	100

Table 4

Hardware/Software Satisfaction

	Hardware		Software	
	n	%	n	%
Very Satisfied	15	71.4	12	57.1
Somewhat Satisfied	4	19.0	5	23.8
Somewhat Dissatisfied	1	4.8	1	4.8
Very Dissatisfied	1	4.8	3	14.3
	21	100	21	100

Table 5

Current and Planned Usage of Data Bases

Data Bases	n = 21 Currently Using Micros			n = 8 Planning to Use Micros		
	No. of Mentioned	%	Rank	No. of Mentioned	%	Rank
Accounting	17	80.9	(1)	7	87.5	(1)
Employee Information	17	80.9	(1)	3	37.5	(5)
Financial Information	16	76.2	(3)	5	62.5	(3)
Inventory Control	15	71.4	(4)	7	87.5	(1)
Sales	15	71.4	(4)	4	50.0	(4)
Customer Information & Mailing List	14	66.6	(6)	3	37.5	(5)
Production	5	23.8	(7)	-	-	-

Figure 1

RELATIVE IMPORTANCE OF PERSONNEL INVOLVED IN HARDWARE SELECTION

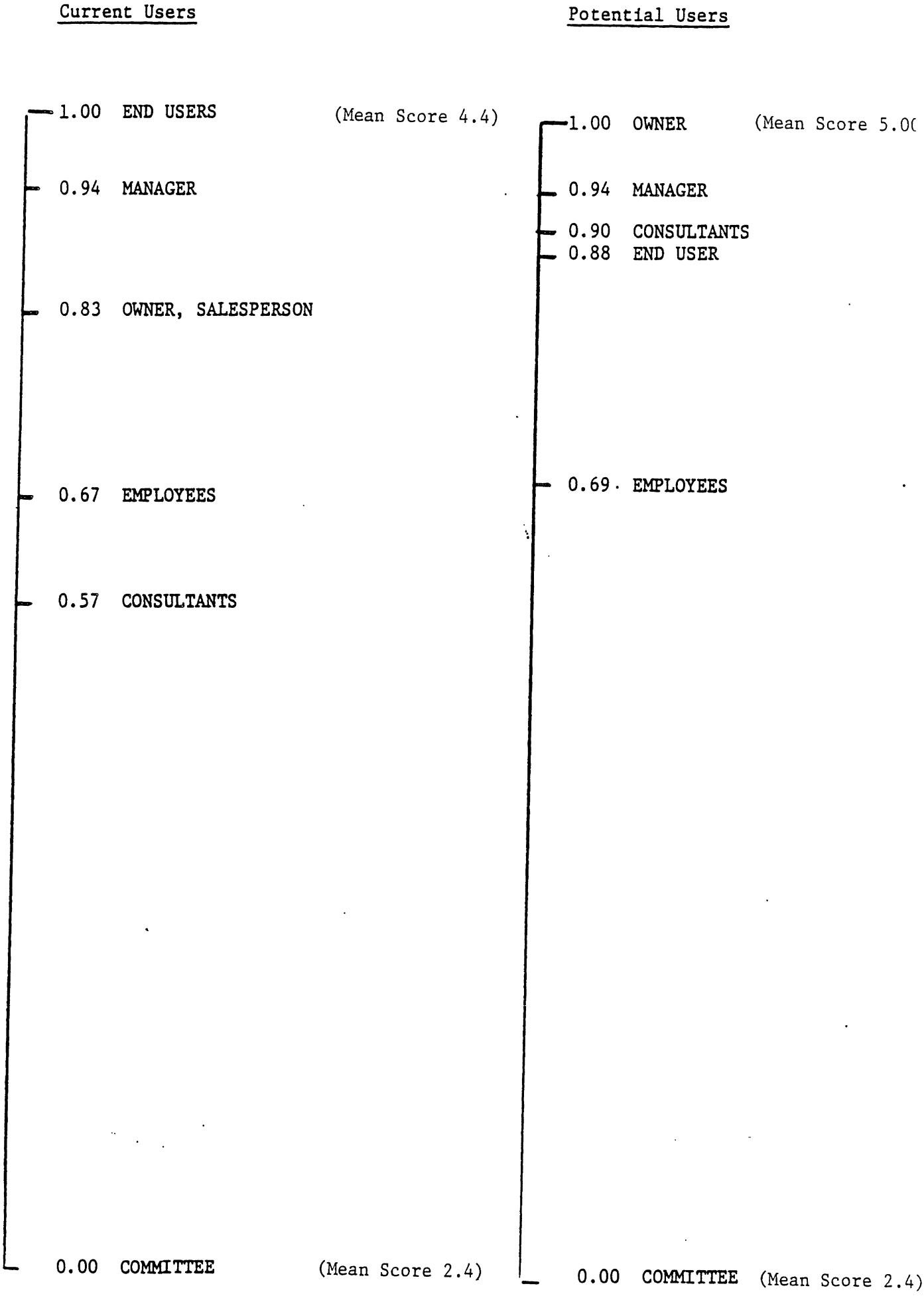


Figure 2

RELATIVE IMPORTANCE OF CRITERIA FOR SELECTING HARDWARE

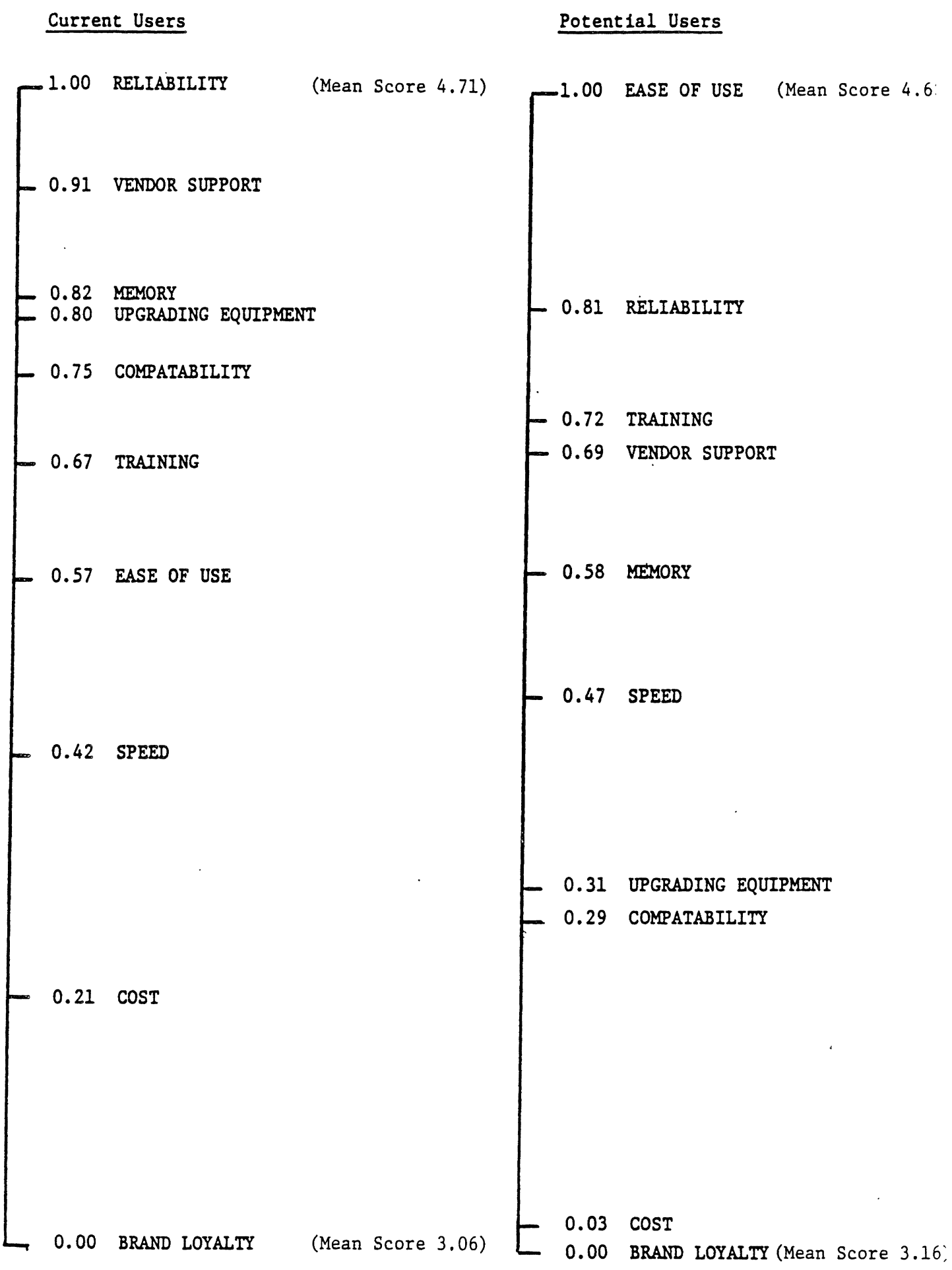


Figure 3

RELATIVE IMPORTANCE OF CRITERIA FOR SELECTING SOFTWARE

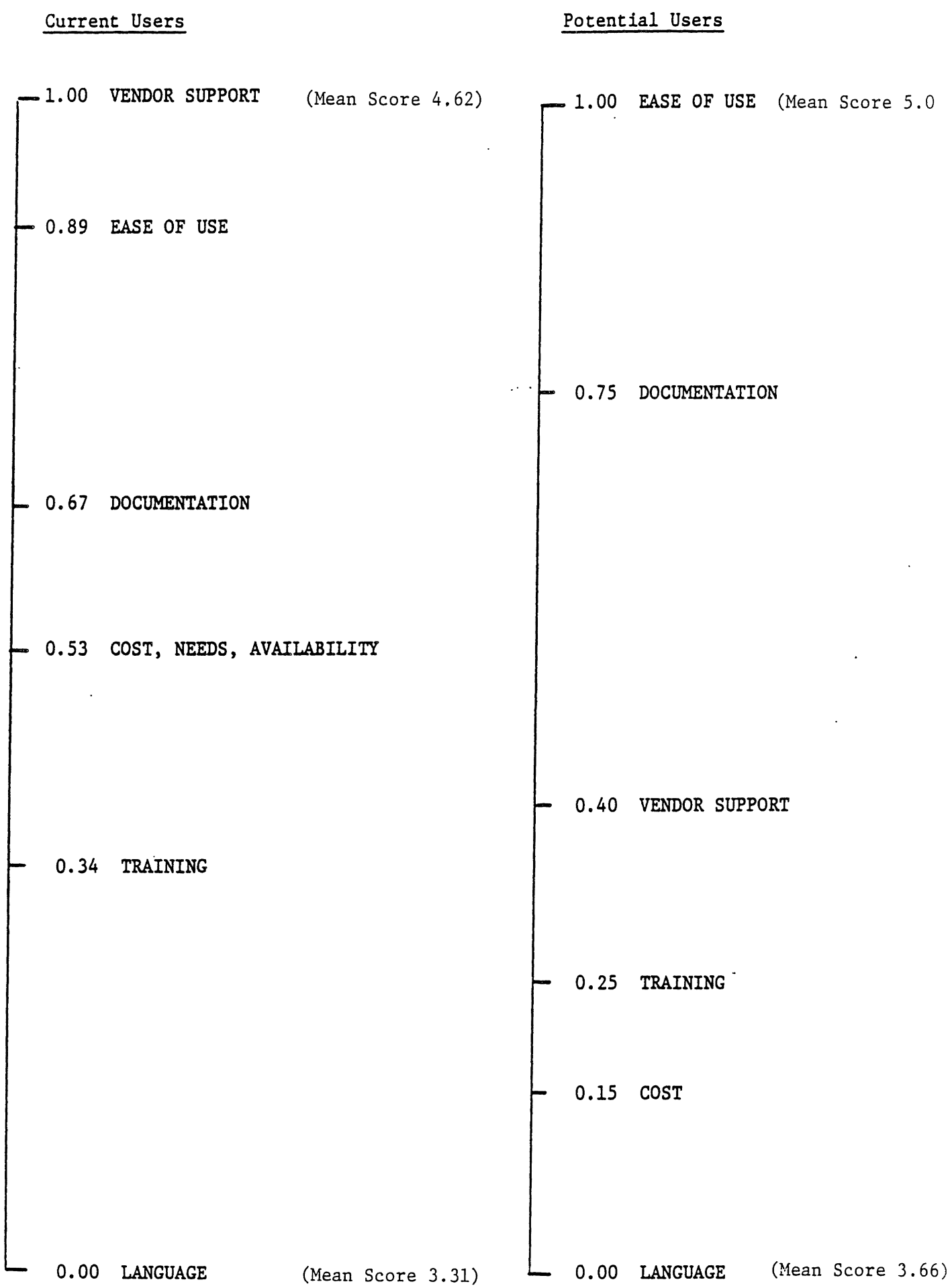


Figure 4

RELATIVE IMPORTANCE OF FUNCTIONS THAT SOFTWARE PERFORMS TO BUSINESS

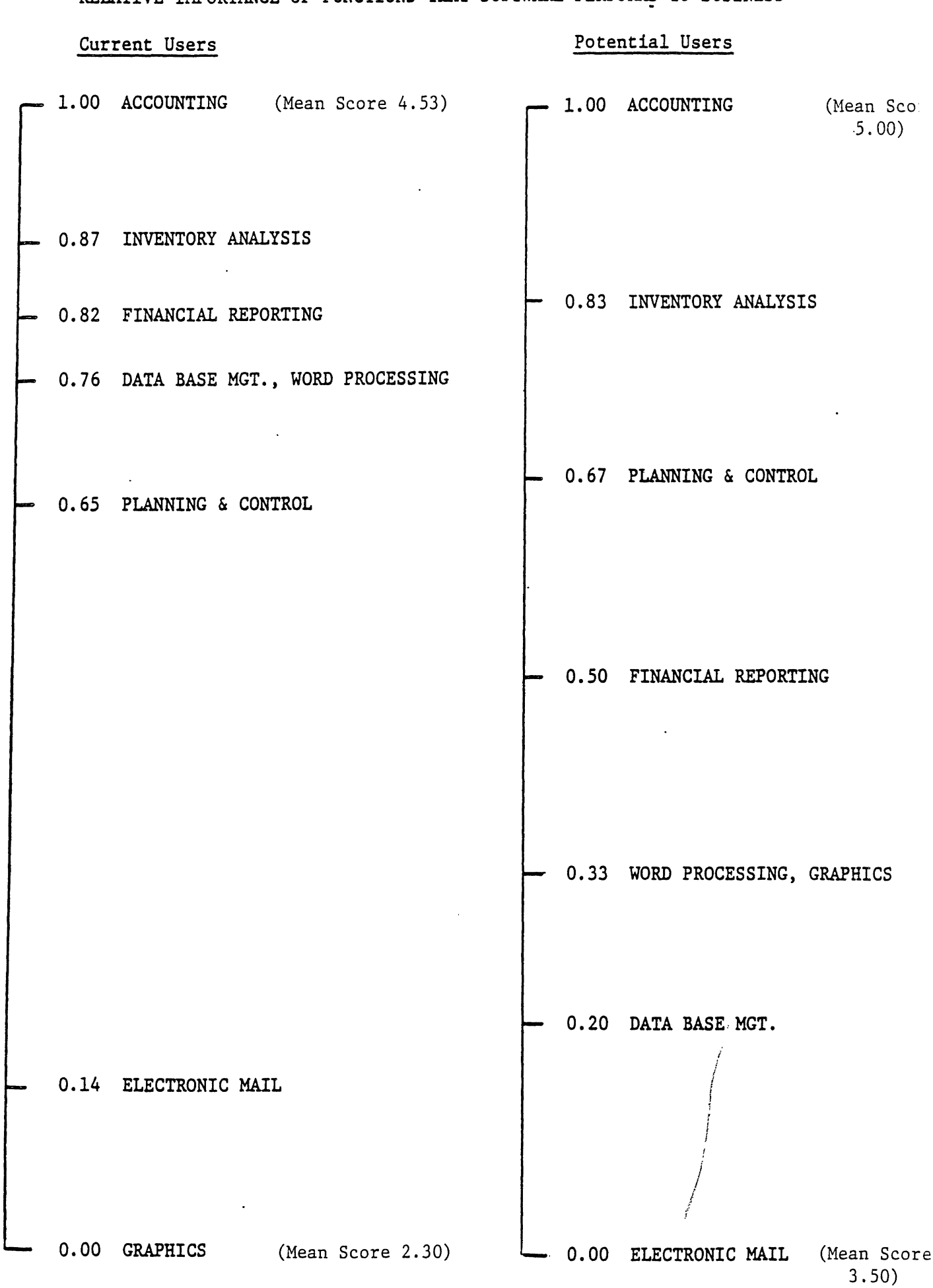
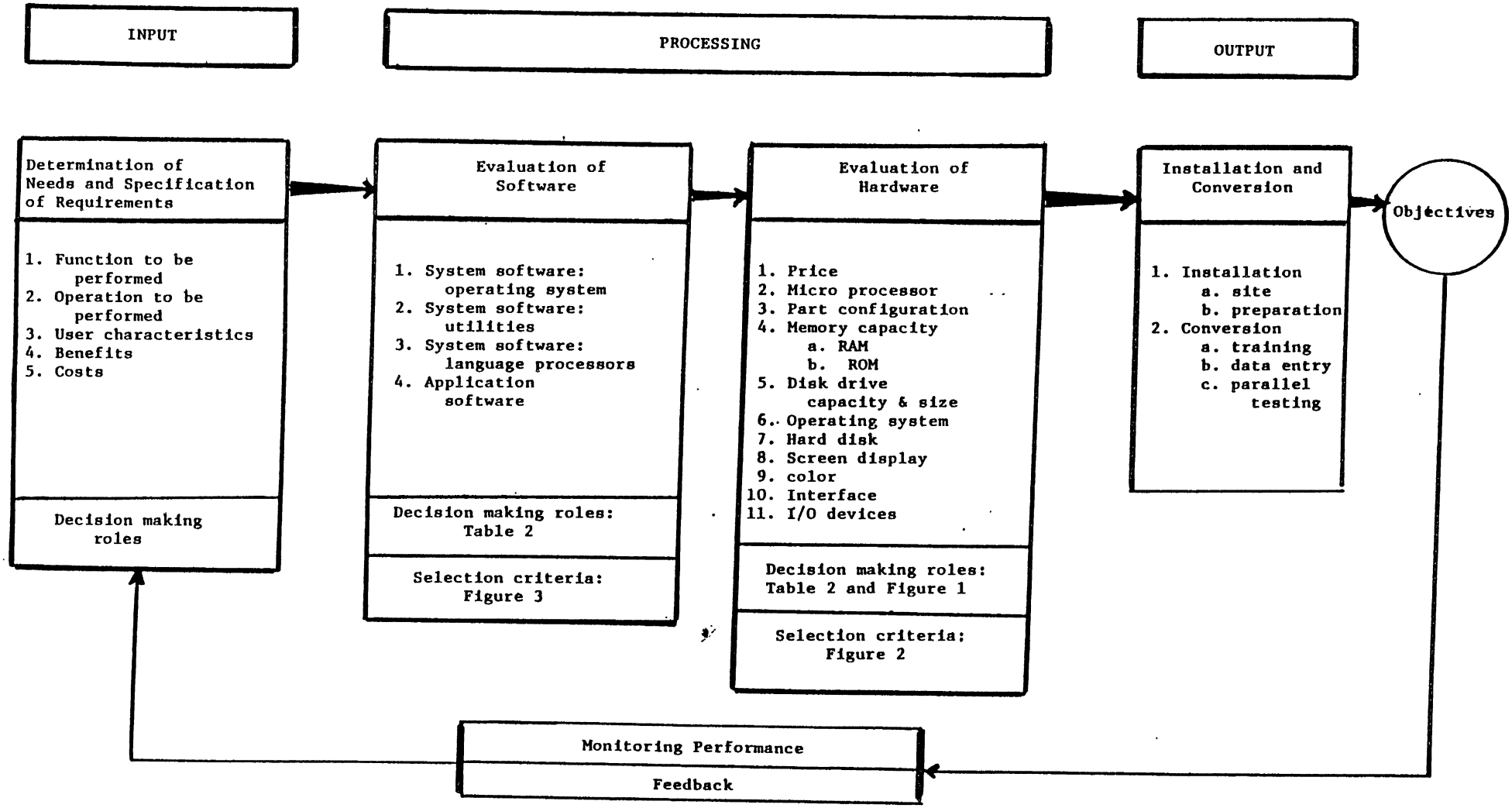


Figure 5

A SYSTEMS MODEL OF MICROCOMPUTERS AND SOFTWARE SELECTION AND USAGE



APPENDIX

Thurstones Case V Procedure

The psychological process by which an individual responds to a stimulus was called his discriminal process by Thurstone. Each discriminal process is assumed to be normally distributed.

Let R_j, and R_k denote the mean values of the discriminal processes j and K and σ_j^2 and σ_k^2 their variances, δ_{jk} denotes their correlation coefficient. Our task is to construct an interval scale from the observed frequency data developed on each pair of stimuli. Under the assumption of normality, it can be shown that:

$$R_j - R_k = Z_{jk}\sqrt{\sigma^2_j + \sigma^2_k - 2\delta_{jk}\ \sigma_j\ \sigma_k}$$

where Z_{jk} is the unit normal variate associated with the observed proportion of cases in which stimulus j is preferred to stimulus k.

By setting $\sigma^2_j = \sigma^2_k$ and $\delta_{jk} = \delta$, for all j and k we obtain

$$R_j - R_k = Z_{jk}\sqrt{2\sigma^2(1 - \delta)}$$

since, we are constructing an interval scale, the unit of measurement as well as the origin are arbitrary. Hence, we can set $\sqrt{2\sigma^2(1-\delta)}$, a constant, equal to 1. This results in the following interval scale values.

$$R_j - R_k = Z_{jk}$$

or

$$\sum_k R_j - \sum_k R_k = \sum_k Z_{jk}$$

Now we set $\sum_k R_k = 0$.

Hence $\sum_k R_j = n R_j = \sum_k Z_{jk}$

or $R_j = \dfrac{\sum_k Z_{jk}}{n}$

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