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DOCUMENTATION OF DECISION-AIDING SOFTWARE:

RAM USERS MANUAL

DECISIONS AND DESIGNS INC.

Dorothy M. Amey
Phillip H. Feuerwerger
Roy M. Gulick

September 1979

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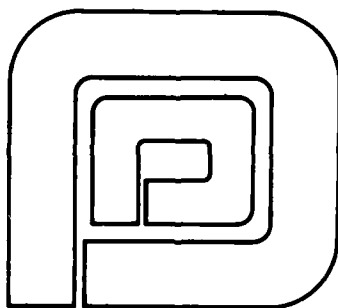
Dorothy M. Amey, Phillip H. Feuerwerger, and Roy M. Gulick

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RAM USERS MANUAL

1.0 INTRODUCTION

1.1 Purpose of the Users Manual

The purpose of this manual is to provide users of the RAM system with the background material and the detailed instructions necessary to use and interpret the various functions that RAM provides. The manual also presents the concepts inherent in the RAM approach, including the assumptions and restrictions concerning its use. The manual includes case study applications.

Because the manual must serve users both skilled and unskilled in the use of decision-analytic methodology, it is prepared in a modular fashion. Thus, whereas the initial sections provide detailed information for the naive user, the last section is direct and unelaborated for those users knowledgeable in the approach.

1.2 References

1.2.1 Buede, Dennis M., and Peterson, Cameron R. An Application of Cost-Benefit Analysis to the USMC Program Objectives Memorandum (POM). Technical Report TR 77-8-72. McLean, Virginia: Decisions and Designs, Inc., September 1977.

1.2.2 Buede, Dennis M., and Ragland, Janice E. Cost-Benefit Analysis Applied to the Program Objectives Memorandum (POM). Technical Report TR 78-9-72. McLean, Virginia: Decisions and Designs, Inc., November 1978.

1.2.3 Buede, Dennis M., et al. Applications of Decision Analysis to the U.S. Army Affordability Study. Technical Report TR 78-10-72. McLean, Virginia: Decisions and Designs, Inc., December 1978.

1.2.4 Amey, Dorothy M.; Feuerwerger, Phillip H.; Gulick, Roy M. Documentation of Decision-Aiding Software: RAM Functional Description. McLean, Virginia: Decisions and Designs, Inc., September 1979.

1.2.5 Amey, Dorothy M.; Feuerwerger, Phillip H.; Gulick, Roy M. Documentation of Decision-Aiding Software: RAM System Specification. McLean, Virginia: Decisions and Designs, Inc., September 1979.

1.3 Terms and Abbreviations

1.3.1 RAM - RAM, the name of the system, is an abbreviation for Resource Allocation Model, reflecting the system's major area of applicability.

2.0 SYSTEM SUMMARY

2.1 Background

Cost-benefit analysis traditionally has two distinct purposes. The first is to determine the appropriateness of undertaking a specific action, such as building a dam or a new plant, by determining whether the benefits outweigh the costs and any negative side-effects. The second is to achieve the most beneficial allocation of a fixed level of resources among a large number of candidate programs, each of which would be bought were adequate resources available. The latter application is addressed by the RAM software system.

RAM is a model-building system that supports the decision process of allocating scarce monetary resources among many competing alternatives. Its general purpose is to aid decision makers by providing them with the capability to construct, store, retrieve, exercise, and refine cost-benefit models of the complex resource allocation problems they face.

Cost-benefit analysis serves as the methodological foundation for the RAM system. A RAM cost-benefit model serves as the organizing framework for systematically processing information concerning the costs and relative benefits of the competing alternatives.

The overall purpose of RAM is to permit the user to prioritize the allocation of limited resources in a manner that is logically consistent with the user's considered value structure.

2.2 Objective

RAM is a computer-assisted resource allocation tool. Its primary objective is to provide decision makers with a procedural framework that will ensure that their ultimate allocation of resources is a coherent one: a choice consistent with their own value structures and beliefs about the relative costs and benefits of the proposed programs. In that regard, it must be emphasized that the use of cost-benefit analysis and RAM does not replace human judgment: their use aids human judgment.

The objective of the RAM software system is to provide decision makers with the capability to construct, store, retrieve, exercise, and modify resource allocation models. The user who is inexperienced in constructing such models is cautioned that the methodology should not be applied indiscriminately, nor should the model results be interpreted blindly.

The RAM system is designed to be used interactively by end users who are relatively unsophisticated with respect to computer technology. Accordingly, the design satisfies two human-factors objectives: RAM is a menu-driven system, and one that is generally forgiving of procedural errors made by the user.

In addition, to facilitate the production of the program specification and coding necessary to implement RAM at a physical site, the system is designed in a hierarchically structured and modular fashion. The logical structure of RAM is contained in RAM System Specification, reference 1.2.5. A discussion of the specific functions and calculations performed by RAM is contained in RAM Functional Description, reference 1.2.4.

2.3 Procedural Overview

To formulate and solve a problem using RAM, the user must perform a cost-benefit analysis. Employing cost-benefit analysis for the purpose of allocating resources consists of the following broad tasks.

First, the candidate programs are explicitly defined and listed. Second, the total cost of each program is determined. Third, the relative benefit associated with each program is determined by the program's sponsor. Fourth, the rationales for the benefit assessments are elicited and recorded. Fifth, a committee of interested and unbiased "honest brokers" merges the programs contributed by the various sponsors into a single list, ordered by relative benefit. Sixth, cost-benefit ratios are obtained by dividing each program's cost by its benefit; the programs are ranked accordingly. Finally, specific funding constraints are applied, and a final prioritized list of programs emerges.

Most of the tasks listed in the preceding paragraph are quite difficult and time-consuming. The overall task is simple in concept and complex in practice.

In assisting the overall analysis, the RAM software prompts the user to supply the names of the candidate programs, the costs, the sponsor-assigned benefits, the supporting rationale, and the "honest broker"-assigned weights used to merge the various sponsor benefit lists. The program calculates the overall cost-benefit ratios and ranks the programs accordingly. It then allows the user to apply any appropriate resource constraints to obtain a final prioritized list.

Essentially, the RAM software assists the decision maker in organizing the data required for effective and

coherent resource allocation and in performing the calculations necessary to implement it.

2.4 An Example

To illustrate the general procedure discussed in the previous section, consider the following example. Assume that a small company has two operational departments: production and marketing. In preparation for a semi-annual budget review, each department has nominated several projects for funding. The departments have ranked the projects in order of their perceived benefit, as shown in Figure 2-1.

PRODUCTION			MARKETING		
<u>RANK</u>	<u>PROJECT</u>	<u>COST</u>	<u>RANK</u>	<u>PROJECT</u>	<u>COST</u>
1.	A	\$60K	1.	X	\$80K
2.	B	\$40K	2.	Y	\$30K
3.	C	\$10K	3.	Z	\$20K
4.	D	\$12K			

Figure 2-1
PROJECTS RANKED BY PERCEIVED BENEFIT

Assume that the company has only limited resources and can expend approximately \$140K. Note that the total cost of all seven projects is \$252K. The company president must decide which of the seven projects to fund.

The initial step is for each department to scale the benefits of their own projects. A relative benefit value (utility) of 100 is assigned to the most beneficial project. The other projects are then scaled accordingly and the assigned values are supported by written rationale.

Assume that the projects are assigned the benefit values shown in Figure 2-2. Note that costs are temporarily excluded.

PRODUCTION		MARKETING	
<u>PROJECT</u>	<u>BENEFIT</u>	<u>PROJECT</u>	<u>BENEFIT</u>
A	100	X	100
B	50	Y	80
C	20	Z	25
D	15		

Figure 2-2
BENEFIT SCALING

Note that several implications arise from the scaled values. For example, the production department implies that funding project A alone will prove more beneficial than funding all of the remaining projects: B, C, and D. (The total benefit of the latter is only 85% that of project A.) The marketing department implies that project Y is more than three times more beneficial than project Z. Those implications and others can be used to discover inconsistencies in the assignment of benefit values.

Several experts, representing the company as a whole and referred to as honest brokers, are briefed on the company-wide benefits of one marketing project and one production project, the choice of projects being random. Department-assigned benefit values are not disclosed to the honest brokers.

Assume that the honest brokers have been briefed on projects C and Y. The honest brokers are asked to rank order and then interval-scale the two projects. Assume

their result is as shown in Figure 2-3. Note that project C was judged only 40% as beneficial to the company as project Y.

COMPANY-WIDE	
<u>PROJECT</u>	<u>COMPANY BENEFIT</u>
Y	100
C	40

Figure 2-3
COMPANY-WIDE BENEFIT SCALING

At this point, the relative benefits of all of the seven candidate projects have been established in a mathematically and logically consistent relationship. The implied results are as shown in Figure 2-4. (The mathematical procedure for producing the integrated list is discussed in the RAM Functional Description, reference 1.2.4.)

COMPANY-WIDE	
<u>PROJECT</u>	<u>BENEFIT</u>
A	100
X	62.5
B	50
Y	50
C	20
Z	15.6
D	15

Figure 2-4
COMPANY-WIDE BENEFIT

The combined list should be carefully checked by the honest brokers for consistency. For example, they might ask to be briefed on projects Z and D and then decide if the two really have essentially equal benefits to the company, as the list implies.

Finally, the costs of the projects are used to determine the prioritized list ordered by cost-benefit ratio. The final list is shown in Figure 2-5.

COMPANY-WIDE				
<u>FUNDING ORDER</u>	<u>PROJECT</u>	<u>COST</u>	<u>COMPANY BENEFIT</u>	<u>COST-BENEFIT RATIO</u>
1	C	\$10K	20	0.5
2	A	\$60K	100	0.6
3	Y	\$30K	50	0.6
4	B	\$40K	50	0.8
5	D	\$12K	15	0.8
6	X	\$80K	62.5	1.3
7	Z	\$20K	15.6	1.3

Figure 2-5
COST-BENEFIT PRIORITIZATION

A line has been drawn at the approximate funding level constraint of \$140K. Given that fiscal constraint, it would be inconsistent for the company to fund programs D, X, and Z.

Note also that if the company had adopted a strategy of funding the projects in the order of their benefit only, the final order would have been quite different, as shown in Figure 2-6.

<u>FUNDING ORDER</u>	<u>PROJECT</u>	<u>COST</u>	<u>COMPANY BENEFIT</u>
1	A	\$60K	100
2	X	\$80K	62.5
3	Y	\$30K	50
4	B	\$40K	50
5	C	\$10K	20
6	Z	\$20K	15.6
7	D	\$12K	15

Figure 2-6
BENEFIT-ONLY PRIORITIZATION

Again, a line has been drawn at the approximate funding level constraint of \$140K. Note that for the same expenditure of funds, the benefit-only prioritization provides a total company benefit of 162.5, whereas the cost-benefit prioritization provides a total benefit of 220, more than a 35% improvement.

In general, the items always will be purchased in different orders according to the two prioritization criteria, with the cost-benefit criterion preferred. Figure 2-7 represents this notion graphically.

References 1.2.1, 1.2.2, and 1.2.3 provide excellent background material for anyone performing a cost-benefit analysis using RAM.

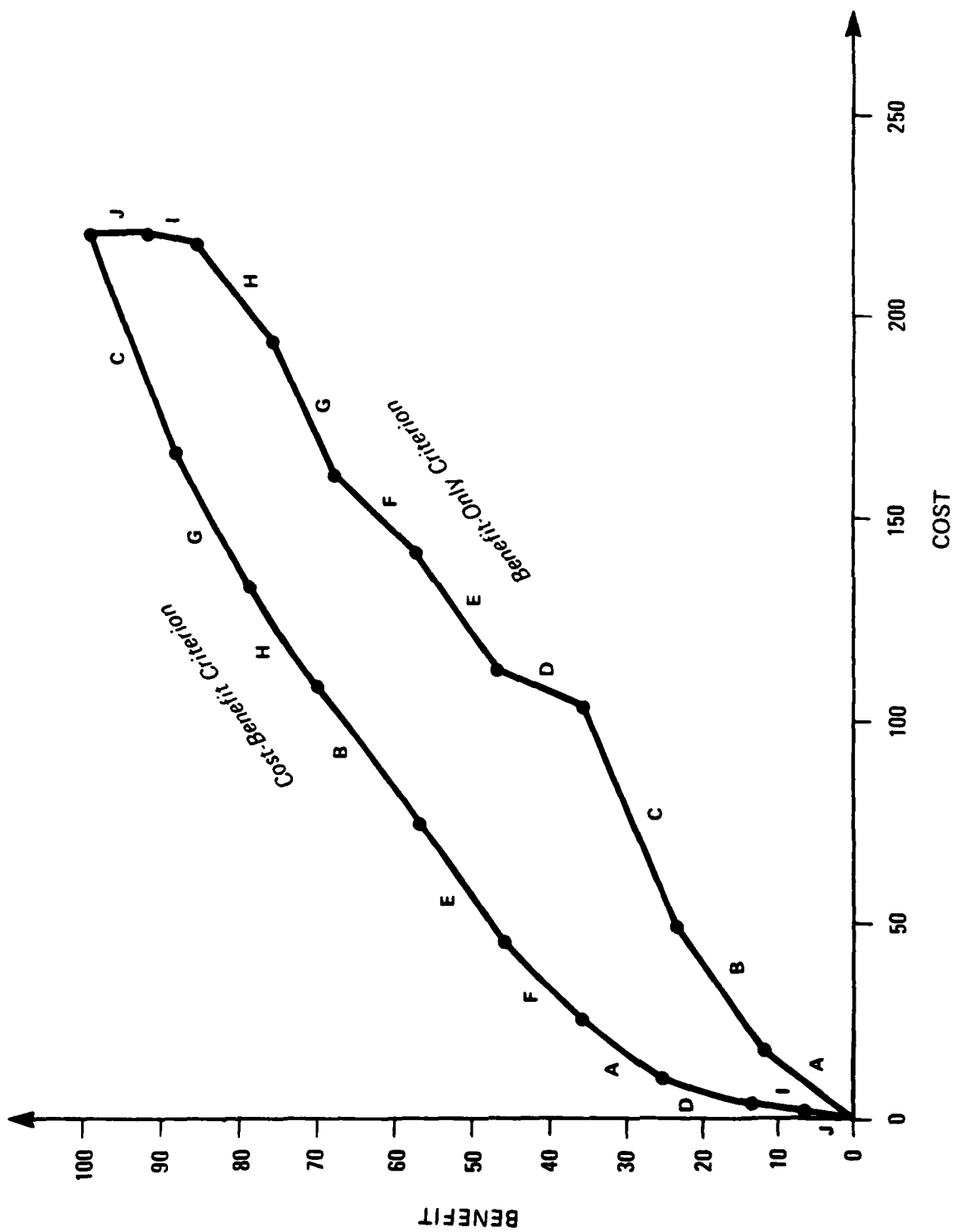


Figure 2-7
COST-BENEFIT VS. BENEFIT-ONLY CRITERION

3.0 TECHNICAL OPERATIONS

RAM is a hierarchically structured, menu-driven system. It consists of two independent parts, BUILDGRAM and REPRAM. BUILDGRAM is used to build new models, input data, and edit an existing model. REPRAM is designed to produce reports by displaying the currently loaded model in a variety of useful formats. The BUILDGRAM software system is discussed in Section 3.2 and the REPRAM software system is discussed in Section 3.3.

3.1 Option Menus

In the RAM software package, user options are generally displayed as a menu that lists various options. Selection of any particular option will either cause an operation to be performed or result in the display of another menu. If a secondary menu appears and the user subsequently wishes to return to the previous menu, the user need only return the carriage without selecting any specific option. With few exceptions, returning the carriage at any time (without inputting other instructions or making selections) will cause the computer to display the next higher menu in the hierarchy of menus. If the menu displayed is the one at the very top of the hierarchy, returning the carriage will result in a query to the user regarding termination of the program.

For example, the user begins a session with REPRAM by having the highest level menu displayed. That menu contains the following options, discussed more fully in Section 3.3.1.

- o Load Model
- o Display Results
- o Printer Listing

- o Sort
- o Rationale

By selecting "Sort," for example, and returning the carriage, the user causes a new menu, which requests additional information, to appear. Thus, selecting the "Sort" option requires the user to specify in more detail the particular format by which the results are to be sorted. The format is specified by selecting one of the options appearing in the secondary menu, as follows:

- o Sponsor and Item
- o Sponsor Benefit
- o Overall Benefit
- o Cost
- o Cost Benefit
- o Rank

However, if instead of selecting one of these options, the user simply returns the carriage, the program will return to the primary menu.

3.2 The BUILDGRAM Software Program

3.2.1 Appropriate uses of the BUILDGRAM software - The BUILDGRAM software is designed to provide the means to build models to solve problems of resource allocation. This software is also used for editing such models after they have been built.

3.2.2 The primary menu - After the user has loaded the BUILDGRAM program into the computer, the primary menu will be displayed. This menu contains the following eight options:

- o Load/Save Model
- o Display by Sponsors

- o Create Model
- o Enter Data
- o Develop Sponsor Weights
- o Edit
- o Calculate
- o C/B versus Benefit

This menu provides access to various building and editing functions, as well as to secondary menus. Each of those primary options and the options appearing in the secondary menus are discussed in the following sections.

3.2.2.1 Load/save model - In order to use the BUILDAM software, the user must select either the "Load/Save Model" option or the "Create Model" option, as those are the only two ways to load a model into the computer. When "Load/Save Model" is selected, a secondary menu will be displayed. That menu contains the two options "Load Model" and "Save Model."

Selecting "Load Model" will cause the computer to inform the user of the models that are stored and available for loading and will instruct the user on how to load the model into the computer. Once the user has loaded the model into the computer, the model will be available for editing (the "Edit" option), entering new sets of data (the "Enter Data" option), developing new sponsor weights (the "Develop Sponsor Weights" option), or for display purposes (the "Display by Sponsors" and "C/B versus Benefit" options).

Selecting the "Save Model" option will cause the computer to instruct the user how to save the newly created or newly edited model permanently. A model must be saved after it has been created or edited, otherwise it will be lost when the computer is turned off. Normally, the "Save Model" option is used immediately after any editing

or creating is done, ensuring that the model is permanently saved even if a computer malfunction or human error should subsequently occur.

3.2.2.2 Display by sponsors - Selecting this option will cause the computer to display a secondary menu requesting the name of the sponsor whose items are to be displayed. When the user has selected a sponsor, the computer will produce a display which includes the sponsor number, the names and numbers of the sponsor's items, and the benefits (both sponsor and overall), costs, cost-benefit ratios, and ranks of the items. Also displayed is the relative weight of the specified sponsor's items in comparison with all items.

3.2.2.3 Create model - Selecting this option allows the user to structure a new model. After loading the BUILDGRAM program into the computer, the user must either create a new model or load an existing one. No other means exist for loading a model in the computer.

When the user selects the "Create Model" option, the system will request that the user type in the names of the various sponsors. If all items are proposed by a single individual, the user need only type in the one sponsor name. After typing in the first sponsor's name, the user must return the carriage. The system will then ask for another sponsor name. It will continue requesting sponsor names until the user returns the carriage without typing anything at all. At that point, the system will request confirmation that the user is finished before moving to the next step. The user must be certain to include all sponsors, as there is no way to add or delete sponsors from the model.

The system will next request the names of the five cost components. These are normally the separate

fiscal years in which the costs will be expended, though other component categorizations may be used. The user must again type these names in, one name per line. The system will automatically create a sixth category, "OTHER," to incorporate all costs not specifically attributable to any of the five named categories.

After the user has typed in the category names, the system will ask the user to input the individual items belonging to each sponsor. The computer asks which sponsor is desired, and the user must then type in the names of the items of that sponsor, one per line, until all items are listed. Returning the carriage without typing anything at all will produce a response requesting confirmation that the list of items is complete. Once the user completes one sponsor's list of items, the system will instruct the user to specify the next sponsor whose items are to be input. This process continues until the items belonging to all of the sponsors have been typed in.

The computer will then inform the user that all costs and weights have been set to zero. The user must return to the primary menu and select another option to reset those values.

3.2.2.4 Enter data - Selecting this option allows the user to type in the values of benefit and cost associated with each sponsor's items. The system will display a secondary menu asking the user whether "Benefits" or "Costs" are to be entered.

Costs. If the user selects the "Costs" option, the system responds by displaying the items sequentially, requesting the value of each of the five components of the cost, as well as the value of other costs which do not fit into any of the five categories. After the user has

typed in the six costs figures and returned the carriage, the next item will be displayed. This process is continued until all costs have been entered. After the final cost has been typed in, the system returns the user to the "Costs/ Benefits" menu.

Benefits. If the "Benefits" option is selected, the computer responds by displaying the items sequentially, requesting that the user type in the value of benefit which the item's sponsor associates with that particular item. The benefit numbers of all items belonging to any single sponsor are related to one another, though the benefit numbers of different sponsors need have no relation. That is, if two items sponsored by a single sponsor have been assigned benefits of 100 and 50, the implication is that the former is twice as beneficial as the latter. But if two items sponsored by different sponsors each are assigned the same benefit value, the items do not necessarily possess the same benefit to the organization as a whole. Rather, the ratio of their sponsor importance weights will determine their ultimate relative benefit. Sponsor importance weights are assigned under the "Develop Sponsor Weights" option discussed below. After all of the sponsor benefits have been typed in, the system will return the user to the "Cost/ Benefit" menu. Returning the carriage without selecting an option will return the user to the primary menu.

3.2.2.5 Develop sponsor weights - This option allows the user to input the relative importance weights assigned to the various sponsors. The computer will instruct the user to select one item from each sponsor and assign it a relative importance weight. It will automatically assign a weight of 100 to the first item selected. The benefits assigned to all other selected items should have been assessed by honest brokers in relation to this standard of 100. The system will then ask for the item's

importance weight immediately after its sponsor and item numbers are input. The user should be certain to include only one item from each sponsor. After the user has designated the proper number of items (the same number as there are sponsors) and assigned an importance weight to each, the system will return the user to the primary menu.

3.2.2.6 Edit. Selecting the "Edit" option causes the system to display a secondary menu requesting that the user supply further instructions about what is to be edited. The options in this menu are explained in the next few paragraphs.

Edit benefits. Selecting this option allows the user to edit the sponsor benefits assigned under the "New Data" option. Editing the benefit value for any item does not affect the benefit values previously assigned to any other item.

When "Edit Benefits" is selected, the system will respond by requesting the sponsor and item numbers of the item to be edited. After those numbers are specified, the system will display the name of the specified item and its currently assigned benefit. It will then ask that the user type in the new value for sponsor benefit. After this is done, the system will ask for another sponsor and item. If none is supplied, the system will request confirmation that the user has finished editing benefits before returning the user to the previous menu.

Edit item names. If the user wishes to change the name of an item, perhaps because a different name seems to be more appropriate or because an error was made when the name was originally typed in, this option is selected. The system will request the sponsor and item numbers of the item to be edited. When those are specified, the

system will display the current name and provide a space for a new name. After this is supplied and the carriage returned, the system will request the sponsor and item numbers of the next name requiring editing. If none are supplied, the system will request confirmation that editing is complete before returning to the previous menu.

Add a new item. This option is selected when the user wishes to include in the analysis an item which has not been included originally. When this option is selected, the system instructs the user to input the sponsor and item numbers of the new item. The system will then provide the user a space in which to type the item's name. Once this has been typed in, the system will request the sponsor and item numbers of the next item. When the user returns the carriage without supplying the numbers, the system will return to the previous menu. Because the system automatically sets the cost and benefit values for new items to zero, the user must use "Edit Costs" and "Edit Benefits" to supply those numbers.

Delete an item. This option is selected if the user wishes to eliminate an item from the analysis. When this option is selected, the system will request the sponsor and item numbers of the item to be deleted. It will then request confirmation that the specified item is actually the one to be deleted. Only on confirmation will it actually delete the item and ask if any other items need to be deleted. If not, the user will be returned to the previous menu.

Edit costs. Selecting this option allows the user to edit the costs associated with any item. Costs were originally assigned under the "New Data" option. Editing the cost value for any item does not affect the value assigned to any other item.

When the "Edit Costs" option is selected, the system will respond by requesting the sponsor and item numbers of the item to be edited. After those numbers are specified, the system will display the name of the specified item and the current values of its current cost components. It will then ask that the user type in the new values for each of the six cost components (including the "Other" category). After that is done, the system will ask for another sponsor and item. If none is supplied, the system will request confirmation that the user has finished editing costs before returning the user to the previous menu.

3.2.2.7 Calculate - This option must be selected before a model can be saved. Otherwise, the model will not be properly formatted for saving or for recalling later from permanent storage.

When this option is selected, the system will ask the user to input the sponsor and item numbers of any items which must be bought regardless of cost or benefit. Generally, those items must be bought for such reasons as prior commitment, a superior's order, or other uncompromising pressures. Those items should be identified one at a time, in the order in which they must be bought. After each item has been specified, the system will request confirmation that the correct item has been specified. When the user has finished specifying all of the must-buy items, the carriage should be returned without specifying another item. This will return the user to the primary menu.

3.2.2.8 C/B versus benefit - This option offers the user the ability to display a set of reports contrasting the order of purchase of the items under two different criteria: Benefit and Cost-Benefit. One such report is available for each sponsor. The reports will consist of a listing of items in order of purchase by each criterion.

The list is staggered according to the total amount of resources expended. Cumulative cost and benefit columns are displayed for each item for each criterion.

When the "C/B versus Benefit" option is selected, the computer will display a menu of the sponsors for which a report is available. When the user specifies a sponsor, a Cost-Benefit versus Benefit report of that sponsor's items will be displayed. Returning the carriage returns the user to the menu of sponsors, from where the user can easily return to the primary menu by returning the carriage without specifying any sponsor.

3.3 The REPRAM Software Program

3.3.1 Appropriate uses of the REPRAM software - The REPRAM software system is designed to provide a variety of different displays of a model that has been previously constructed using the BUILDGRAM system. The different displays were chosen because of their proven usefulness in clarifying different aspects of the model. The reports include selected portions of the input data and the final results arranged in a variety of different orders and formats. Note that a model cannot be built using REPRAM. Furthermore, editing can only be performed on the rationale. Other editing, as well as initial model construction, can be performed only by using the BUILDGRAM system.

3.3.2 The primary menu - After the user has loaded the REPRAM program, the primary menu is displayed. This menu contains five options:

- o Load Model
- o Display Results
- o Printer Listing

- o Sort
- o Rationale

This menu provides the user access to various displays and secondary menus. Each of these primary options and the options appearing in the secondary menus are discussed in the following sections.

3.3.2.1 Load model - Selection of this option causes the system to inform the user of the names of the models already built and available for loading. It also informs the user of any physical procedure necessary for loading a model, e.g., placing a disk, tape, or other object in a specific slot. A user may wish to load a model in order to display an existing model, to check the results of sorting the data in various ways, or to view or revise the rationale supporting the results. The labels of the various models which appear were initially assigned using the "Load/Save Model" option available in BUILD RAM. Selecting a specific model causes the system to load that model into the computer.

3.3.2.2 Display results - When this option is selected, the primary menu will be replaced by a secondary menu containing the following options:

- o Display Overall
- o Display by Sponsors
- o Overall Costs
- o Sponsor Costs

These options indicate the various data or results which can be displayed.

The "Display Results" option is passive in that it allows the user to display results previously

stored in the computer or calculations based on those results. It does not provide the user with a mechanism for changing any of the inputs or sorting the results in a different order. Such revision is accomplished in the BUILDGRAM system or under the "Sort" option of the REPRAM system.

Display overall. Selection of this option causes the system to display the name, the sponsor-assigned benefit, the overall benefit, the cost, the cost-benefit ratio, and the rank of the items in whatever order they have been sorted. If the "Sort" option has not been used previously, the display will always be by sponsor. The system will display the items in groups of ten, asking after each group whether the user wishes to display additional items.

Display by sponsors. Selection of this option causes another menu to be displayed. That menu lists the sponsors by name. Selecting a sponsor causes the names of that sponsor's items to be displayed, along with each item's sponsor-assigned benefit, overall benefit, cost, cost-benefit ratio, and rank. Also appearing is the importance weight of that sponsor's items relative to the items of all sponsors. Once again, the system displays those items in groups of ten, asking after each group whether the user wishes to see additional items.

Overall costs. Selection of this option causes the system to display the costs of each item. The sum of the partial costs is the cost shown under the "Display Overall" and "Display by Sponsors" options. The system displays items in groups of ten, asking after each group whether the user wishes to display additional items.

Sponsor costs. Selection of this option causes another menu to be displayed. That menu lists the sponsors by name. Identifying a desired sponsor causes that sponsor's items to be displayed, broken down by cost, as in the "Overall Costs" option. The system displays items in groups of ten, asking after each group whether the user wishes to display additional items.

3.3.2.3 Printer listing - Selecting this option causes the system to instruct the user on how to obtain a printed version of the results in their current form. The output will be the same as that available in the "Display Overall" and "Overall Costs" options, together with the cumulative costs of the items. A different printer listing may be compiled for each sorting order, as discussed below.

3.3.2.4 Sort - Selection of this option causes another menu to appear, requesting the order in which the items should be sorted. The items may be sorted in any of the following six orders:

- o by Sponsor and Item
- o by Sponsor Benefit
- o by Overall Benefit
- o by Cost
- o by Cost/Benefit
- o by Rank

After the user selects the order in which the items should be sorted, the system will ask whether the user would like the items in ascending or descending order. The system will then return to the primary menu. Normally, either the results will be displayed or a printer listing will be made. The various sorting orders are:

Sponsor and item. Selecting this ordering places the items in order, one sponsor after another, with the items of each sponsor placed in the order in which they were input during the model's construction. This ordering is the default order. That is, any display or printer listings selected before the "Sort" option has been specified will automatically appear in this order.

Sponsor-assigned benefit. Selecting this option causes the items to be sorted according to the value of benefit assigned by the sponsors. If more than one item has been assigned the same benefit, those items are listed in order of the sponsor number.

Overall benefit. Selecting this option causes the items to be sorted according to the overall benefit, thus accounting for the relative importance weights assigned to each sponsor's items.

Cost. Selecting this option causes the items to be sorted in order of their overall cost.

Cost/benefit. Selecting this option causes the items to be sorted according to the ratio of cost to benefit. The cost-benefit ordering is most often used as the final order of purchase in resource allocation situations.

Rank. Selecting this option causes the items to be sorted according to the actual order of purchase. The rank order differs from the cost-benefit order in that the rank ordering takes into account circumstances other than cost and benefit, that is, if an item must be bought for some reason independent of cost and benefit.

3.3.2.5 Rationale - Selecting this option allows the user to input rationale concerning the benefit numbers

assigned or to edit rationale previously entered. When this option is selected, the system instructs the user how to input the rationale. The system will then request that the user identify the item by sponsor number and item number. It then displays the rationale as it currently exists and allows the user to type new rationale or edit the current rationale.

4.0 EXAMPLE USE OF THE RAM SOFTWARE

This chapter presents a hypothetical cost-benefit analysis using the RAM system. The decision problem contains all of the qualities necessary to make it ideal for RAM: a set of competing items nominated by a set of sponsors, each item characterized by an appropriate cost and relative benefit.

4.1 Background of the Example

This example concerns the resource allocation required in order to provide a college various improved services within a variety of potential cost constraints. Different funding levels will lead to different final program selections.

In this example, five college sponsors are seeking funds beyond their current level of funding in order to improve services. All of the programs are either entirely new or are increments of spending on old programs beyond the current budget. For instance, the program later referred to as "In-House Computer Facility" is an entirely new expenditure, whereas the program entitled "Counseling Program" would simply be an extension of an already existing program. All existing programs are assumed to be continuing; the current analysis is undertaken only to help decide how to distribute funds beyond those already committed.

Assume that the college administration is divided into five sections, each of which proposes and sponsors its own programs within areas under its purview. The five sponsors are:

- o Planning and Institutional Research;
- o Business and Facilities;
- o Student Services;
- o Faculty and Curriculum; and
- o Development and Public Relations.

Each group has submitted a list of proposals for funding consideration. The President and Board of Overseers of the college must decide which programs to fund.

Program costs could be categorized in many ways. The Board decided that all programs would be budgeted for a five-year life-cycle period. This would allow for continuity and for an evaluation of the long-term costs and benefits. The Board decided to have the cost components be the total cost during each fiscal year from 1980 to 1984, inclusive.

4.2 Using the BUILD RAM Software to Structure the Example Problem

This section structures the RAM model for this example. The figures which appear are simply representations of possible input and output formats. Other formats would be equally suitable.

The first step that the user must perform is to load the program. Instructions concerning how to load a model will appear. Next, a menu of options such as the one given in Figure 4-1 will be displayed. In this and all succeeding figures, user inputs have been underlined for clarity.

```

SELECT THE NUMBER OF THE OPTION YOU DESIRE
1)  LOAD/SAVE MODEL
2)  DISPLAY BY SPONSORS
3)  CREATE MODEL
4)  ENTER DATA
5)  DEVELOP SPONSOR WEIGHTS
6)  EDIT
7)  CALCULATE
8)  C/B VS. BENEFIT
SELECTION:  3

```

Figure 4-1
THE PRIMARY MENU

Selecting "Create Model" places the system in the structuring mode. The system will ask the user to enter the names of the sponsors. After the user types in the sponsor names and returns the carriage, the system will request confirmation. Normally, some limitation in the length of sponsor names will be specified in order to conserve space. Figure 4-2 shows a representation of the input of sponsor names for the example.

```

ENTER THE LABELS FOR THE SPONSORS,
ONE PER LINE, NO MORE THAN 20 CHARACTERS.
1)  PLNG & INST RESEARCH
2)  BUSINESS & FACILITIES
3)  FACULTY & CURRICULUM
4)  STUDENT SERVICES
5)  DEVELOPMENT & P.R.
6)
THE LABELS YOU HAVE ENTERED ARE:
1 - PLNG & INST RESEARCH
2 - BUSINESS & FACILITIES
3 - FACULTY & CURRICULUM
4 - STUDENT SERVICES
5 - DEVELOPMENT & P.R.
IF THESE ARE CORRECT TYPE GO:  GO

```

Figure 4-2
INPUTTING THE SPONSOR NAMES

The system will then request the names of the five cost components. Again, confirmation will be requested. Figure 4-3 illustrates this process.

ENTER THE LABELS FOR THE FIVE COST COMPONENTS,
ONE PER LINE, LIMITED TO FOUR CHARACTERS.

- 1) FY80
- 2) FY81
- 3) FY82
- 4) FY83
- 5) FY84

THE LABELS YOU HAVE ENTERED ARE:

- 1 - FY80
- 2 - FY81
- 3 - FY82
- 4 - FY83
- 5 - FY84

IF THESE ARE CORRECT TYPE GO: GO

Figure 4-3
INPUTTING THE COST COMPONENTS

The system then asks for the names of the items (programs) proposed by each sponsor. The user will type them in one at a time, returning the carriage after each. The user returns the carriage without typing anything to signal that no more programs exist for the sponsor under consideration. After each sponsor's program list is completed, the system requests confirmation. Figure 4-4 illustrates this process.

ENTER THE LABELS FOR THE PROGRAMS SPONSORED BY "PLNG
& INST RESEARCH," ONE PER LINE, LIMITED TO 20 CHARACTERS.

- 1) SECRETARIAL SERVICES
- 2) ALUMNI SURVEY
- 3) ARCHITECTURAL SURVEY
- 4) EXPANSION PLANNING
- 5)

THE LABELS YOU HAVE ENTERED ARE:

- 1 - SECRETARIAL SERVICES
- 2 - ALUMNI SURVEY
- 3 - ARCHITECTURAL SURVEY
- 4 - EXPANSION PLANNING

IF THESE ARE CORRECT TYPE GO: GO

ENTER THE LABELS FOR THE PROGRAMS SPONSORED BY "BUSINESS & FACILITIES," ONE PER LINE, LIMITED TO 20 CHARACTERS.

- 1) LAB FACILITIES
- 2) ATHLETIC COMPLEX
- 3) IN-HOUSE COMPUTER
- 4) MAINT & RENOVATION
- 5) INVESTMENT AID
- 6)

THE LABELS YOU HAVE ENTERED ARE:

- 1 - LAB FACILITIES
- 2 - ATHLETIC COMPLEX
- 3 - IN-HOUSE COMPUTER
- 4 - MAINT & RENOVATION
- 5 - INVESTMENT AID
- 6 -

IF THESE ARE CORRECT TYPE GO: GO

ENTER THE LABELS FOR THE PROGRAMS SPONSORED BY "FACULTY & CURRICULUM," ONE PER LINE, LIMITED TO 20 CHARACTERS.

- 1) INTERVIEW & HIRING
- 2) FACULTY RAISES
- 3) NURSING PROGRAM
- 4) BUSINESS PROGRAM
- 5) FACULTY OFFICE BLDG
- 6) BOOKS & PERIODICALS

THE LABELS YOU HAVE ENTERED ARE:

- 1 - INTERVIEW & HIRING
- 2 - FACULTY RAISES
- 3 - NURSING PROGRAM
- 4 - BUSINESS PROGRAM
- 5 - FACULTY OFFICE BLDG
- 6 - BOOKS & PERIODICALS

IF THESE ARE CORRECT TYPE GO: GO.

ENTER THE LABELS FOR THE PROGRAMS SPONSORED BY "STUDENT SERVICES," ONE PER LINE, LIMITED TO 20 CHARACTERS.

- 1) STUDENT CENTER
- 2) COUNSELING PROGRAM
- 3) CAREER PLACEMENT CTR
- 4) HOUSING GUIDE
- 5) EXTRACURRICULAR
- 6) HEALTH SERVICES
- 7)

THE LABELS YOU HAVE ENTERED ARE:

- 1 - STUDENT CENTER
- 2 - COUNSELING PROGRAM
- 3 - CAREER PLACEMENT CNTR
- 4 - HOUSING GUIDE
- 5 - EXTRACURRICULAR
- 6 - HEALTH SERVICES
- 7 -

IF THESE ARE CORRECT TYPE GO: GO

ENTER THE LABELS FOR THE PROGRAMS SPONSORED BY "DEVELOPMENT & P.R.," ONE PER LINE, LIMITED TO 20 CHARACTERS.

- 1) ALUMNI ASSOCIATION
- 2) FEDERAL RELATIONS
- 3) FOUNDATION SUPPORT
- 4) COMMUNITY INVOLVEMENT
- 5) RECRUITING
- 6)

THE LABELS YOU HAVE ENTERED ARE:

- 1 - ALUMNI ASSOCIATION
- 2 - FEDERAL RELATIONS
- 3 - FOUNDATIONS SUPPORT
- 4 - COMMUNITY INVOLVEMENT
- 5 - RECRUITING

IF THESE ARE CORRECT TYPE GO: GO

Figure 4-4
INPUTTING ITEMS

The system next informs the user that all costs and benefits have been set to zero. Figure 4-5 shows this exchange. The system will then return the user to the primary menu.

ALL COSTS AND BENEFITS HAVE BEEN SET TO ZERO.
THESE CAN BE RESET USING THE "NEW DATA" OPTION.
RETURN THE CARRIAGE TO RETURN TO THE PRIMARY MENU.

Figure 4-5
INSTRUCTIONS ON ENTERING DATA

The user should now select the "New Data" option in order to input the costs and benefits of the various programs. Selecting "New Data" will cause the system to display a menu asking whether the user wishes to input costs or benefits. Selecting the "Benefits" option will allow the user to type in the relative benefits assigned by each

sponsor to the respective programs. This process is illustrated in Figure 4-6.

ENTER THE RELATIVE BENEFITS ASSIGNED BY EACH SPONSOR:

SPONSOR	ITEM	LABEL	BENEFITS
1	1	SECRETARIAL SERVICES	<u>10</u>
1	2	ALUMNI SURVEY	<u>25</u>
1	3	ARCHITECTURAL SURVEY	<u>100</u>
1	4	EXPANSION PLANNING	<u>65</u>
2	1	LAB FACILITIES	<u>60</u>
2	2	ATHLETIC COMPLEX	<u>5</u>
2	3	IN-HOUSE COMPUTER	<u>70</u>
2	4	MAINT & RENOVATION	<u>100</u>
2	5	INVESTMENT AID	<u>20</u>
3	1	INTERVIEW & HIRING	<u>55</u>
3	2	FACULTY RAISES	<u>30</u>
3	3	NURSING PROGRAM	<u>25</u>
3	4	BUSINESS PROGRAM	<u>70</u>
3	5	FACULTY OFFICE BLDG	<u>80</u>
3	6	BOOKS & PERIODICALS	<u>100</u>
4	1	STUDENT CENTER	<u>30</u>
4	2	COUNSELING PROGRAM	<u>35</u>
4	3	CAREER PLACEMENT CTR	<u>100</u>
4	4	HOUSING GUIDE	<u>15</u>
4	5	EXTRACURRICULAR	<u>20</u>
4	6	HEALTH SERVICES	<u>75</u>
5	1	ALUMNI ASSOCIATION	<u>25</u>
5	2	FEDERAL RELATIONS	<u>90</u>
5	3	FOUNDATION SUPPORT	<u>100</u>
5	4	COMMUNITY INVOLVEMENT	<u>50</u>
5	5	RECRUITING	<u>70</u>

Figure 4-6
INPUTTING THE BENEFITS

The system will then return to the "Costs"/"Benefits" display. Selecting "Costs" will cause a display of the names of the sponsors to appear. When a sponsor has been selected, the system will display that sponsor's items, one at a time, so that the user may type in the various component costs. After that sponsor's items have been input, the display will return to the menu of sponsors in order to allow the user to select another sponsor. The whole process is shown below. In Figure 4-7, costs are input in thousands of dollars.

SELECT THE NUMBER OF THE OPTION YOU DESIRE:

- 1) COSTS
- 2) BENEFITS

SELECTION: 1

SELECT THE NUMBER OF THE OPTION YOU DESIRE:

- 1) PLNG & INST RESEARCH
- 2) BUSINESS & FACILITIES
- 3) FACULTY & CURRICULUM
- 4) STUDENT SERVICES
- 5) DEVELOPMENT & P.R.

SELECTION: 1

		COST					
		FY80	FY81	FY82	FY83	FY84	OTHER
1	1) SECRETARIAL SERVICES	<u>15</u>	<u>17</u>	<u>19</u>	<u>21</u>	<u>23</u>	<u>0</u>
1	2) ALUMNI SURVEY	<u>5</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
1	3) ARCHITECTURAL SURVEY	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>0</u>
1	4) GROWTH PLANNING	<u>20</u>	<u>21</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>0</u>

SELECT THE NUMBER OF THE OPTION YOU DESIRE:

- 1) PLNG & INST RESEARCH
- 2) BUSINESS & FACILITIES
- 3) FACULTY & CURRICULUM
- 4) STUDENT SERVICES
- 5) DEVELOPMENT & P.R.

SELECTION: 2

		COST					
		FY80	FY81	FY82	FY83	FY84	OTHER
2	1) LAB FACILITIES	<u>50</u>	<u>50</u>	<u>50</u>	<u>60</u>	<u>60</u>	<u>0</u>
2	2) ATHLETIC COMPLEX	<u>1000</u>	<u>3000</u>	<u>20</u>	<u>20</u>	<u>20</u>	<u>0</u>
2	3) IN-HOUSE COMPUTER	<u>280</u>	<u>300</u>	<u>25</u>	<u>27</u>	<u>28</u>	<u>0</u>
2	4) MAINT & RENOVATION	<u>40</u>	<u>45</u>	<u>50</u>	<u>55</u>	<u>60</u>	<u>0</u>
2	5) INVESTMENT AID	<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>20</u>	<u>0</u>

SELECT THE NUMBER OF THE OPTION YOU DESIRE:

- 1) PLNG & INST RESEARCH
- 2) BUSINESS & FACILITIES
- 3) FACULTY & CURRICULUM
- 4) STUDENT SERVICES
- 5) DEVELOPMENT & P.R.

SELECTION: 3

		COST					
		FY80	FY81	FY82	FY83	FY84	OTHER
3	1) INTERVIEW & HIRING	15	19	21	23	22	0
3	2) FACULTY RAISES	180	190	202	215	230	0
3	3) NURSING PROGRAM	310	340	370	400	450	0
3	4) BUSINESS PROGRAM	200	210	230	260	300	0
3	5) FACULTY OFFICE BLDG	10	300	450	25	25	0
3	6) BOOKS & PERIODICALS	75	80	85	90	95	0

SELECT THE NUMBER OF THE OPTION YOU DESIRE:

- 1) PLNG & INST RESEARCH
- 2) BUSINESS & FACILITIES
- 3) FACULTY & CURRICULUM
- 4) STUDENT SERVICES
- 5) DEVELOPMENT & P.R.

		COST					
		FY80	FY81	FY82	FY83	FY84	OTHER
4	1) STUDENT CENTER	11	14	10	9	8	0
4	2) COUNSELING PROGRAM	19	20	22	24	25	0
4	3) CAREER PLACEMENT CTR	5	8	9	10	12	0
4	4) HOUSING GUIDE	8	1	1	1	1	0
4	5) EXTRACURRICULAR	1	3	3	3	3	0
4	6) HEALTH SERVICES	45	51	54	61	67	0

SELECT THE NUMBER OF THE OPTION YOU DESIRE:

- 1) PLNG & INST RESEARCH
- 2) BUSINESS & FACILITIES
- 3) FACULTY & CURRICULUM
- 4) STUDENT SERVICES
- 5) DEVELOPMENT & P.R.

SELECTION: 5

		COST					
		FY80	FY81	FY82	FY83	FY84	OTHER
5	1) ALUMNI ASSOCIATION	4	5	5	6	6	0
5	2) FEDERAL RELATIONS	15	16	18	19	21	0
5	3) FOUNDATION SUPPORT	23	25	26	28	30	0
5	4) COMMUNITY INVOLVEMENT	45	47	48	49	50	0
5	5) RECRUITING	18	19	21	22	23	0

Figure 4-7
INPUTTING COSTS

Now that the user has typed in all of the benefits and costs, the "Edit" option should be selected from the primary menu in order to make any necessary changes. Selecting this option will produce the menu shown in Figure 4-8.

```
SELECT THE NUMBER OF THE DESIRED OPTION:
1)  EDIT BENEFITS
2)  EDIT ITEM NAMES
3)  ADD A NEW ITEM
4)  DELETE AN ITEM
5)  EDIT COSTS
SELECTION:
```

Figure 4-8
THE EDIT MENU

Selecting "Edit Benefits" allows the user to change any benefits which were erroneously input or which have been reassessed. Figure 4-9 demonstrates this process.

```
SELECTION:  1

*****  EDIT BENEFITS  *****
ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM
TO BE EDITED:  2  5
2  5)  INVESTMENT AID
        CURRENT BENEFIT:  20
        NEW BENEFIT:  12

ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM
TO BE EDITED:  4  2
4  2)  COUNSELING PROGRAM
        CURRENT BENEFIT:  35
        NEW BENEFIT:  45

ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM
TO BE EDITED:
```

Figure 4-9
EDITING THE BENEFITS

Selecting "Edit Costs" allows the user to change any costs which were erroneously input or which, after rethinking, have been reassessed. Figure 4-10 demonstrates this process.

SELECTION: 5

***** EDIT COSTS *****

ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM

TO BE EDITED: 2 2

2 2) ATHLETIC COMPLEX FY80 FY81 FY82 FY83 FY84 OTHER

CURRENT COSTS:	1000	3000	20	20	20	0
----------------	------	------	----	----	----	---

NEW COSTS:	<u>1000</u>	<u>4000</u>	<u>20</u>	<u>20</u>	<u>20</u>	<u>0</u>
------------	-------------	-------------	-----------	-----------	-----------	----------

ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM

TO BE EDITED:

Figure 4-10
EDITING THE COSTS

Selecting "Edit Item Names" allows the user to rename any item or to correct any misspelled labels. Figure 4-11 demonstrates this process.

SELECTION: 2

***** EDIT ITEM NAMES *****

ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM

TO BE EDITED: 1 4

1 4) GROWTH PLANNING

CURRENT LABEL: GROWTH PLANNING

NEW LABEL: EXPANSION PLANNING

ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM

TO BE EDITED:

Figure 4-11
EDITING ITEM NAMES

Selecting "Add a New Item" allows the user to include new items in the analysis which had previously been ignored. It may be necessary to edit the model by adding programs which had earlier been forgotten or to decompose a single program into two separate programs. This option provides this function. Figure 4-12 demonstrates its use.

```
SELECTION:  3

***** ADD A NEW ITEM *****
ENTER THE NUMBER OF THE SPONSOR OF THE NEW ITEM:  1
ENTER THE LABEL OF THE NEW ITEM, LIMITED TO
20 CHARACTERS.
LABEL OF NEW ITEM:  NEW
1 5)  NEW

ENTER THE NUMBER OF THE SPONSOR OF THE NEW ITEM:

THE COSTS AND BENEFITS OF THE NEW ITEMS HAVE BEEN
SET TO ZERO.  TO RESET THESE VALUES, SELECT THE
"EDIT COSTS" AND "EDIT BENEFITS" OPTIONS.
```

Figure 4-12
ADDING NEW ITEMS

Selecting "Delete Items" allows the user to eliminate any program no longer under consideration. Figure 4-13 demonstrates its use.

```
SELECTION:  4

***** DELETE ITEM *****
ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM
TO BE DELETED:  1 5
DO YOU WISH TO DELETE "NEW"?  YES

ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEM
TO BE DELETED:
```

Figure 4-13
DELETING AN ITEM
38

The user must now return to the primary menu and select the "Develop Sponsor Weights" option. The interchange shown in Figure 4-14 will result.

SELECTION: 5

***** CROSS SPONSOR ANALYSIS *****
SELECT AN ITEM FROM EACH SPONSOR AND ASSIGN IT
A WEIGHT. THE FIRST ITEM SELECTED WILL BE
ASSIGNED A WEIGHT OF 100.

ENTER SPONSOR AND ITEM: 2 4
2 4) MAINT & RENOVATION
ENTER SPONSOR AND ITEM: 3 6
3 6) BOOKS & PERIODICALS
WEIGHT: 60
ENTER SPONSOR & ITEM: 5 3
5 3) FOUNDATION SUPPORT
WEIGHT: 20
ENTER SPONSOR AND ITEM: 1 3
1 3) ARCHITECTURAL SURVEY
WEIGHT: 10
ENTER SPONSOR AND ITEM: 4 3
4 3) CAREER PLACEMENT CTR
WEIGHT: 35

Figure 4-14
CROSS-SPONSOR WEIGHTING

The system will now automatically return to the primary menu. Selecting "Calculate" will allow the user to specify those items which must be bought under all circumstances and will allow the system to rank order the items. The process is shown in Figure 4-15.

SELECTION: 7
ENTER THE SPONSOR AND ITEM NUMBERS OF THE ITEMS
WHICH MUST BE BOUGHT IN THE ORDER REQUIRED:
ENTER SPONSOR AND ITEM NUMBERS: 3 2
YOU MUST BUY FACULTY RAISES? YES
ENTER SPONSOR AND ITEM NUMBERS:

Figure 4-15
SPECIFYING ITEMS WHICH MUST BE BOUGHT

The system will return to the primary menu after it completes its computation. The user should immediately save the model by using the "Load/Save Model" option in order to prevent loss of the model due to human error or computer breakdown. Figure 4-16 depicts the process.

```
SELECTION: 1
SELECT THE NUMBER OF THE OPTION YOU DESIRE:
    1) LOAD MODEL
    2) SAVE MODEL
SELECTION: 2
ENTER THE NAME OF THE MODEL, LIMITED TO TEN
CHARACTERS: UNIVERSITY
```

Figure 4-16
LOAD/SAVE MODEL DISPLAY

The user may now wish to view the model to ensure that no additional changes are necessary. The "Display by Sponsor" option can be employed for this purpose. It allows the user to view the assigned sponsor benefit, overall (weighted benefit), total cost, cost-benefit ratio, and rank of any sponsor's items. When "Display by Sponsor" is selected, the user is asked to select the sponsor to be viewed. A possible display for "Student Services" is shown in Figure 4-17.

SPONSOR: STUDENT SERVICES WEIGHT: 38.01

	ITEM	SPONSOR BENEFIT	OVERALL BENEFIT	COST	C/B	RANK
4	1) STUDENT CTR	30.00	10.50	52.0	5.0	9
4	2) COUNSEL PRGRM	45.00	15.75	110.0	7.0	14
4	3) CAREER PLACE- MENT CENTER	100.00	35.00	44.0	1.3	2
4	4) HOUSING GUIDE	105.00	5.25	31.0	5.9	11
4	5) EXTRA- CURRICULAR	20.00	7.00	29.0	4.1	6
4	6) HEALTH SERVICES	75.00	26.25	278.0	10.6	19

PLEASE RETURN CARRIAGE TO CONTINUE

Figure 4-17
DISPLAY BY SPONSOR-STUDENT SERVICES

Another set of displays is available under the "C/B vs. Benefit" option. In those displays, the order in which a sponsor would purchase the proposed items, under both the cost-benefit and the benefit-only criteria, is displayed. Figure 4-18 depicts this display for the "Student Services" sponsor.

ORDERED BY BENEFIT	CUMULATIVE BENEFIT COST	CUMULATIVE COST BENEFIT	ORDERED BY COST BENEFIT
CAREER PLACEMENT CTR	35 44.0	44.0 35	CAREER PLACEMENT CTR
		73.0 42	EXTRACURRICULAR
		125.0 53	STUDENT CENTER
		156.0 58	HOUSING GUIDE
		266.0 74	COUNSELING PROGRAM
HEALTH SERVICES	61 322.0		
COUNSELING PROGRAM	77 432.0		
STUDENT CENTER	88 484.0		
EXTRACURRICULAR	95 513.0		
HOUSING GUIDE	100 544.0	544.0 100	HEALTH SERVICES

PLEASE RETURN CARRIAGE TO CONTINUE

Figure 4-18
BENEFIT VERSUS COST BENEFIT-STUDENT SERVICES

If the user is satisfied with these displays, then it is time to load the REPRAM program in order to view the model more closely. To do this, the user must return to the primary display. Returning the carriage without selecting an option will cause the system to print a message stating that the BUILDRAW system is about to terminate and reminding the user to save the model if it has not been done. The system will then request confirmation that the user wishes to terminate the program. If the user does not give confirmation, the system will return to the primary display for further building and editing.

4.3 Using the REPRAM Software to View the Model

Now that the model has been built, the user may wish to view the results or attach rationale for the scores. The REPRAM software is used for those purposes.

The first step in the use of REPRAM is to load it into the computer workspace. Once that is done, the program will inform the user that a model must be loaded before any reports can be produced. The system will then display the primary menu shown in Figure 4-19.

```
SELECT THE NUMBER OF THE OPTION YOU DESIRE
1)  LOAD MODEL
2)  DISPLAY RESULTS
3)  PRINTER LISTING
4)  SORT
5)  RATIONALE
SELECTION:
```

Figure 4-19
REPRAM'S PRIMARY MENU

Selecting "Load Model" will cause the system to display the available models and will give instructions on how to load the desired model. For the current example, the user would follow the instructions and load the model labeled "University." The system then returns to the primary menu.

It is useful, at this point, to discuss the various displays available in REPRAM. The user will want to sort the items in one or another order. The items may be sorted in any of six orders using the "Sort" Option. Those orders are as follows: by sponsor and item number, sponsor-assigned benefit, overall benefit, cost, cost-benefit ratio, and rank. Note that "Rank" places items which must be bought at the top of the list, independent of that item's cost-benefit ratio. The items may be sorted either in ascending or descending order. If no sorting is done, all displays will be sorted in ascending order.

Once the items are sorted, five types of display are available. Those are "Overall Display," "Display by Sponsors," "Overall Costs," and "Sponsor Costs" (all available in the secondary menu under the "Display Results" option) and the "Printer Listing" (available in the primary menu). When "Display by Sponsors" or "Sponsor Costs" is chosen, the user must specify the sponsor whose listing is desired. The sorting mechanism is demonstrated in Figure 4-20 and the five output displays are shown in Figures 4-21 through 4-25. In those figures, the items are sorted in ascending order according to rank.

SELECT THE NUMBER OF THE OPTION YOU DESIRE

- 1) LOAD MODEL
- 2) DISPLAY RESULTS
- 3) PRINTER LISTING
- 4) SORT
- 5) RATIONALE

SELECTION: 4

SELECT THE NUMBER OF THE ORDER YOU DESIRE

- 1) SPONSOR & ITEM
- 2) SPONSOR BENEFIT
- 3) OVERALL BENEFIT
- 4) COST
- 5) COST/BENEFIT
- 6) RANK

SELECTION: 6

DO YOU WISH TO SORT IN ASCENDING ORDER? YES

PLEASE RETURN CARRIAGE TO RETURN TO PRIMARY MENU.

Figure 4-20
SORTING INTO RANK ORDER

SELECT THE NUMBER OF THE OPTION YOU DESIRE

- 1) LOAD MODEL
- 2) DISPLAY RESULTS
- 3) PRINTER LISTING
- 4) SORT
- 5) RATIONALE

SELECTION: 2

SELECT THE NUMBER OF THE OPTION YOU DESIRE

- 1) OVERALL DISPLAY
- 2) DISPLAY BY SPONSORS
- 3) OVERALL COSTS
- 4) SPONSOR COSTS

SELECTION: 1

	ITEM	OVERALL RAM SPONSOR BENEFIT	OVERALL BENEFIT	COST	C/B	RANK
3	2)FACULTY RAISES	30.0	18.0	1017.0	56.5	1
4	3)CAREER PLACEMENT CTR	100.0	35.0	44.0	1.3	2
1	2)ALUMNI SURVEY	25.0	2.5	5.0	2.0	3
2	4)MAINT & RENOVATION	100.0	100.0	250.0	2.5	4
3	1)INTERVIEW & HIRING	55.0	33.0	100.0	3.0	5
4	5)EXTRACURRICULAR	20.0	7.0	29.0	4.1	6
2	1)LAB FACILITIES	60.0	60.0	270.0	4.5	7
5	2)FEDERAL RELATIONS	90.0	18.0	89.0	4.9	8
4	1)STUDENT CENTER	30.0	10.5	52.0	5.0	9
5	1)ALUMNI ASSOCIATION	25.0	5.0	26.0	5.2	10
4	4)HOUSING GUIDE	15.0	5.25	31.0	5.9	11
2	5)INVESTMENT AID	12.0	12.0	72.0	6.0	12
5	3)FOUNDATION SUPPORT	100.0	20.0	132.0	6.6	13
4	2)COUNSELING PROGRAM	45.0	15.75	110.0	7.0	14
3	6)BOOKS & PERIODICALS	100.0	60.0	425.0	7.1	15
5	5)RECRUITING	70.0	14.0	103.0	7.4	16
1	3)ARCHITECTURAL SURVEY	100.0	10.0	80.0	8.0	17
2	3)IN-HOUSE COMPUTER	70.0	70.0	660.0	9.4	18
4	6)HEALTH SERVICES	75.0	26.25	278.0	10.6	19
3	5)FACULTY OFFICE BLDG	80.0	48.0	810.0	16.9	20
1	4)EXPANSION PLANNING	65.0	6.5	113.0	17.4	21
5	4)COMMUNITY INVOLVEMENT	50.0	10.0	244.0	24.4	22
3	4)BUSINESS PROGRAM	70.0	42.0	1200.0	28.6	23
1	1)SECRETARIAL SERVICES	10.0	1.0	95.0	95.0	24
3	3)NURSING PROGRAM	25.0	15.0	1870.0	124.7	25
2	2)ATHLETIC COMPLEX	5.0	5.0	5060.0	1012.0	26

PLEASE RETURN CARRIAGE TO CONTINUE.

Figure 4-21
OVERALL DISPLAY OF ITEMS RANKED IN ASCENDING ORDER

SELECT THE NUMBER OF THE OPTION YOU DESIRE

- 1) OVERALL DISPLAY
- 2) DISPLAY BY SPONSORS
- 3) OVERALL COSTS
- 4) SPONSOR COSTS

SELECTION: 2

SELECT THE NUMBER OF THE SPONSOR YOU DESIRE

- 1) PLNG & INST RESEARCH
- 2) BUSINESS & FACILITIES
- 3) FACULTY & CURRICULUM
- 4) STUDENT SERVICES
- 5) DEVELOPMENT & P.R.

SELECTION: 1

PLNG & INST RESEARCH RAM						
	ITEM	SPONSOR BENEFIT	OVERALL BENEFIT	COST	C/B	RANK
1	2)ALUMNI SURVEY	25.0	2.5	5.0	2.0	3
1	3)ARCHITECTURAL SURVEY	100.0	10.0	80.0	8.0	17
1	4)EXPANSION PLANNING	65.0	6.5	113.0	17.4	21
1	1)SECRETARIAL SERVICES	10.0	1.0	95.0	95.0	24

PLEASE RETURN CARRIAGE TO CONTINUE

Figure 4-22
SPONSOR BENEFIT DISPLAY (FOR PLNG & INST RESEARCH)
OF ITEMS IN ASCENDING ORDER BY RANK

SELECT THE NUMBER OF THE OPTION YOU DESIRE

- 1) OVERALL DISPLAY
- 2) DISPLAY BY SPONSORS
- 3) OVERALL COSTS
- 4) SPONSOR COSTS

SELECTION: 3

OVERALL COSTS							
	ITEM	FY80	FY81	FY82	FY83	FY84	OTHER
3	2)FACULTY RAISES	180.0	190.0	202.0	215.0	230.0	0
4	3)CAREER PLACEMNT CTR	5.0	8.0	9.0	10.0	12.0	0
1	2)ALUMNI SURVEY	5.0	.0	.0	.0	.0	0
2	4)MAINT & RENOVATION	40.0	45.0	50.0	55.0	60.0	0
3	1)INTERVIEW & HIRING	15.0	19.0	21.0	23.0	22.0	0
4	5)EXTRACURRICULAR	3.0	6.0	6.0	7.0	7.0	0
2	1)LAB FACILITIES	50.0	50.0	50.0	60.0	60.0	0
5	2)FEDERAL RELATIONS	15.0	16.0	18.0	19.0	21.0	0
4	1)STUDENT CENTER	11.0	14.0	10.0	9.0	8.0	0
5	1)ALUMNI ASSOCIATION	4.0	5.0	5.0	6.0	6.0	0
4	4)HOUSING GUIDE	18.0	3.0	3.0	3.0	4.0	0
2	5)INVESTMENT AID	10.0	12.0	14.0	16.0	20.0	0
5	3)FOUNDATION SUPPORT	23.0	25.0	26.0	28.0	30.0	0
4	2)COUNSELING PROGRAM	19.0	20.0	22.0	24.0	25.0	0
3	6)BOOKS & PERIODICALS	75.0	80.0	85.0	90.0	95.0	0
5	5)RECRUITING	18.0	19.0	21.0	22.0	23.0	0
1	3)ARCHITECTURAL SURVEY	14.0	15.0	16.0	17.0	18.0	0
2	3)IN-HOUSE COMPUTER	280.0	300.0	25.0	27.0	28.0	0
4	6)HEALTH SERVICES	45.0	51.0	54.0	61.0	67.0	0
3	5)FACULTY OFFICE BLDG	10.0	300.0	450.0	25.0	25.0	0
1	4)EXPANSION PLANNING	20.0	21.0	23.0	24.0	25.0	0
5	4)COMMUNITY INVOLVMENT	45.0	47.0	48.0	49.0	55.0	0
3	4)BUSINESS PROGRAM	200.0	210.0	230.0	260.0	300.0	0
1	1)SECRETARIAL SERVICES	15.0	17.0	19.0	21.0	23.0	0
3	3)NURSING PROGRAM	310.0	340.0	370.0	400.0	450.0	0
2	2)ATHLETIC COMPLEX	1000.0	4000.0	20.0	20.0	20.0	0

PLEASE RETURN CARRIAGE TO CONTINUE.

Figure 4-23
OVERALL COST OF ITEMS IN ASCENDING ORDER BY RANK

SELECT THE NUMBER OF THE OPTION YOU DESCRIBE

- 1) OVERALL DISPLAY
- 2) DISPLAY BY SPONSORS
- 3) OVERALL COSTS
- 4) SPONSOR COSTS

SELECTION: 4

SELECT THE NUMBER OF THE SPONSOR YOU DESIRE

- 1) PLNG & INST RESEARCH
- 2) BUSINESS & FACILITIES
- 3) FACULTY & CURRICULUM
- 4) STUDENT SERVICES
- 5) DEVELOPMENT & P.R.

SELECTION: 3

FACULTY & CURRICULUM COSTS							
	ITEM	FY80	FY81	FY82	FY83	FY84	OTHER
3	2)FACULTY RAISES	180.0	190.0	202.0	215.0	230.0	0
3	1)INTERVIEW & HIRING	15.0	19.0	21.0	23.0	22.0	0
3	6)BOOKS & PERIODICALS	75.0	80.0	85.0	90.0	95.0	0
3	5)FACULTY OFFICE BLDG	10.0	300.0	450.0	25.0	25.0	0
3	4)BUSINESS PROGRAM	200.0	210.0	230.0	260.0	300.0	0
3	3)NURSING PROGRAM	310.0	340.0	370.0	400.0	450.0	0

PLEASE RETURN CARRIAGE TO CONTINUE

Figure 4-24
SPONSOR COSTS (FOR FACULTY AND CURRICULUM)
OF ITEMS IN ASCENDING ORDER BY RANK

SELECT THE NUMBER OF THE OPTION YOU DESIRE

- 1) LOAD MODEL
- 2) DISPLAY RESULTS
- 3) PRINTER LISTING
- 4) SORT
- 5) RATIONALE

SELECTION: 3

ACTIVATE PRINTING MECHANISM AND RETURN CARRIAGE
TO CONTINUE

OVERALL RANK

ITEM	SPONSOR BENEFIT	OVERALL BENEFIT	COST	C/B	RANK
3 2)FACULTY RAISES	30.0	18.0	1017.0	56.5	1
4 3)CAREER PLACEMENT CTR	100.0	35.0	44.0	1.3	2
1 2)ALUMNI SURVEY	25.0	2.5	5.0	2.0	3
2 4)MAINT & RENOVATION	100.0	100.0	250.0	2.5	4
3 1)INTERVIEW & HIRING	55.0	33.0	100.0	3.0	5
4 5)EXTRACURRICULAR	20.0	7.0	29.0	4.1	6
2 1)LAB FACILITIES	60.0	60.0	270.0	4.5	7
5 2)FEDERAL RELATIONS	90.0	18.0	89.0	4.9	8
4 1)STUDENT CENTER	30.0	10.5	52.0	5.0	9
5 1)ALUMNI ASSOCIATION	25.0	5.0	26.0	5.2	10
4 4)HOUSING GUIDE	15.0	5.25	31.0	5.9	11
2 5)INVESTMENT AID	12.0	12.0	72.0	6.0	12
5 3)FOUNDATION SUPPORT	100.0	20.0	132.0	6.6	13
4 2)COUNSELING PROGRAM	45.0	15.75	110.0	7.0	14
3 6)BOOKS & PERIODICALS	100.0	60.0	425.0	7.1	15
5 5)RECRUITING	70.0	14.0	103.0	7.4	16
1 3)ARCHITECTURAL SURVEY	100.0	10.0	80.0	8.0	17
2 3)IN-HOUSE COMPUTER	70.0	70.0	660.0	9.4	18
4 6)HEALTH SERVICES	75.0	26.25	278.0	10.6	19
3 5)FACULTY OFFICE BLDG	80.0	48.0	810.0	16.9	20
1 4)EXPANSION PLANNING	65.0	6.5	113.0	17.4	21
5 4)COMMUNITY INVOLVEMENT	50.0	10.0	244.0	24.4	22
3 4)BUSINESS PROGRAM	70.0	42.0	1200.0	28.6	23
1 1)SECRETARIAL SERVICES	10.0	1.0	95.0	95.0	24
3 3)NURSING PROGRAM	25.0	15.0	1870.0	124.7	25
2 2)ATHLETIC COMPLEX	5.0	5.0	5060.0	1012.0	26

OVERALL COSTS

ITEM	FY80	FY81	FY82	FY83	FY84	OTHER	FY80	FY81	FY82	FY83	FY84	OTHER
3 2)FACULTY RAISES	180.0	190.0	202.0	215.0	230.0	0	180.0	190.0	202.0	215.0	230.0	0
4 3)CAREER PLACEMENT CTR	5.0	8.0	9.0	10.0	12.0	0	185.0	198.0	211.0	225.0	242.0	0
1 2)ALUMNI SURVEY	5.0	.0	.0	.0	.0	0	190.0	198.0	211.0	225.0	242.0	0
2 4)MAINT & RENOVATION	40.0	45.0	50.0	55.0	60.0	0	230.0	243.0	261.0	280.0	302.0	0
3 1)INTERVIEW & HIRING	15.0	19.0	21.0	23.0	22.0	0	245.0	262.0	282.0	303.0	324.0	0
4 5)EXTRACURRICULAR	3.0	6.0	6.0	7.0	7.0	0	248.0	268.0	288.0	310.0	331.0	0
2 1)LAB FACILITIES	50.0	50.0	50.0	60.0	60.0	0	298.0	319.0	338.0	370.0	391.0	0
5 2)FEDERAL RELATIONS	15.0	16.0	18.0	19.0	21.0	0	313.0	334.0	356.0	389.0	412.0	0
4 1)STUDENT CENTER	11.0	14.0	10.0	9.0	8.0	0	324.0	348.0	366.0	398.0	420.0	0
5 1)ALUMNI ASSOCIATION	4.0	5.0	5.0	6.0	6.0	0	328.0	353.0	371.0	404.0	426.0	0
4 4)HOUSING GUIDE	18.0	3.0	3.0	3.0	4.0	0	346.0	356.0	374.0	407.0	430.0	0
2 5)INVESTMENT AID	10.0	12.0	14.0	16.0	20.0	0	356.0	368.0	389.0	423.0	450.0	0
5 3)FOUNDATION SUPPORT	23.0	25.0	26.0	28.0	30.0	0	379.0	393.0	414.0	451.0	480.0	0
4 2)COUNSELING PROGRAM	19.0	20.0	22.0	24.0	25.0	0	398.0	413.0	436.0	475.0	505.0	0
3 6)BOOKS & PERIODICALS	75.0	80.0	85.0	90.0	95.0	0	473.0	493.0	521.0	565.0	600.0	0
5 5)RECRUITING	18.0	19.0	21.0	22.0	23.0	0	491.0	512.0	542.0	587.0	623.0	0
1 3)ARCHITECTURAL SURVEY	14.0	15.0	16.0	17.0	18.0	0	505.0	527.0	558.0	604.0	641.0	0
2 3)IN-HOUSE COMPUTER	280.0	300.0	25.0	27.0	28.0	0	785.0	827.0	883.0	931.0	969.0	0
4 6)HEALTH SERVICES	45.0	51.0	54.0	61.0	67.0	0	830.0	878.0	937.0	992.0	1036.0	0
3 5)FACULTY OFFICE BLDG	10.0	300.0	450.0	25.0	25.0	0	840.0	1178.0	1087.0	717.0	761.0	0
1 4)EXPANSION PLANNING	20.0	21.0	23.0	24.0	25.0	0	860.0	1199.0	1110.0	741.0	786.0	0
5 4)COMMUNITY INVOLVEMENT	45.0	47.0	48.0	49.0	55.0	0	905.0	1246.0	1158.0	790.0	841.0	0
3 4)BUSINESS PROGRAM	200.0	210.0	230.0	260.0	300.0	0	1105.0	1456.0	1398.0	1050.0	1141.0	0
1 1)SECRETARIAL SERVICES	15.0	17.0	19.0	21.0	23.0	0	1120.0	1473.0	1407.0	1071.0	1164.0	0
3 3)NURSING PROGRAM	310.0	340.0	370.0	400.0	450.0	0	1430.0	1813.0	1777.0	1471.0	1614.0	0
2 2)ATHLETIC COMPLEX	1000.0	4000.0	20.0	20.0	20.0	0	2430.0	5813.0	1797.0	1491.0	1634.0	0

PLEASE RETURN CARRIAGE TO CONTINUE.

Figure 4-25
THE PRINTER LISTING OF ITEMS RANKED IN ASCENDING ORDER

The other display available in REPRAM is the set of rationale upon which any particular cost or benefit score is based. Rationale is displayed under REPRAM, and it also can be input or edited. The procedure is shown in Figure 4-26.

SELECT THE NUMBER OF THE OPTION YOU DESIRE

- 1) LOAD MODEL
- 2) DISPLAY RESULTS
- 3) PRINTER LISTING
- 4) SORT
- 5) RATIONALE

SELECTION: 5

YOU CAN NOW VIEW OR ENTER THE RATIONALE FOR AN ITEM. YOU WILL BE GIVEN TEN LINES FOR THIS INFORMATION. TYPE A PERIOD IN THE FIRST SPACE AFTER THE LINE NUMBER WHEN YOU HAVE FINISHED ENTERING THE INFORMATION. IF A RATIONALE ALREADY APPEARS YOU MAY EDIT IT IN THE SAME WAY. PLEASE RETURN CARRIAGE TO CONTINUE.

ENTER SPONSOR AND ITEM NUMBERS: 2 3

2 3) IN-HOUSE COMPUTER

1) THIS IS THE RATIONALE FOR 2 3.

2)

3)

4)

5)

6)

7)

8)

9)

10)

(No rationale has been input. If one existed, the computer would print it out.)

1) BENEFITS: (1) SHOULD REDUCE COST OF PRESENT TIME-
2) SHARED PROCESSING BY \$5000 EACH MONTH. (2) WILL IM-
3) PROVE CONTROL OVER BUSINESS DATA PROCESSING OPTIONS.
4) (3) WILL ADD FLEXIBILITY. (4) WILL IMPROVE TECHNO-
5) LOGICAL IMAGE OF COLLEGE. (5) USEFUL TO STUDENTS IN
6) PROGRAMMING COURSE. DETRIMENTS: (1) BUSINESS DATA
7) PROCESSING IS SATISFACTORY AT PRESENT. (2) LACK OF
8) QUALIFIED COMPUTER OPERATIONS PERSONNEL.
9) .

ENTER SPONSOR AND ITEM NUMBERS:

Figure 4-26
THE RATIONALE

The user inputs the rationale one line at a time, returning the carriage between lines. Rationale is displayed, input, and edited consecutively. Any changes made will be saved permanently. Returning the carriage without specifying sponsor and item numbers will cause the system to return the user to the primary menu.

Once the user has reviewed and displayed the model to satisfaction and has completed any necessary additions or changes to the rationale, the carriage is returned without selecting any option. The system will then request confirmation that the user is finished before terminating the program. When confirmation is given, the computer will terminate the program and print a message instructing the user how to reload the program if desired.

5.0 ABRIDGED USERS MANUAL

This section is designed for the user who is already familiar with RAM. It describes the essential elements of the resource allocation problem and discusses how those are molded into a RAM model.

5.1 Structuring the Resource Allocation Problem

Every resource allocation problem appropriate for RAM includes the following elements:

- o a list of one or more sponsors;
- o a list of proposed items or programs;
- o a set of cost components;
- o constraints on the cost components (or on the total expenditures) within which an allocation must be made; and
- o a list of items that must be purchased regardless of cost or benefit.

Assessments which must be made include:

- o the component costs of each item or program;
- o the benefit assigned by the proposing sponsor of each item; and
- o the relative importance of each sponsor.

Once the elements are identified and the assessments prepared, the user is ready to use the RAM system. RAM consists of two subsystems: BUILDAM and REPRAM.

5.2 Options Available in RAM

5.2.1 Options available in BUILDAM - Once BUILDAM is loaded into the computer, a menu of options available to the user appears. This menu contains the following options:

- o Load/Save Model
- o Display by Sponsors
- o Create Model
- o Enter Data
- o Develop Sponsor Weights
- o Edit
- o Calculate
- o C/B versus Benefit

The user must either load or create a model to begin.

Selecting "Load/Save Model" allows the user to load or save a model. Once a model is loaded, the user may select "Display by Sponsors" and be presented a menu of sponsors. Selecting a sponsor will present that sponsor's item names and numbers, and the total costs, benefits (both sponsor-assigned and overall), cost-benefit ratios, and ranks of the items. Selecting "C/B versus Benefit" will also present a menu of the sponsors. Selecting any sponsor will cause the computer to display a report contrasting the order of purchase of that sponsor's items under both the Benefit and the Cost-Benefit criteria. The user may also select "Edit" which produces a menu with the following options:

- o Edit Benefits
- o Edit Item Names
- o Add a New Item
- o Delete an Item
- o Edit Costs

The user may make the changes or may select "Develop Sponsor Weights" to input a new set of sponsor weights. A list of required items can be input by using "Calculate." The user may wish to input a whole new set of costs or benefits by using "Enter Data." If the model is edited in any way and the user wishes to save a copy of the new version, the user must save the model by using the "Load/Save Model" option.

If the user decides to create a new model rather than loading an old one, "Create Model" should be selected. The user will then be asked the names of the sponsors, the cost components, and the items. The user then selects "Enter Data" to input the item costs and benefits. "Develop Sponsor Weights" should be selected to weight the sponsor's items and any necessary editing should be performed by using "Edit." The user must then ask the system to calculate the model and specify any required items by using "Calculate." The user then saves the model (to avoid accidental loss of the model caused either by computer malfunction or human error) before viewing the results. Results are obtained by choosing the "Display by Sponsors" or "C/B versus Benefit" options.

5.2.2 Options available in REPRAM - Once REPRAM is loaded, a menu of options available to the user appears. This menu contains the following options:

- o Load Model
- o Display Results
- o Printer Listing
- o Sort
- o Rationale

The user must use "Load Model" to load a model from the model library before proceeding.

Selecting "Sort" allows the user to rearrange the items, either in ascending or descending order, according to the following criteria:

- o Sponsor and Item
- o Sponsor Benefit
- o Overall Benefit
- o Cost
- o Cost/Benefit
- o Rank

Once the items are sorted in the appropriate order, the user may select "Display Results." This produces a menu containing the following options:

- o Display Overall
- o Display by Sponsors
- o Overall Costs
- o Sponsor Costs

"Display Overall" and "Display by Sponsors" cause the name, sponsor and overall benefits, total cost, cost-benefit ratio, and ranking of the items to be displayed in the order in which the items are sorted. "Display Overall" does this for all items whereas "Display by Sponsors" does this only for the sponsor thereafter selected. "Overall Costs" and

"Sponsor Costs" causes the system to display the component costs of the items. These are listed in the specified order. "Overall Cost" does this for all items whereas "Sponsor Costs" does it only for the sponsor thereafter selected.

Selecting "Printer Listing" will allow the user to obtain a print-out containing everything in "Display Overall" and "Overall Costs," as well as a display of the cumulative costs of the components as each item is purchased in the specified order. Selecting "Rationale" allows the user to display or edit the rationale for the assessments made concerning any particular item or program.