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(57) Abstract

A system and method for rendering decisions based upon a set of attributes and input from a user. The method contains a combination of compensatory and non-compensatory procedures, as well as a multi-attribute function, to yield an optimal result based upon the input received from the user. Post-decision techniques are also included, such as storing, tracing or analyzing a previously rendered decision. Apparatus is disclosed for housing the system. The apparatus can be a personal or portable computer, a calculator, an on-line or interactive input coupled to a processor and memory, a network or distributed system, or a telephone/television link. A graphic user interface is disclosed that communicates with the user in a user-friendly manner. A matrix of attributes relevant to the products or services under consideration, as well as a relative weight for each attribute to the decision, is presented to the user in a single display window.

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DECISION MAKING SYSTEM AND METHOD

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BACKGROUND OF THE INVENTION

The present invention relates to decision analysis techniques, and more particularly, to an electronic system and method for rendering an answer to a decision problem received from a user.

Ever since von Neumann and Morgenstern published their work on decision theory entitled Theory of Games and Economic Behavior, scholars and researchers have attempted to model and simulate human decision-making. Several decision models for reaching an "optimal" choice have been conceived. However, there is a consensus in the art that human cognition is incapable of making the detailed calculations that are needed to arrive at such an optimal choice. Without the assistance of external factors or tools, therefore, the human mind is limited in its ability to reach decisions in a truly optimal fashion.

The advent of "Cognitive Algebra" and standard decision algorithms provides the necessary tools for humans to arrive at such an optimal choice. These techniques can render decisional choices that compare favorably according to the theoretical models. Computers can thus be employed that implement these

algorithms and calculations to enable such decision-making in a similar manner to the way calculators enable users to make complicated numerical calculations. An article written by A. Sage entitled, Human Judgment and Decision Rules, provides a good overview of currently known decision analysis techniques.

Specific attempts at computer assisted decision tools are known. For example, a second article written by Sage and White entitled, ARIADNE: A Knowledge Based Interactive System for Planning and Decisions, discloses a computer program decision tool incorporating a particular sequence of decision analysis techniques. However, the program described is complex and expressly requires operation by skilled experts rather than directly by the user. One commercially available program called the Decision Maker currently offered by Palo Alto Software, Inc. also provides some form of decision-reaching tool or assistance. This program also does not provide a friendly user interface. In addition, the Decision Maker program requires the user to estimate complex mathematical variables such as expected probabilities and utilities, and to operate at different risk levels.

Moreover, neither of the above programs provide the benefit of a built-in database of attributes relevant to a decision. A built-in attribute database would provide the user with specific comparison points for related categories of decision, such as consumer products, real estate and financial instruments, to name a few. These programs also lack the advantage of providing a history of previously rendered decisions so that an analysis or recapitulation of prior decisions can be made, as well as input from advisor units.

U.S. Patent No. 5,195,172, issued to Elad et al., describes a system and method for representing and solving numeric and symbolic problems by allowing a user to enter objects and attributes, thereby forming a table of at least two dimensions having object-attribute pairs. U.S. Patent No. 4,965,743, issued to Malin et al., and U.S. Patent No. 5,331,545, issued to Yajima et al., both describe various systems for planning and solving problems. These references also do not include a built-in database of predetermined product attributes relevant to each

decision alternative that allow for user-provided attribute weights. Nor do these references provide a mechanism for analyzing a decision or recording prior decisions.

The above systems also lack the advantage of quality control and importance mechanisms (so-called non-compensatory rules), as well as a tie breaking procedure when more than one alternative is capable of satisfying a user's requirements. These decision making systems also typically require the user to have sufficient skills to supply or input a specific decision rule for each decision requested of the system rather than having a series of decision rules pre-programmed for ease of use.

What is lacking is a user friendly electronic decision tool that provides a simple mechanism for a lay user to reach decisions in an optimal fashion. Such a tool would include a unique sequence of pre-programmed decision analysis techniques that allow for subjective user input and are capable of yielding decisions for any choices faced by the user. The choices can involve, preferably, both monetary and non-monetary related problems. The tool would also include a built-in predetermined set of attributes for a host of alternatives for many different categories of decision as well as allow the user to add or develop custom comparison points for a particular decision.

SUMMARY OF THE INVENTION

In view of the above, the present invention provides a system and method for rendering a decision based upon stored attributes and information received from the user. In one aspect of the invention, a system is provided for choosing an alternative from one or more alternatives. At least one attribute pertinent to the at least one alternative is provided. The system includes an input to receive information from a user regarding the at least one attribute and at least one alternative. Means are provided for choosing an alternative based upon the information received from the user and employing at least one built-in decision rule. An output is included for communicating the decision to the user.

According to another aspect of the invention, a method is provided for reaching a decision. The method includes the steps of providing at least one alternative and at least one attribute pertinent to the alternative; receiving information from a user; choosing an alternative, based on the information received from the user and employing a built-in decision rule; and communicating the choice to the user.

In another aspect of the invention, a graphic user interface is provided for use in reaching a decision. The graphic user interface includes a matrix window that allows the user to identify the various alternatives of the decision and relevant attributes for each of the alternatives. The interface also includes a metric window for assigning a level of importance to each of the attributes identified in the matrix window.

In another aspect of the invention, apparatus is provided for reaching a decision. The apparatus includes a housing, and a memory, contained within the housing, for storing a plurality of alternatives and at least one attribute relevant to the decision. The housing also includes an input to receive an attribute importance level from a user, and a processing element for rendering a decision according to the information received from the user and employing a built-in decision rule. An output coupled to the housing is provided for communicating the rendered decision to the user.

The present invention preferably enables the user to incorporate non-numerical rankings of attributes, and is sensitive to the price of the product or service being considered. The invention also preferably includes a tie-breaking procedure to arrive at the optimal choice for a difficult or close decision. The invention further provides automatic interpretation and analysis of the rendered decision, as well as a record of how previous decisions were reached. A history of previous decisions made with the system is provided, which can be sorted by date, category, subcategory, "satisfaction" score, or name of winning alternative. The invention is, therefore, applicable to any decision considered by any user, without requiring the user to select or assign a specific decision rule for each situation.

The invention also includes a user-friendly graphic user interface that allows the user to operate the system directly without the aid of outside experts or skilled operators.

These and other features and advantages of the invention will become apparent upon consideration of the following detailed description of the presently preferred embodiments of the invention, taken in conjunction with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow chart of the presently preferred decision algorithm employed with the invention, where FIG. 1(a) provides initial checks for number of products and product prices; FIG. 1(b) provides checks for dominated products and high importance attributes; FIG. 1(c) provides checks for ties between products or services; and FIG. 1(d) provides checks for quality control and provides a final result.

FIG. 2 shows one presently preferred embodiment of the apparatus of the invention for execution of the algorithm identified in FIG. 1; where FIG. 2(a) shows an overall block diagram and FIG. 2(b) illustrates the various platforms for connection to the device of the invention.

FIG. 3 displays one presently preferred category selection window identifying broad categories of products or services for selection by the user.

FIG. 4 shows the main interface window prior to checking/selecting among pre-determined attributes to be used in the decision,

FIG. 5 displays a window that allows the user to search for a subcategory from a list of categories.

FIG. 6 shows a category dialog box that allows changing the category without leaving the main window of FIG. 4.

FIG. 7 illustrates two mechanisms for changing subcategories, where FIG. 7(a) is a dialog box that allows changing the subcategory without leaving the

main window of FIG. 4; and FIG. 7(b) is a dialog box that allows external changing of the user defined subcategories.

FIG. 8 shows the main window show in FIG. 4 after the grades/scores and importance level of each of these attributes have been entered.

FIG. 9 shows the main window of FIG. 4 where attribute scores are expressed in a range between one and 100.

FIG. 10 identifies the various preferred menus accessible through the main window, where FIG. 10(a) shows the file menu; FIG. 10(b) shows the run menu; FIG. 10(c) shows the scores menu; FIG. 10(d) shows the names menu; and FIG. 10(e) shows the help menu.

FIG. 11 is a window that allows the user to change the names of product attributes.

FIG. 12 is a window that alerts the user that the product is higher than the maximum price specified.

FIG. 13 is a window that tells the user that one product is inferior to another in some way.

FIG. 14 displays a presently preferred quality control window.

FIG. 15 displays a presently preferred importance window.

FIG. 16 presents the windows used to break a tie between two choices, where FIG. 16(a) notifies the user of a tie between products; and FIG. 16(b) allows the user to manually break the tie.

FIG. 17 displays a window presenting the user with the computerized choice of the system.

FIG. 18 is a window that provides an analysis of the particular decision process.

FIG. 19 is a save decision window used to save a decision for later reference.

FIG. 20 is a window that enables the user to list and sort previous decisions, where FIG. 20(a) lists the decision; FIG. 20(b) allows the user to load a

specific database; and FIG. 20(c) is the retrieved decision presented in matrix form.

FIG. 21 is one preferred error window.

FIG. 22 displays the add advisor input button on the main window of FIG. 8.

FIG. 23 displays the incorporate advisor's opinion window.

FIG. 24 shows a preferred advisor's input screen; where FIG. 24(a) allows identification of key advisors, and FIG. 24(c) provides an advisor warning for the decision.

FIG. 25 displays the add on-line data and CD-ROM data buttons on the main window of FIG. 8.

FIG. 26 shows a preferred interface screen for on-line communication or CD-ROM access; where FIG. 26(a) shows sorting by alternatives, and FIG. 26(b) shows sorting by attribute.

FIG. 27 is a detailed flow chart of the preferred program for use with the invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS OF THE INVENTION

Referring to the drawings, where like reference numerals refer to like elements throughout, FIG. 1 identifies a flow chart of the steps performed by the presently preferred decisional algorithm employed with the invention. According to the flow chart shown in FIG. 1, certain decision analysis techniques are employed to render decisions for a user. Various existing techniques are combined in a unique sequence to provide the user with the result of an input decision. Overall, the sequence first checks for a dominant alternative for the target decision. If a dominant alternative is not found, then compensatory additive procedures are employed to arrive at a total score for each alternative to the decision. Non-compensatory strategies are then employed to cover all available situations in arriving at the final choice. Modifications to the basic formula and calculations utilized in the fields of decision theory and linear programming are introduced that

enable the user to make an "optimal" choice based on his/her subjective input and independent of the content of the decision.

Unlike prior decision support systems that aim at finding (ultimately) a dominant alternative, the presently preferred algorithm shown in FIG. 1 starts the decision calculus by examining whether a dominant alternative exists in the first place. The algorithm also preferably enables the user to rate alternatives based on a simple 1 to 10, 1 to 100, or F to A+scales, and to automatically break a tied score. In one embodiment of the invention, the algorithm is also sensitive to the price of the product (also on a 1-10 scale), as well as the importance of the price of the product/service to the user. The types of decisions solved can include the purchase of consumer goods, durables, financial instruments, real estate, and automobiles, to name a few, but can be extended to any other decision. Alternatively, a decision can be made independent of any monetary (or other) price. Examples of such decisions include a career choice decision (three jobs which offer the same benefits package), an employer's hiring decision, a decision to play soccer or basketball, or a decision to enroll at particular school or university, to name but a few. In such a case, the formula or algorithm used to reach the optimal choice is the same except that the total score arrived at is not divided by any price or monetary cost.

As shown in FIG. 1(a), the general algorithm begins with a start step 10 that allows the system running the algorithm to initialize and prepare to receive input. The program proceeds at step 12 upon a request by the user to render a decision. If no alternatives have been specified, the program proceeds to step 14, transmits an error identifying that no alternatives have been specified, and exits. If at least one alternative (i.e. product or service) was specified for the decision, the program proceeds to step 16 for a determination if more than one alternative has been specified. If not, the program provides such an error notification and exits at step 18. If more than one alternative has been properly specified by the user, the algorithm provides such notification at step 20 and proceeds to perform the decision calculus.

At step 22, the algorithm begins the elimination of alternatives to determine and ultimately render a result. The first aspect of elimination is based on the price, if any, of the alternative. If all alternatives are too expensive based upon the user's input, the program provides such notice to the user at step 22. Again, a test of whether any further alternatives satisfying the user's price range exists is performed at step 24. If not, notification to that effect is provided at step 26 and the program exits. If alternatives remain that are within the price range specified by the user, the program proceeds to step 28. If only one alternative exists within the user's defined price range, notice to that effect is provided at step 30 and the program exits. If not, the program continues with the decisional calculus to find the optimal choice based upon the user's input and the predefined attributes.

Referring to FIG. 1(b), the algorithm proceeds to eliminate dominated alternatives at step 32. According to the preferred embodiment of the invention, the algorithm eliminates dominated alternatives when the alternative is inferior to another and not superior in any way by removing the alternative from the choice set. Should only one alternative remain as a result of the analysis performed at step 32, the program proceeds at steps 34 and 36 to provide such notification and exits. If more than one alternative still remains, the program proceeds from step 34 to step 38 where a check for high importance level attributes is made.

Referring to FIG. 1(c), the next step in the decision calculus is to determine if two or more of the alternatives under consideration present a tie based upon the predetermined attributes and user supplied input and weights. At step 40, the program checks for a tie condition. If a tie has occurred, the program proceeds at step 42 to check if an automatic tie breaking procedure, preferably built into the algorithm, will break the tie. If so, notice to that effect is provided at step 44 and the program continues on to step 48. If not, an option is presented to the user (described in more detail below) to either break the tie manually or to cancel

execution at step 46. If the tie is broken manually, the program proceeds to step 48 with notification of the outcome being provided at step 46.

As shown in FIG. 1(d), at step 48 the program determines if the "winning" alternative, which is the result of the above process steps, contains a low grade in an attribute identified by the user as important. If not, a decision has been reached by the algorithm. The program then proceeds at step 50 to identify the rendered alternative and its rank among the other products considered by the program, and the program terminates. Should a low grade exist in an important attribute, the program proceeds at step 52 to ask the user whether to remove the selected alternative. The user may decline to remove the alternative, and disregard the importance originally associated to the particular attribute. In such case, notice of the user's decision to overlook the low grade is provided at step 54, and the program continues to step 50 and proceeds as indicated above. If the user elects to eliminate the selected alternative based upon the low grade in an important attribute, the program provides such notice at step 56, and at step 58 checks if any alternatives remain from which to render a decision. Should no further alternative remain, notice to that effect is provided at step 60 and the program exits. If there are remaining alternatives, the program loops back to step 40 to again perform the above-outlined steps of the decision calculus until a decision is reached.

As those skilled in the art will appreciate, the preferred algorithm utilizes a certain sequence of decision rules which combine a multi-attribute utility function and non-compensatory decision rules such as the "elimination by aspect" and "lexicographic" rules. Those skilled in the art will also appreciate that the sequence of the decision calculus is important to yield the proper result to a particular decision based upon the attributes of the decision and the assigned weights given by the user. An algorithm that initially uses non-compensatory rules and then utilizes multi-attribute calculations may lead to a different outcome than an algorithm that uses multi-attribute functions and then incorporates non-compensatory rules.

In one preferred mode of the invention, the program allows the user to analyze the outcome of a particular decision. Thus, the user can understand why s/he arrived at a certain choice and not at another. One alternate embodiment of the invention includes saving a history of previously rendered decisions. In so doing, the algorithm allows the user to save all or some of the decisions made employing the system. The user can preferably load historical decisions and also sort them either chronologically by date, by name, by price, by winner, by a satisfaction grade (a weighted formula used to calculate this score), by category, or by subcategory.

The program preferably stores the way a decision was made based on the method of "process tracing." Those skilled in the art will appreciate that known techniques for process tracing exist and are contemplated. One presently preferred technique is described in J. K. Ford, N. Schmitt, S.L. Schechtman, B.M. Hults, and M. L. Doherty, Process Tracing Methods: Contributions, Problems, and Neglected Research Questions, Organizational Behavior and Human Decision Processes 43:75-117 (1989). In one preferred embodiment, the system provides a computerized display of the way a decision was made. By saving the original decision matrix, the constraints of the decision maker (e.g. regarding the maximum price the user is willing to pay for the product), the user's answers to the non-compensatory ("importance" and "quality control") questions, and the "weights" assigned to different attributes and the advisors' input, the user can "trace" and understand how the decision was reached.

The program also preferably allows for incorporating the opinions and views of others into the decision making calculus. Because people frequently listen to others while making decisions (even though they may eventually ignore the advice) such information is important and may form a useful part of a particular decision. The opinion of "advisory" decision units, consisting for example of a spouse, mother, father, brother, sister, child, friends, boss, co-workers, or colleagues, is preferably incorporated into the algorithm. In one embodiment, pre-determined lists of "members" of these advisory units appear in the graphic

user interface (see FIG. 25). Employing this feature, the user can adopt his advisor's recommendation, follow his own opinion, or compare the two while making a decision. Calculating group decisions or outcomes is also possible using the same technique. Users can therefore reach a collective decision while communicating with other users and/or other computers over local and wide area networks.

Alternate features of the algorithm allow the user to order and pay for the product or service of a decision through an on-line shopping network coupled to the system. The algorithm preferably enables the user to retrieve data from on-line services, electronic catalogs, World Wide Web shopping malls, or from a CD-ROM database, and incorporate the data directly into the decision matrix, thus adding another dimension to the repertoire of decision-related tasks. The algorithm also preferably allows the user to incorporate multiple databases while making a decision. The system can thus serve as a decision making platform or generator, where the user can select and utilize varying databases and tasks for different types of decisions (e.g., purchasing real estate, obtaining finance, etc.). An example of one presently preferred program algorithm that includes the above features and functions appears in FIG. 27. A printout of the source code for the program shown in FIG. 27 appears in the Microfiche Appendix.

Several systems are contemplated for the invention. One presently preferred embodiment of a system for executing the preferred algorithm is shown in FIG. 2. As shown in FIG. 2(a), the system preferably includes a processor 70, a memory 72, an input 74 and an output 78. In one embodiment, the processor 70 comprises a microprocessor or central processing unit. In the preferred embodiment, the output 76 comprises a computer cathode ray tube display screen or LED display that visually represents output generated by the system, or generates a signal for communicating the results of a decision or any intermediate notices to another computer or electronic device. Similarly, the input 74 can comprise a keyboard or keypad, or be capable of receiving input over an electronic medium such as a computer network, television or telephone line (e.g. by

interactive voice response unit). The memory 72 can comprise any form of electronic memory generally known in the art.

As those skilled in the art will appreciate, many alternate combinations and platforms including these basic elements are contemplated for the system. For example, an shown in FIG. 2(b), the system 80 can be embodied within a hand-held or palm-top computer 82, or installed on laptop or desktop computers 84. One preferred palm-top computer is the Hewlett-Packard 200LX or 1000. Other portable devices such as the Apple Newton, Zoomer and Psio, or the Sharp Zaurus, are also contemplated. Additionally, in one embodiment, the system 80 can be accessed over a local area computer network 86 or wide area network 88 such as Prodigy, CompuServe, AmericaOnline, the Internet or World Wide Web; or through an (800) or (900) number telephone line and/or Interactive Voice Response ("IVR") unit 90. Other platforms include calculators 92, an ATM device or kiosk 94, or an interactive television 96.

The calculator 92 may be a generic calculator modified to implement the decisional calculus of the invention. However, because of the limited amount of space within a calculator's housing, and thus limited memory size, a built-in database of attributes may be omitted. In this event, certain attributes can be hard-wired or stored in firmware to implement certain choices or tailor the calculator 92 to a specific task. A light emitting diode (LED) display may also replace a CRT display in the calculator 92 embodiment.

Referring again to FIG. 2(a), the memory 72 preferably includes a built-in database providing a set of predetermined attributes or parameters for commonly encountered decisions. The database may include, for example, attributes for consumer goods and appliances, financial investments or loan information, as well as user-defined items. In a generic system, many different attributes may be provided in one database. However, more specifically tailored systems are contemplated each having a specialized database (e.g., a system for car dealers). Examples of such specialized systems can take the form of an ATM device or kiosk 94 (FIG. 2(b)) having a stand-alone or networked device that

provides an answer or result to any personal choice problem. Such system 80 can be installed, for example, in bars and restaurants, or in insurance brokers, real estate agents and investment center offices. Other presently contemplated embodiments of the system include multi-lingual systems, and installation of the system on pen and voice computers.

One presently preferred graphical user interface for use with the system is shown in FIGS. 3-26. Referring first to FIG. 3, in the presently preferred embodiment of the invention, a list of categories and subcategories of attributes for use with the system is presented to the user as a tabbed notebook 100, which displays broad categories of products or services (such as appliances, cars, electronics, financial, and"user defined" categories). When the user places the cursor on any of the tabs 102 of the notebook 100 and clicks on a mouse or other pointing device (not shown), that notebook page 108 is selected for use in connection with a particular decision. Accordingly, a list of specific products 104 for each broad decision category 106 is presented on each page 108.

Referring next to FIG. 4, the main user interface window 120 is shown. The window 120 is shown in FIG. 4 in its blank form prior to data being entered and/or selected by the user for use with a particular decision. In the course of providing/selecting the inputs for each decision, the user can select among predetermined attributes 122 to be used in the decision, indicate the maximum price 124 the user is willing to pay for the specific product or service, and decide on the number of products to be considered in the decision. The user may also enter relevant price information 126 for the products under decision and the extent or importance of price 132 to the user (on a 1-10 scale) for that decision. Grades for the products on each attribute, and the relative importance of each of the attributes, can be selected by the user. Also displayed in the main window 120 are a Run button 128, and Rename Attribute button 130 (described in detail below).

In the preferred embodiment shown in FIG. 5, a window 140 is provided to allow the user to search, at any time, for a subcategory 142 from a list of categories 106. The user can preferably type in any part of the name of the

product into an input field 146 in a manner generally known in the art. As shown in FIG. 5, two lists 146 are then presented on the interface. The left list 148 jumps to the first match found, and the right list 150 lists all matching products in alphabetical order. By placing the cursor in proper position, the user can select one of the products listed. Alternatively, the user can select or change categories directly from the main window 120, as shown in FIG. 6. By selecting the drop-down menu 152 in the main window 120 (FIG. 4) a list of available decision categories is presented in a known manner. The category menu 154 thus allows the user to change the category without leaving the main window 120.

A similar feature is provided for the subcategories of a decision. Referring to FIG. 7(a), the user can select or change subcategories directly from the main window 120. By selecting the drop-down menu 156 in the main window 120 (FIG. 4) a list of available subcategories is presented in a known manner. The subcategory menu 158 thus allows the user to change subcategories without leaving the main window 120. In an alternate embodiment, the user can specifically select a pre-defined subcategory 142. As shown in FIG. 7(b), a Change Subcategory Name dialog box 160 is provided for this function. This dialog box 160 allows changing of any user defined subcategories 142. This option is disabled unless a user defined subcategory 142 is present.

Once the category 106 and subcategory 142 have been selected, the system provides at least one alternative product or service 104 along with any relevant attributes 122, and displays such information in the main window 120 in a matrix or ledger format (see FIG 8). After the maximum price 124 the user is willing to pay for the product/service 104 has been entered, along with the number of products 104 (decision alternatives), price of each product entered 162, relevant attributes 122 checked/selected, and grades/scores 164 and importance level 166 of each of these attributes 122 entered, the main window 120 appears as shown in FIG. 8. At this stage, the decision matrix is complete and ready for execution of the decision program/calculus. The main window 120 thus reflects the

predetermined attributes 122 and the subjective input of the user for each attribute 122.

According to the presently preferred embodiment of the invention, the user can select between several pre-programmed grading scales for use with a decision. Referring to FIG. 9, a drop-down menu 180 is provided to allow the user to change the grading scale employed with the decision. Three grading scales are presently contemplated for grading products and services using the system. They are a numerical scale of one to ten 182, letter or alphanumeric grades 184, and a numeric scale of one to one hundred 186. By accessing the drop-down menu 180, the grading scales can preferably be changed or switched by the user at any time.

Other drop-down menus are preferably included in the main window 120 to allow the user to quickly perform certain functions or choose between available alternatives. Five such drop-down menus are illustrated in FIGS. 10(a) - 10(e). As shown in FIG. 10(a), a file menu 190 is provided. The File Menu 190 preferably contains five command options: Load Database 192, Load Previous Decision 194, Access On-Line Information 196, Load CD-ROM 198 and an Exit command 200. These commands are described in more detail below.

Referring to FIG. 10(b), a run menu 202 is also provided in the main window 122. The run menu 202 causes execution of the decision algorithm when it is selected. In one embodiment, the function performed by selecting the run menu 202 is the same as "pressing" the run button 128 displayed in the lower right corner of the main window 120.

Figure 10(c) illustrates the scores menu 180 discussed above in connection with FIG. 9. The currently selected option will be checked as shown.

The presently preferred graphic user interface also incudes a menu for selecting subcategories 142 and/or attributes 122. Referring to FIG. 10(d), a names menu 204 is shown. The names menu 204 contains the following three command options: Change Subcategory Name 206; Change Attribute Name 208; and Search for Subcategory 210 commands. These commands provide the same functionality described above in connection with FIGS. 5-7.

A help menu 212 is also provided in the main window 120, as shown in FIG. 10(e). The help menu 212 preferably contains two command options: Contents 214 and About 216. The Contents option 214 brings up and displays the contents of the help file in a manner generally known in the art. The About option 216 informs the user about the currently installed version of the system.

In order to allow for customization of the system, and to provide for use of the system with any type of decision, a window is preferably provided to list and rename the attributes 122 associated with a particular subcategory 142. As shown in FIG. 11, a Rename Attributes window 220 is provided to allow the user to change the names of the predetermined product attributes 122. Moreover, through the Rename Attributes window 220 the user can include or add attributes 122 relevant to a particular decision or subcategory 142 by labeling one of several "user defined" attribute names 222 reserved for this purpose (see FIG. 10(a)). The new name provided by the user appears in a new name field 224 on the window 220.

Upon the completion of the above steps, the system is ready to execute the presently input decision. Examples of a fully programmed main window 120 ready for execution are shown in FIGS. 8-10. When either the Run button 128 or Run menu 202 have been selected, the algorithm is initiated and begins the task of rendering a decision based upon the user's input. As mentioned above in connection with the flow chart (FIG. 1), a plurality of intermediate outcomes or notices can be reached in the course of rendering the decision. Some of these intermediate outcomes can present further choices or options for the user that are presented through the preferred graphic user interface. Examples of such intermediate decision windows are discussed below.

As shown in FIG. 12, a price window 230 is provided to alert the user that the product is higher than the maximum price 124 specified for this decision. In response to the notification, the user is presented with two option buttons 232, 234. By selecting the first button 232 the user may disregard the

product, or by selecting the second button 234 the user can raise the maximum price 124 allowed for the decision, if appropriate.

Referring to FIG. 13, a product domination window 240 is provided. This window 240 tells the user that one product 104 is inferior to another and is not superior in any way. The user can select between two options presented as buttons 242, 244 in a manner generally known in the art. First, by selecting button 242 the user can alert the algorithm to ignore the inferior product since it has no advantages and several disadvantages over the other product 104. Selecting button 244 tells the system to consider the product anyway.

Figure 14 illustrates a preferred quality control window 250. The quality control window 250 alerts the user that the system is concerned about possibly low grade or low quality of important attribute(s) 122 of specific products/services 104. For example, where product X may be the best choice overall, a low grade on an important attribute 122 may make product X an unacceptable choice. Through the quality control feature, the user may choose to eliminate the product by selecting button 252, or to cause the system to consider it anyway by selecting button 254. A list of grades and attributes may also be included in the message.

In order to process data received from the user, the system will ask about any attributes 122 that have been labeled by the user as very important. Because these attributes 122 are obviously very important to the user, the system may make a decision based exclusively on the important attributes, or on some subset of the important attributes. Preferably the interface allows the user to assign a relative importance to each attribute of a decision. In one embodiment shown in FIG. 15, the importance of an attribute is identified to the user through a window 260. The user can assign as a relative importance a number ranging from 1 to 10, with 1 signifying low importance and 10 identifying high importance (see FIG. 8). The user can also instruct the system to use one or more attributes 122 exclusively by selecting either button 262 or button 264, as shown in FIG. 15.

From time to time, a tie between two outcomes of a particular decision can occur based upon the unique combination of attributes 122, importance levels 166, products/services 104 and other parameters. One presently preferred embodiment of the invention, therefore, alerts the user to the tie in the analysis or outcome by providing a window 270 bearing such notice, as shown in FIG. 16(a). A tie occurs, for example, when two or more products 104 cannot be distinguished with the attributes 122 and weights provided by the user. The interface thus provides the user with an option to provide more information for the system to consider by adding attributes 122 (and rankings/grades of products for these attributes) or by breaking the tie manually. A built-in procedure can be included to break the tie by adding or subtracting "bonus" points for certain alternatives based on non-compensatory decision criteria. As shown in FIG. 16(a), two buttons 272, 274 are provided to receive the user's selection. A third button 276 is preferably included to provide help in a manner generally known in the art. (This button is included throughout FIGS. 12-21.) If the user elects to manually break the tie, a second window 280 is provided, as shown in FIG. 16(b). Two buttons 282, 284 are provided in FIG. 16(b) that identify the two possible outcomes to the decision. As those skilled in the art will appreciate, more than two products/services 104 can create a tie, and thus additional corresponding buttons would be provided for each choice.

A number of post-decision functions are preferably provided to the user via the graphic interface. For example, FIG. 17 displays a computerized choice window 290. The window 290 advises the user of the choice or outcome of the decision algorithm (and any advisors' decision or advice), and enables the user to "request" an analysis of the decision and/or the option to save the decision for later reference or analysis.

Upon completion of the decision, the user may also desire to know the course or process taken to reach the rendered answer. Referring to FIG. 18, a written summary of the steps performed for the specific decision is provided. Through the window 300 shown in FIG. 18 the interface describes to the user just

how the decision was reached and the relative ranking of all the products 104 considered in the decision. The interface preferably mentions the low grades associated with some of the products 104 as well as the high importance of some attributes 122. The interface also lists the products 104 which were considered, any further input received from the user, and the final ranks and grades of the products 104 under decision. Two buttons 302, 278 are provided to acknowledge the analysis or to obtain help, respectively.

In order to save a decision rendered by the system, the interface provides a save decision function. Referring to FIG. 19, a save decision window 310 allows the user to save a decision for later reference or analysis. An input field 312 is provided to receive a name 314 associated with the particular decision. To view the saved decision later, the user selects the Load Previous Decision feature from the file menu 190 (see FIG. 10(c)).

Figure 20(a) enables the user to list and sort decisions that were previously rendered using the system. As shown in FIG. 20(a), a window 320 is presented to the user identifying a list 322 of previously saved decisions. The user can then preferably sort the saved decisions in one of several different ways. For example, when first loaded the decisions will be sorted by date, with the most recently rendered decision appearing at the top of the window 320. This is the default for listing stored decisions. If the user is searching for a particular category or subcategory for a previous decision, the user may sort by these parameters as well. The user may also sort stored decisions alphabetically by the name given the decision when it was first saved. Buttons 324 are provided in the window 320 to initiate these sorting commands.

Preferably, the user can also sort saved decisions by the price of the winning product, or by the satisfaction score associated with the decision. According to the preferred embodiment, the satisfaction score is a measure of how well the winning product satisfied the qualifications for winning, i.e., an estimate of how happy the user may be with the winning product. For instance, a winning product with high grades in important attributes 122 satisfies the attributes 122

well, but a product with lower grades does less well. Alternatively, the interface also allows the user to sort attributes 122 manually using a drag-and-drop feature generally known in the art. As shown in FIG. 20(a), the interface preferably lists in column format the respective attributes 122 and other information for the stored decision.

In the presently preferred embodiment of the invention, the system has the capability of accessing more than one database, for example, of categories, subcategories, product attributes, or saved decisions. Referring to FIG. 20(b), a load database window 330 is shown that provides this function. The window 330 preferably allows the user to change or switch from the current database to another database at any time. Work performed in each database is automatically saved when switching to a different database to prevent inadvertent loss of information or input. A list of available databases is provided through a series of buttons 332-334, each identifying a separate database.

In one preferred embodiment, an historical or previously rendered decision can be repeated exactly as it was when the user first saved the decision (see above). One preferred mode for "tracing" such a decision is shown in FIG. 20(c). According to the presently preferred interface, the user can trace previously rendered and stored decisions by viewing the maximum price 124 the user was willing to pay for that decision, the grades assigned to each attribute 122 for each alternative, the analysis of a particular decision, and any answers to different questions posed to the user by the interface (see FIGS. 14 and 15). Thus, the user can "trace" the manner or process by which a decision was made. As those skilled in the art will appreciate, in the trace mode of operation, none of the input displayed in the window 330 can be edited by the user; rather, the information is provided in a read-only manner for observation purposes only.

In order to alert the user to any possible errors, an error window 340 is provided, as shown in FIG. 21. This window 340 displays any of an assortment of errors which might be due to the input provided by the user. Preferably, as shown in FIG. 21, a written description of the error condition is provided to the

user. An acknowledgment button 342 is displayed in the window 340, along with a help button 278.

According to one embodiment shown in FIG. 22, an Add Advisor Input button 350 is provided on the main window 120. When the user presses this button 350, the window 360 shown in FIG. 23 is displayed. Figure 23 allows the user to incorporate advisors' opinions into the decision calculus. Preferably, predetermined "members" 362 of these advisory groups appear on the graphic interface as "Advisor 1", "Advisor 2," etc. The user can preferably add or remove advisors 362 from these lists by pressing the rename button 361 and typing in the name of the particular person or entity considered. By using this feature, the user can adopt the advisors' recommendation, ignore the advice, or compare the advisor's recommendation to the user's own view en route to a decision.

Moreover, as shown in FIG. 23, the "advisors" 362 rank or rate each alternative 122 by providing a programmed level of importance 364 according to their subjective evaluation. Some members of the advisory group can also be designated by the user as "key" advisors, whose advice the user is unlikely to ignore (see FIG. 24(a)). When an important advisor 362 assigns a low score to an alternative, a "warning" box 366 is preferably displayed (see FIG. 24(b)). If the advisor's 362 opinion is same as the user's opinion, then such opinion becomes the result of the computerized choice. Otherwise, the user is able to compare his/her opinion to that of the advisor 362. A separate decision matrix may also be presented for the advisors' decision (not shown).

According to another embodiment, the user can incorporate data obtained from on-line information services, World Wide Web or Internet shopping malls, or from CD-ROMs directly into the decision calculus. The information retrieved can include specific product attributes and their price, preferably organized by product. Upon receipt, the user can incorporate this information (or the ratings of this data) directly into the decision matrix (see FIG. 8). Referring to FIG. 25, an add on-line data button 370 and an add CD-ROM data button 372 are shown. The on-line feature also enables the user to order and pay for the product

or service 104 identified based upon the result of the decision. The resultant product or service 104 selected can be ordered and paid for electronically via on-line communications (see FIG. 2(b)).

The Access On-Line Information 196 and Load CD-ROM 198 commands (see FIG. 10(a)) can also be used to enable the user to view data or information on attributes, features or prices of products from a specific database. As those skilled in the art will realize, the database can either be loaded from a CD-ROM (not shown) or from a magnetic disk (not shown). Alternately, the database can be loaded or displayed from an on-line site or taken from other electronic sources, such as local area networks or wide area networks including the Internet, World Wide Web or electronic malls. These commands also allow the user to receive or access updated information from an on-line site in real time, or from another source, such as CD-ROM or disk.

Referring to FIG. 26, the information retrieved can be sorted by alternative or by attribute. These functions enable the user to compare alternatives and attributes or associate a grade to each alternative. For example, an Add Selected Product button 374 can be used to automatically add the grades of a product being evaluated into the decision matrix. (This would create a new column to the matrix.) Examples of the presently preferred display screens for these functions which sort by alternative or by attribute respectively are shown in FIGS. 26(a) and 26(b). As can be seen, the screens shown in FIG. 26 are applicable to either on-line or CD-ROM accesses.

There has been described a system and method for automatically rendering decisions based upon a set of predetermined and/or user-defined attributes relevant to the decision and other input provided by the user. The method contains a combination of compensatory (additive) and non-compensatory procedures, as well as a multi-attribute function, which are combined to yield an optimal result for the decision under consideration. Built-in databases containing the attributes or decision criteria relevant to a wide range of decisional categories and subcategories allows for instant application of the system without the need to program these

elements. Moreover, the method of the invention is uniquely programmed to allow the user to reach decisions readily and upon consideration of the user's, or another's, input regarding the choices available. The importance of cost to the decision, as well as other parameters, is considered by the system. Post-decision techniques are also included, such as storing, tracing or analyzing a previously rendered decision.

Apparatus is disclosed for housing the system. The apparatus can be a personal or portable computer, calculator, an on-line or interactive input coupled to a processor and memory, a network or distributed system, or a telephone or television link. One or more databases can be coupled to the memory of the system for customized or specialized applications. The apparatus can also be coupled to interactive voice response units, interactive television sources or interactive computer networks. Locating the apparatus at or near places of purchase allows the use of the system to render consumer-related decisions. Other decisional categories, for example, financial or business-related decisions, are equally accessible using the system.

A graphic user interface communicates with the user in a user-friendly manner. A matrix of attributes relevant to the products or services under consideration, as well as a relative weight for each attribute to the decision, is presented to the user in a single display window. The graphic user interface allows for use of the system by relatively unskilled users without the need for expert intervention. The user can easily assign weights to the preprogrammed attributes relevant to a decision, or incorporate additional user-defined attributes for a specific decision. A series of windows are displayed to communicate intermediate results and/or requests for further input to the user. Windows are also included to allow for post-decision processing such as storing, analyzing or tracing decisions.

It is to be understood that a wide range of changes and modifications to the embodiments described above will be apparent to those skilled in the art and are contemplated. It is therefore intended that the foregoing detailed description be regarded as illustrative rather than limiting, and that it be understood that it is the

following claims, including all equivalents, that are intended to define the spirit and scope of the invention.

I CLAIM:

1. A system for choosing an alternative comprising:

at least one alternative and at least one attribute pertinent to the at least one alternative;

an input to receive information from a user regarding the at least one attribute and the at least one alternative;

means coupled to the input for choosing a preferred alternative based upon the information received and employing at least one built-in decision rule; and

an output coupled to the means for choosing for communicating the choice to the user.

2. The system for choosing an alternative defined in claim 1, wherein the output communicates a visual representation of the decision to the user.

3. The system for choosing an alternative defined in claim 1, wherein the at least one built-in decision rule comprises a non-compensatory decision rule.

4. The system for choosing an alternative defined in claim 1, wherein the at least one attribute is user-definable.

5. The system for choosing an alternative defined in claim 1, further comprising at least one category of decision.

6. The system for choosing an alternative defined in claim 5, further comprising a memory, wherein the at least one of category of decision is programmed into the memory.

7. The system for choosing an alternative defined in claim 1, further comprising at least one sub-category of decision.

8. The system for choosing an alternative defined in claim 1, wherein the at least one built-in decision rule comprises multi-attribute decision analysis.

9. The system for choosing an alternative defined in claim 1, wherein the at least one built-in decision rule comprises an elimination by aspects analysis.

10. The system for choosing an alternative defined in claim 1, further comprising means for providing the user with advice regarding a particular decision.

11. The system for choosing an alternative defined in claim 1, further comprising a plurality of databases, wherein each database comprises at least one alternative and a plurality of attributes pertinent to the at least one alternative.

12. The system for choosing an alternative defined in claim 1, further comprising means for storing and retrieving previously rendered decisions.

13. The system for choosing an alternative defined in claim 1, further comprising means for analyzing the steps performed in reaching a decision.

14. The system for choosing an alternative defined in claim 1, wherein the output is coupled to an interface, the interface for electronically communicating the outcome of the decision.

15. The system for choosing an alternative defined in claim 14, wherein the interface is operable to order products and services over an electronic network.

16. The system for choosing an alternative defined in claim 14, wherein the interface is operable to pay for products and services over an electronic network.

17. A system for rendering a decision from a plurality of alternatives, comprising:

a memory for storing a plurality of alternatives relevant to the decision and a predetermined set of attributes associated with each alternative;

an input coupled to the memory, the input to receive from a user a relative importance level for each attribute and a grade for each attribute associated with each alternative;

a processing element, the processing element for reaching a decision from the plurality of alternatives based upon the input and employing a multi-attribute decision function; and

an output coupled to the memory, the output for communicating the decision to the user.

18. The system for rendering a decision defined in claim 17, wherein the relative importance level received from the user comprises subjective input regarding the decision.

19. The system for rendering a decision defined in claim 17, wherein the grade received from the user comprises subjective input regarding the decision.

20. The system for rendering a decision defined in claim 17, wherein the memory comprises a plurality of databases, each database comprising a plurality of alternatives relevant to a particular decision and a predetermined set of attributes associated with each alternative.

21. The system for rendering a decision defined in claim 20, further comprising means for allowing the user to supply additional databases.

22. The system for rendering a decision defined in claim 17, wherein a subset of the plurality of alternatives relevant to the decision is defined by the user.

23. The system for rendering a decision defined in claim 17, wherein a subset of the predetermined set of attributes associated with each alternative is defined by the user.

24. The system for rendering a decision defined in claim 17, further comprising means for recording previously rendered decisions.

25. The system for rendering a decision defined in claim 17, further comprising means for sorting previously rendered decisions.

26. The system for rendering a decision defined in claim 25, wherein the means for sorting sorts previously rendered decisions by a date the decision was rendered.

27. The system for rendering a decision defined in claim 25, wherein the means for sorting sorts previously rendered decisions by decision category.

28. The system for rendering a decision defined in claim 25, wherein the means for sorting sorts previously rendered decisions by decision sub-category.

29. The system for rendering a decision defined in claim 25, wherein the means for sorting sorts previously rendered decisions by product name.

30. The system for rendering a decision defined in claim 25, wherein the means for sorting sorts previously rendered decisions by chosen alternative.

31. The system for rendering a decision defined in claim 25, further comprising means for generating a satisfaction score for a decision, wherein the means for sorting sorts previously rendered decisions by the satisfaction score associated with the decision.

32. The system for rendering a decision defined in claim 17, further comprising means for tracing the process by which a decision was reached.

33. The system for rendering a decision defined in claim 17, further comprising means for providing an analysis of the rendered decision.

34. The system for rendering a decision defined in claim 17, further comprising a housing.

35. The system for rendering a decision defined in claim 17, wherein the output comprises a signal for communication to a cathode ray tube display.

36. The system for rendering a decision defined in claim 17, wherein the input comprises a keyboard.

37. The system for rendering a decision defined in claim 17, wherein the input comprises a computer.

38. The system for rendering a decision defined in claim 17, wherein the input comprises a telephone line.

39. The system for rendering a decision defined in claim 17, wherein the input comprises an interactive voice response unit.

40. The system for rendering a decision defined in claim 17, wherein the input comprises a television.

41. The system for rendering a decision defined in claim 17, wherein the input comprises a computer network.

42. The system for rendering a decision defined in claim 17, wherein the input comprises a video communication system.

43. The system for rendering a decision defined in claim 17, wherein the input comprises an on-line communications network.

44. The system for rendering a decision defined in claim 17, wherein the processing element comprises a microprocessor.

45. A system for choosing an optimal alternative from a plurality of alternatives and related attributes based upon subjective user input, comprising:

a memory having a database containing a plurality of alternatives relevant to a plurality of decisions, each alternative having a predetermined set of attributes associated therewith;

an input coupled to the memory, the input for initiating a particular decision in response to information received from the user including the importance level of each attribute to the user and a grade for each attribute associated with each alternative;

a decision generator coupled to the input, the decision generator for rendering a decision according to the information received from the user and employing at least one non-compensatory decision rule; and

an output coupled to the decision generator, the output for communicating the decision to the user.

46. The system for choosing an optimal alternative defined in claim 45, wherein at least one of the attributes is defined by the user.

47. The system for choosing an optimal alternative defined in claim 45, further comprising means for analyzing the rendered decision.

48. A method for choosing an alternative comprising the steps of:

providing at least one alternative and at least one attribute pertinent to the at least one alternative;

receiving information from a user regarding the at least one alternative and the at least one attribute;

choosing a preferred alternative based upon the information received and employing at least one built-in decision rule; and

communicating the choice to the user.

49. The method for choosing an alternative defined in claim 48, further comprising the step of receiving subjective input relevant to the decision from the user.

50. The method for choosing an alternative defined in claim 48, further comprising the step of storing the rendered decision.

51. The method for choosing an alternative defined in claim 48, further comprising the step of analyzing the stored decision.

52. The method for choosing an alternative defined in claim 48, further comprising the step of providing at least one database for storing the at least one alternative and the at least one attribute pertinent to the at least one alternative.

53. The method for choosing an alternative defined in claim 48, further comprising the step of interactively prompting for and receiving additional information from the user relative to the decision.

54. The method for choosing an alternative defined in claim 48, wherein the step of choosing a preferred alternative further comprises the step of employing a multi-attribute utility function.

55. The method for choosing an alternative defined in claim 54, further comprising the steps of deriving a score generated by the multi-attribute utility function and dividing the score by a cost of the alternative.

56. The method for choosing an alternative defined in claim 48, wherein the step of employing a built-in decision rule comprises employing a non-compensatory decision rule.

57. The method for choosing an alternative defined in claim 48, wherein the step of receiving information from a user further comprises receiving at least one importance level for the at least one attribute.

58. The method for choosing an alternative defined in claim 48, wherein the step of receiving information from a user further comprises receiving at least one grade associated with the at least one alternative.

59. The method for choosing an alternative defined in claim 48, further comprising the step of providing the cost of the at least one alternative.

60. The method for choosing an alternative defined in claim 59, further comprising the step of reflecting the importance of cost to the decision.

61. The method for choosing an alternative defined in claim 48, wherein the step of choosing a preferred alternative further comprises employing a dominance decision rule.

62. The method for choosing an alternative defined in claim 48, wherein the step of employing at least one non-compensatory decision rule comprises employing an elimination-by-aspects rule.

63. The method for choosing an alternative defined in claim 48, wherein the step of choosing a preferred alternative further comprises the step of incorporating a lexicographic decision rule.

64. The method for choosing an alternative defined in claim 48, further comprising the step of generating an empty cell solution when the at least one alternative does not satisfy the input from the user.

65. The method for choosing an alternative defined in claim 48, wherein the step of choosing a preferred alternative further comprises the step of providing a tie breaking procedure.

66. The method for choosing an alternative defined in claim 48, further comprising the step of receiving information from other users regarding the at least one alternative and the at least one attribute.

67. The method for choosing an alternative defined in claim 66, further comprising the step of arriving at a collective decision based upon the information received from other users.

68. The method for choosing an alternative defined in claim 48, further comprising the step of providing a satisfaction score.

69. A method for choosing an optimal alternative from a plurality of alternatives and related attributes based upon subjective user input, comprising the steps of:

providing a database containing a plurality of alternatives relevant to a particular decision, each alternative having a plurality of pre-programmed and user-defined attributes associated therewith;

initiating a particular decision in response to information received from the user including the importance level of each attribute to the user and a grade for each attribute associated with each alternative;

rendering a decision according to the information received from the user and employing a multi-attribute decision function; and

communicating the decision to the user.

70. A graphic user interface for reaching a decision, comprising:

a matrix window, the matrix window providing for at least one alternative to the decision and relevant attributes for the at least one alternative; and

a metric window, the metric window for assigning a level of importance to each of the attributes identified in the matrix window.

71. The graphic user interface defined in claim 70, further comprising a decision category input window.

72. The graphic user interface defined in claim 70, wherein the matrix window comprises at least one row associated with each attribute of the decision.

73. The graphic user interface defined in claim 72, wherein the at least one row includes an entry for the at least one alternative to the decision.

74. The graphic user interface defined in claim 73, wherein the user supplies input to the entry for the at least one alternative to the decision, the input including subjective information from the user.

75. The graphic user interface defined in claim 70, wherein the matrix window comprises at least one column associated with the at least one alternative to the decision.

76. The graphic user interface defined in claim 75, wherein the at least one column includes an entry for each attribute of the decision.

77. The graphic user interface defined in claim 76, wherein the user supplies input to the entry for each alternative to the decision, the input including subjective information from the user.

78. The graphic user interface defined in claim 70, wherein the user supplies the level of importance in the metric window, the level of importance including subjective information from the user.

79. The graphic user interface defined in claim 70, further comprising a decision history screen.

80. The graphic user interface defined in claim 70, further comprising a cost window.

81. The graphic user interface defined in claim 70, further comprising a decision analysis window.

82. The graphic user interface defined in claim 70, further comprising a tie breaker window.

83. The graphic user interface defined in claim 70, further comprising a decision subcategory input window.

84. The graphic user interface defined in claim 83, wherein decision subcategories are organized as file folders.

85. The graphic user interface defined in claim 70, further comprising a quality control window.

86. The graphic user interface defined in claim 70, further comprising an advisor's opinion window.

87. Apparatus for reaching a decision, comprising:

a housing;

a memory contained within the housing, the memory for storing a plurality of alternatives relevant to the decision and at least one attribute associated with each alternative;

an input device, coupled to the housing, the input device to receive from a user a relative importance level for each attribute and a grade for each attribute associated with each alternative;

a processing element contained within the housing, the processing element for reaching a decision from the plurality of alternatives based upon the input, and employing at least one built-in decision rule; and

an output, coupled to the housing, the output for communicating the decision to the user.

88. The apparatus defined in claim 87, further comprising a database contained within the memory, the database for storing the plurality of alternatives and at least one attribute associated with each alternative.

89. The apparatus defined in claim 87, wherein the housing comprises a portable computer.

90. The apparatus defined in claim 87, wherein the housing comprises a personal computer.

91. The apparatus defined in claim 87, wherein the housing comprises a remote computer.

92. The apparatus defined in claim 87, wherein the housing comprises a calculator.

93. The apparatus defined in claim 87, wherein the housing is coupled to a network of other housings.

94. The apparatus defined in claim 87, wherein the input received from the user comprises subjective input relative to the decision.

95. The apparatus defined in claim 87, wherein the output communicates a signal indicative of the rendered decision.

96. The apparatus defined in claim 95, wherein the signal generated is operable to order products and services.

97. The apparatus defined in claim 95, wherein the signal generated is operable to pay for products and services.

98. The apparatus defined in claim 95, wherein the signal generated is coupled to a network.

99. The apparatus defined in claim 87, wherein the output comprises a cathode ray tube display.

100. The apparatus defined in claim 87, wherein the output comprises an LED display.

101. The apparatus defined in claim 87, wherein the input comprises a keyboard.

102. The apparatus defined in claim 87, wherein the input comprises a keypad.

103. The apparatus defined in claim 87, wherein the input comprises a computer.

104. The apparatus defined in claim 87, wherein the input comprises a telephone line.

105. The apparatus defined in claim 87, wherein the input comprises a network.

106. The apparatus defined in claim 87, wherein the input comprises a television.

107. The apparatus defined in claim 87, wherein the input comprises an interactive voice response unit.

108. The apparatus defined in claim 87, wherein the built-in decision rule comprises a dominance decision rule.

109. The apparatus defined in claim 87, wherein the built-in decision rule comprises multi-attribute decision analysis.

110. The apparatus defined in claim 87, wherein the built-in decision rule comprises a non-compensatory decision rule.

111. The apparatus defined in claim 87, wherein the built-in decision rule comprises an elimination-by-aspects decision rule.

112. The apparatus defined in claim 87, wherein the built-in decision rule comprises a lexicographic decision rule.

113. The apparatus defined in claim 87, wherein the processing element provides an empty cell solution to the decision when no alternative satisfies the input from the user.

114. The apparatus defined in claim 87, wherein the processing element employs a tie breaking procedure in order to reach a decision.

115. The apparatus defined in claim 87, further comprising means for analyzing previously rendered decisions.

116. The apparatus defined in claim 87, further comprising means for tracing the processing associated with previously rendered decisions.

117. Apparatus for choosing an optimal alternative from a plurality of alternatives and related attributes based upon subjective user input, comprising:

means for housing a decision generator;

a memory contained within the means for housing, the memory having a database containing a plurality of alternatives relevant to a particular decision, each alternative having a predetermined set of attributes associated therewith;

an input device, coupled to the means for housing, the input device initiating a particular decision in response to information received from the user including the importance level of each attribute to the user and a grade for each attribute associated with each alternative;

a decision generator contained within the means for housing, the decision generator for rendering a decision according to the information received from the user and employing a multi-attribute decision function; and

an output, coupled to the means for housing, the output for communicating the decision to the user.

Fig. 1(a)

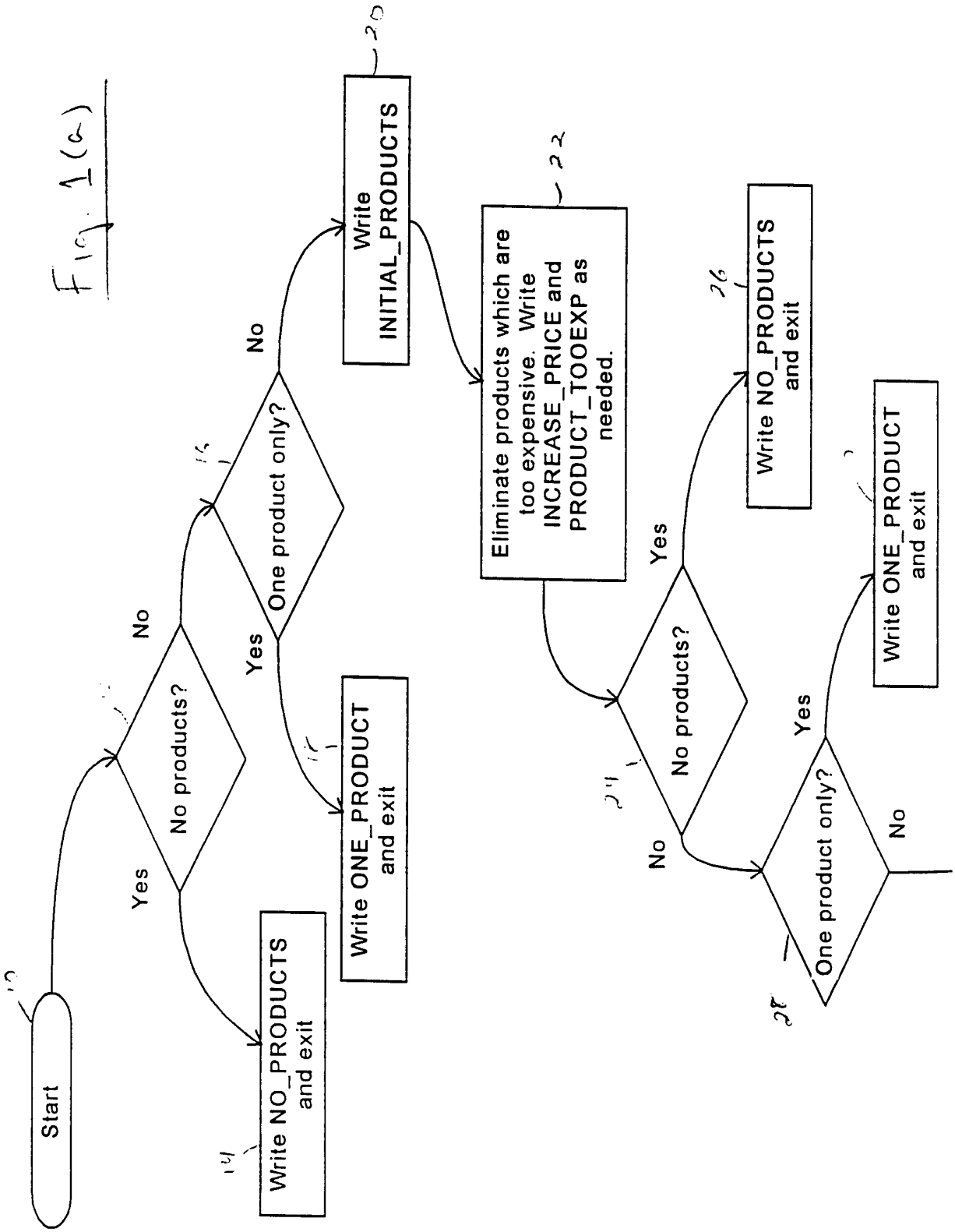

Start
No products?
Yes
No
Write NO_PRODUCTS and exit
One product only?
Yes
No
Write ONE_PRODUCT and exit
Write INITIAL_PRODUCTS
Eliminate products which are too expensive. Write INCREASE_PRICE and PRODUCT_TOOEXP as needed.
No products?
Yes
No
Write NO_PRODUCTS and exit
One product only?
Yes
No
Write ONE_PRODUCT and exit

Fig. 1(b)

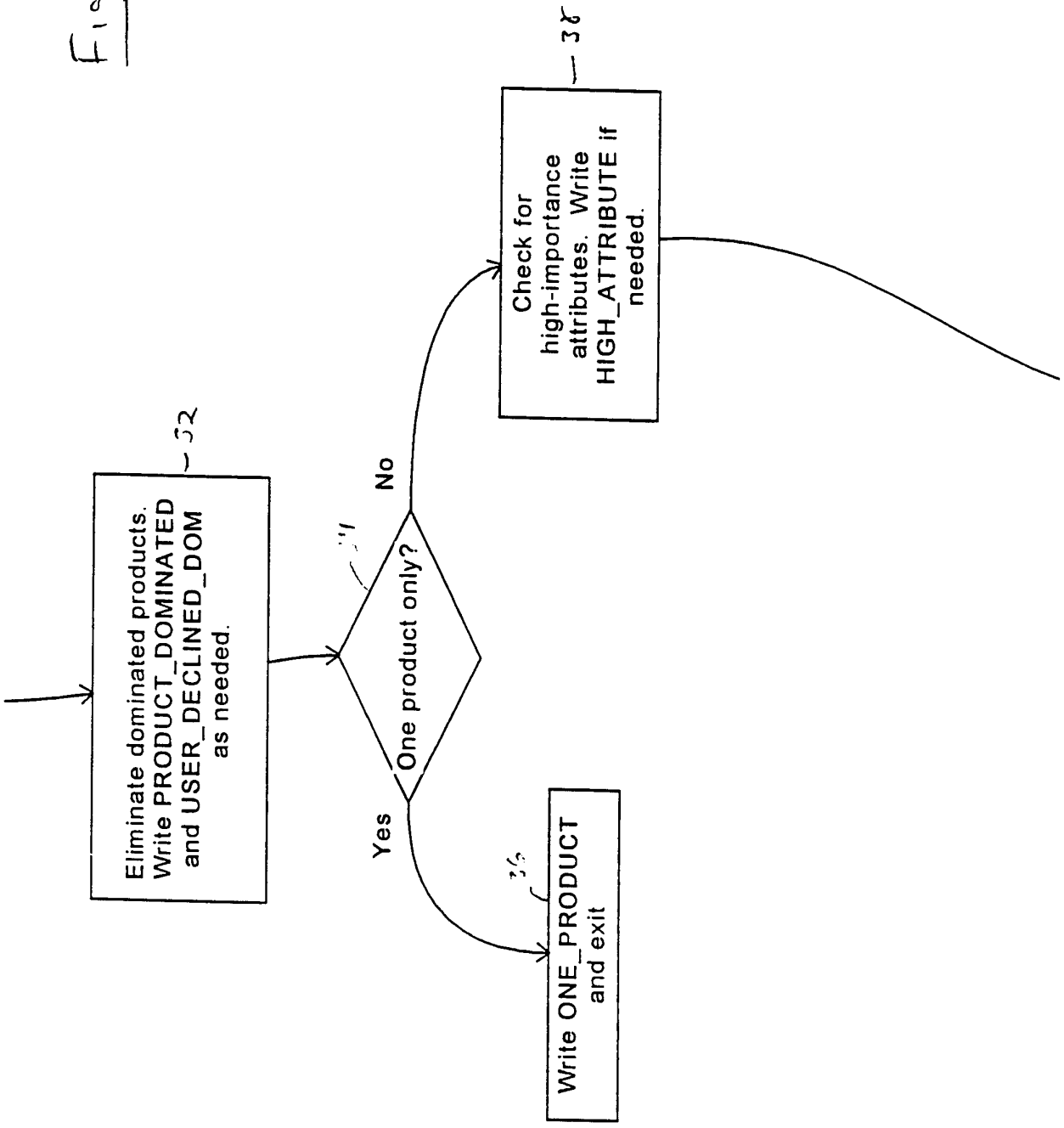

Eliminate dominated products. Write PRODUCT_DOMINATED and USER_DECLINED_DOM as needed.
32
One product only?
No
Yes
Check for high-importance attributes. Write HIGH_ATTRIBUTE if needed.
38
Write ONE_PRODUCT and exit

Fig. 1(c)

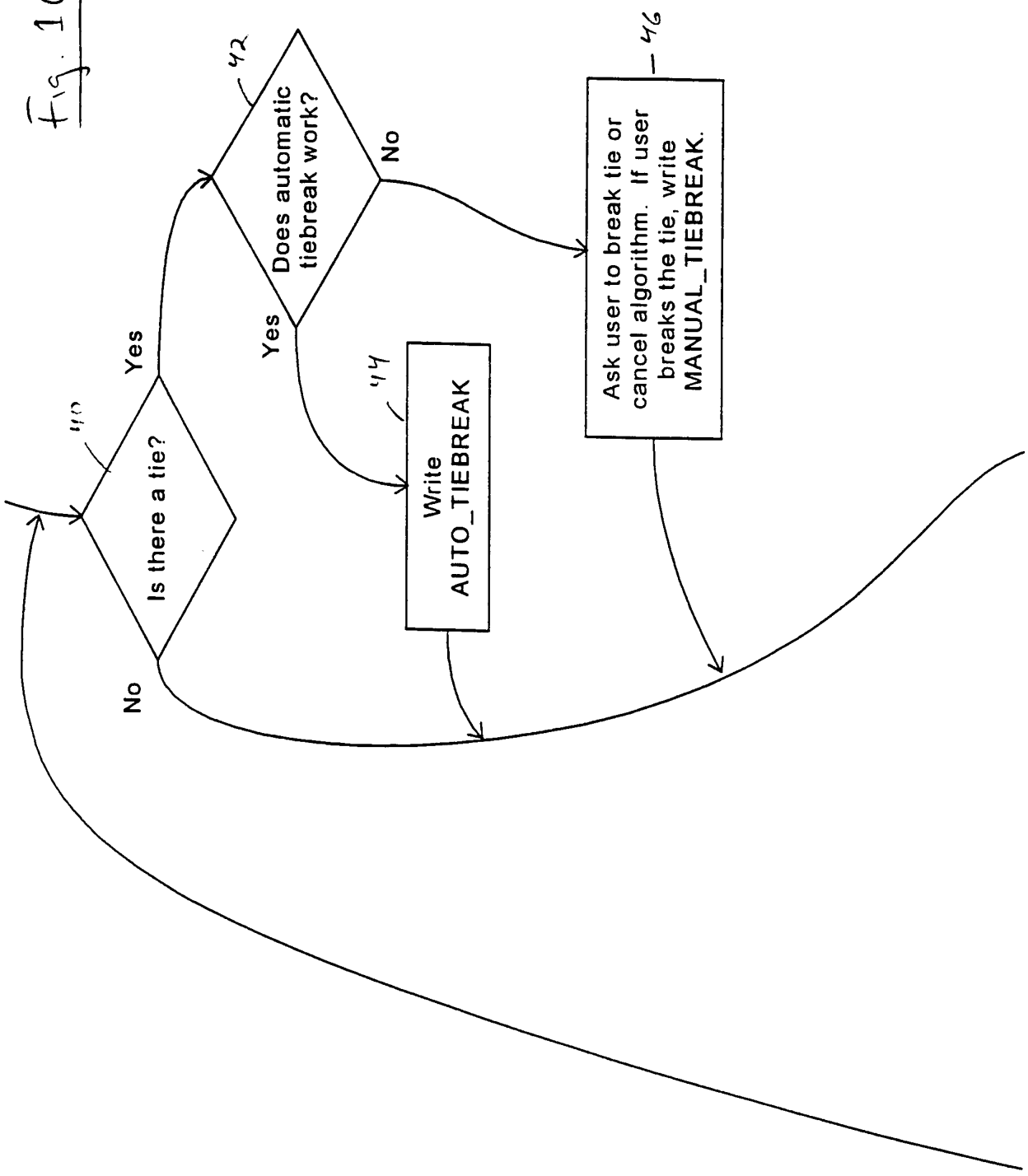

Is there a tie?
Yes
No
Does automatic tiebreak work?
Yes
No
Write AUTO_TIEBREAK
Ask user to break tie or cancel algorithm. If user breaks the tie, write MANUAL_TIEBREAK.

Fig. 1(d)

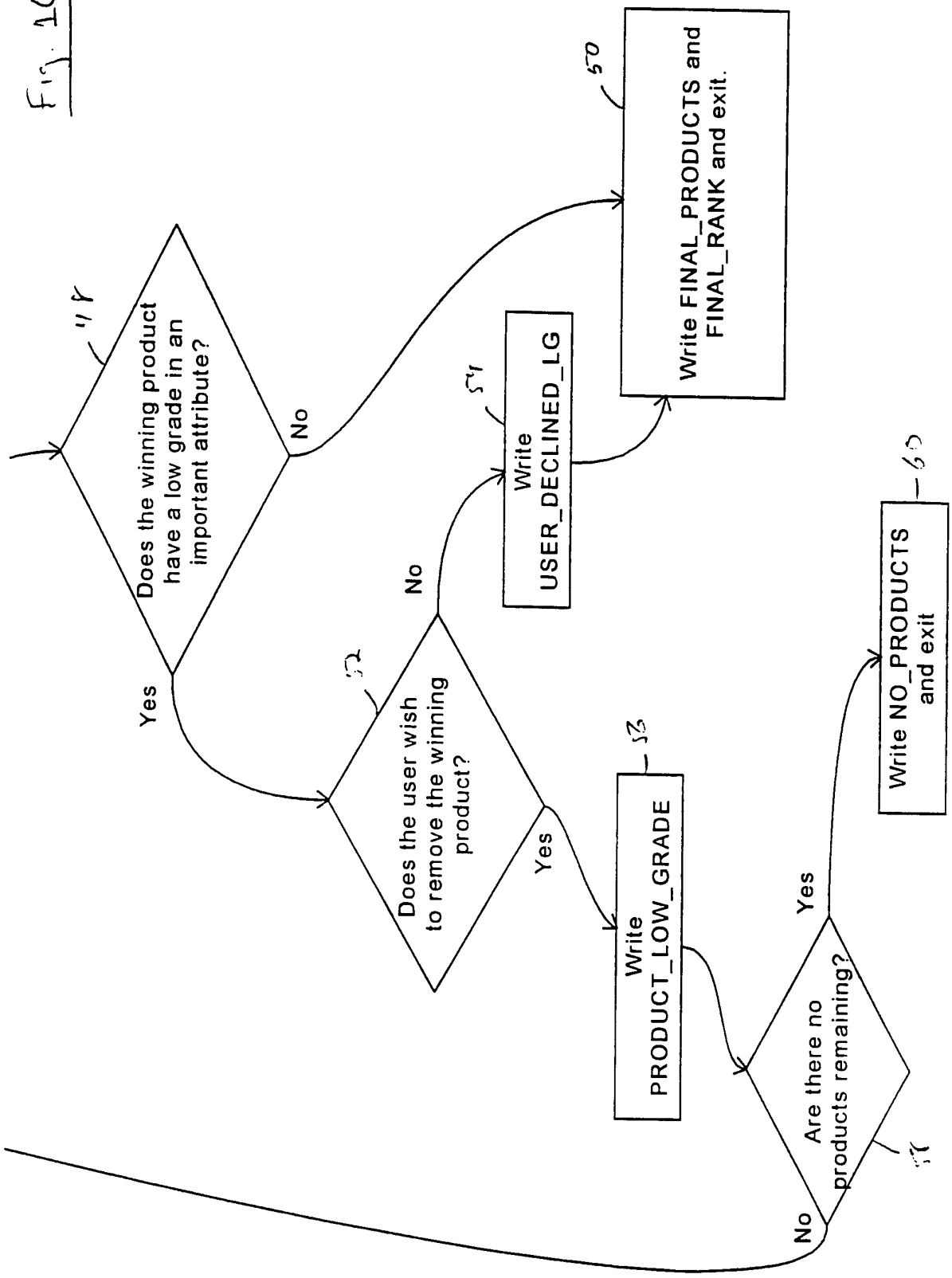

Does the winning product have a low grade in an important attribute?
Yes
No
Does the user wish to remove the winning product?
Yes
No
Write PRODUCT_LOW_GRADE
Write USER_DECLINED_LG
Write FINAL_PRODUCTS and FINAL_RANK and exit.
Are there no products remaining?
Yes
No
Write NO_PRODUCTS and exit

Fig. 2(a)

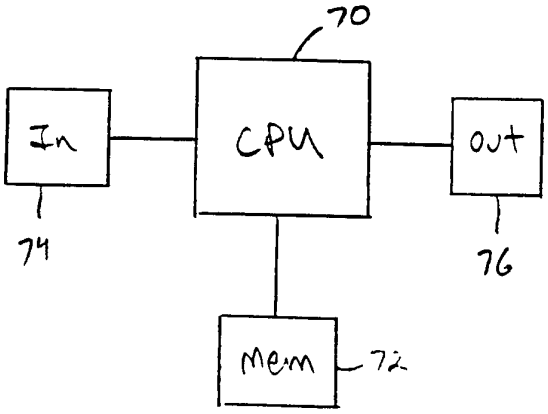

70
In
CPU
Out
74
76
Mem
72

Fig. 3

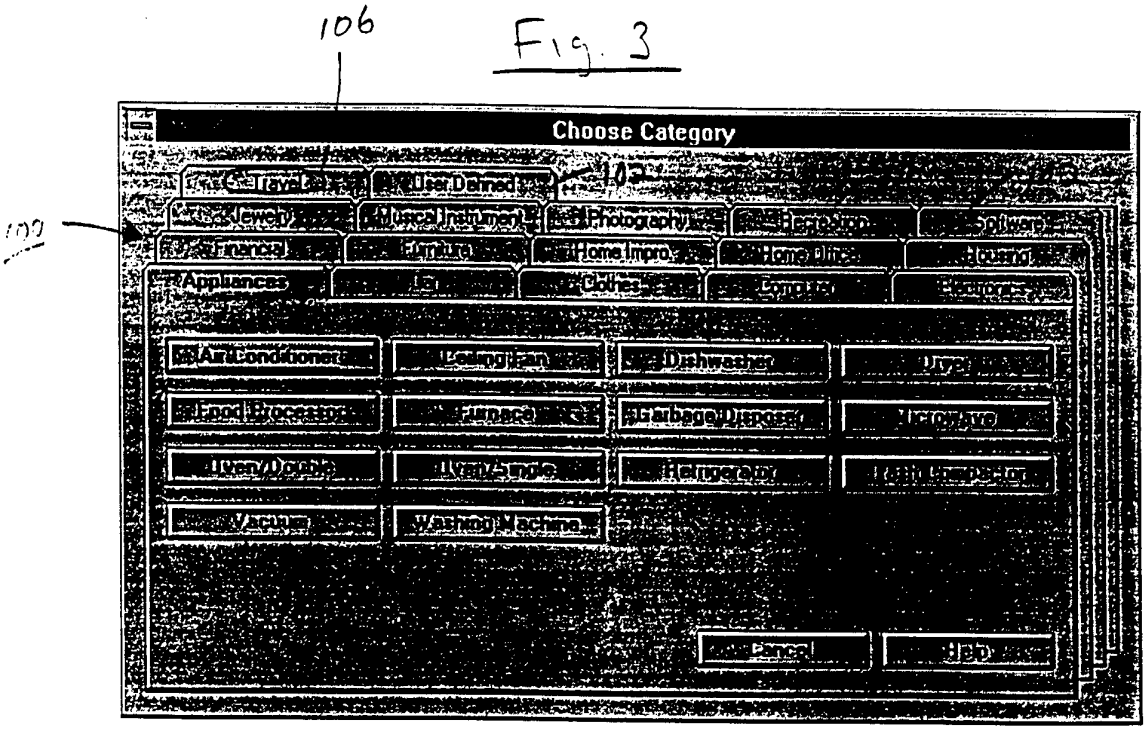

106
100
Choose Category
102
Appliances
Air Conditioner
Ceiling Fan
Dishwasher
Dryer
Food Processor
Furnace
Garbage Disposer
Microwave
Oven/Double
Oven/Single
Refrigerator
Trash Compactor
Vacuum
Washing Machine
Cancel
Help

FIG. 2b

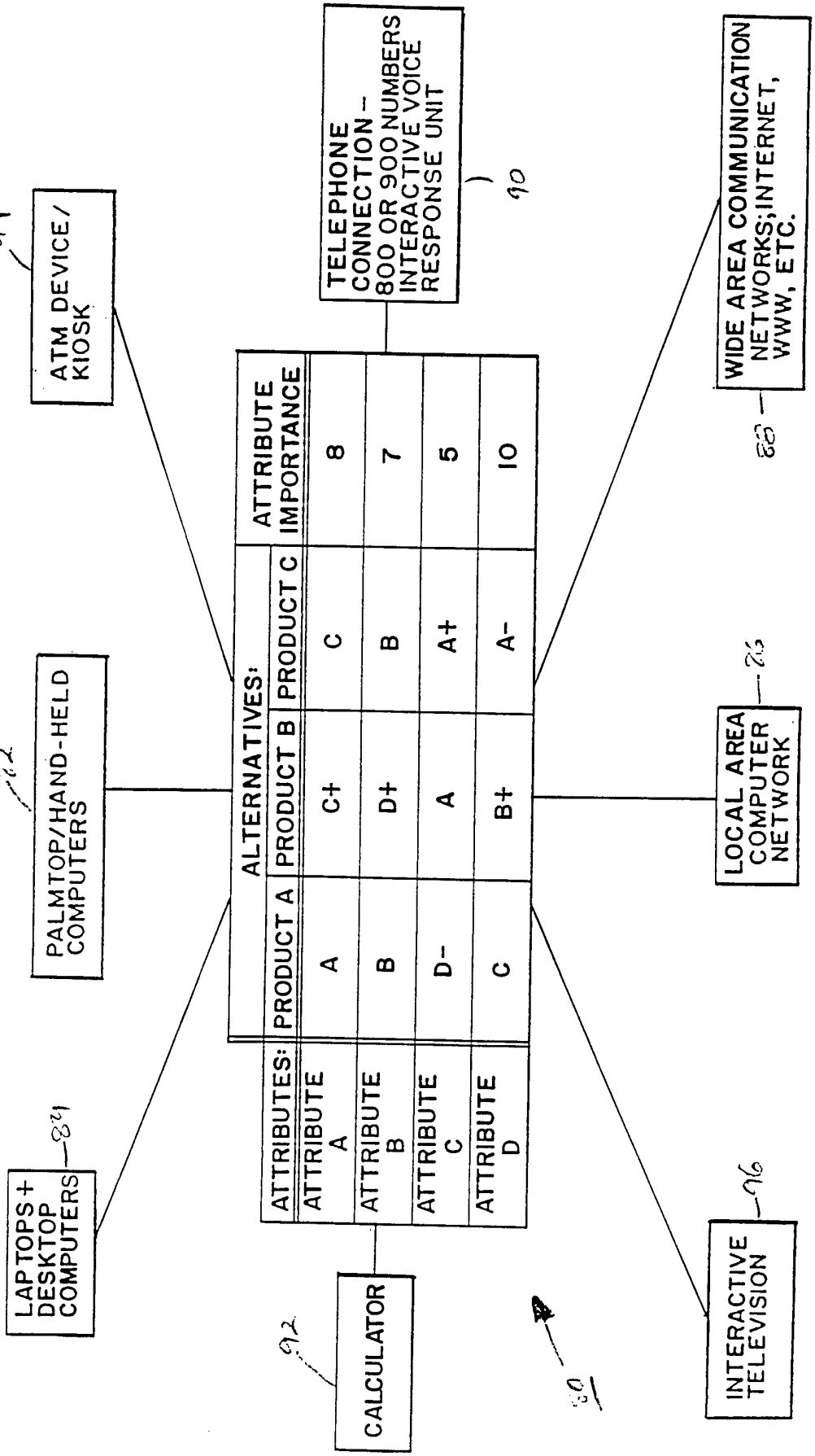
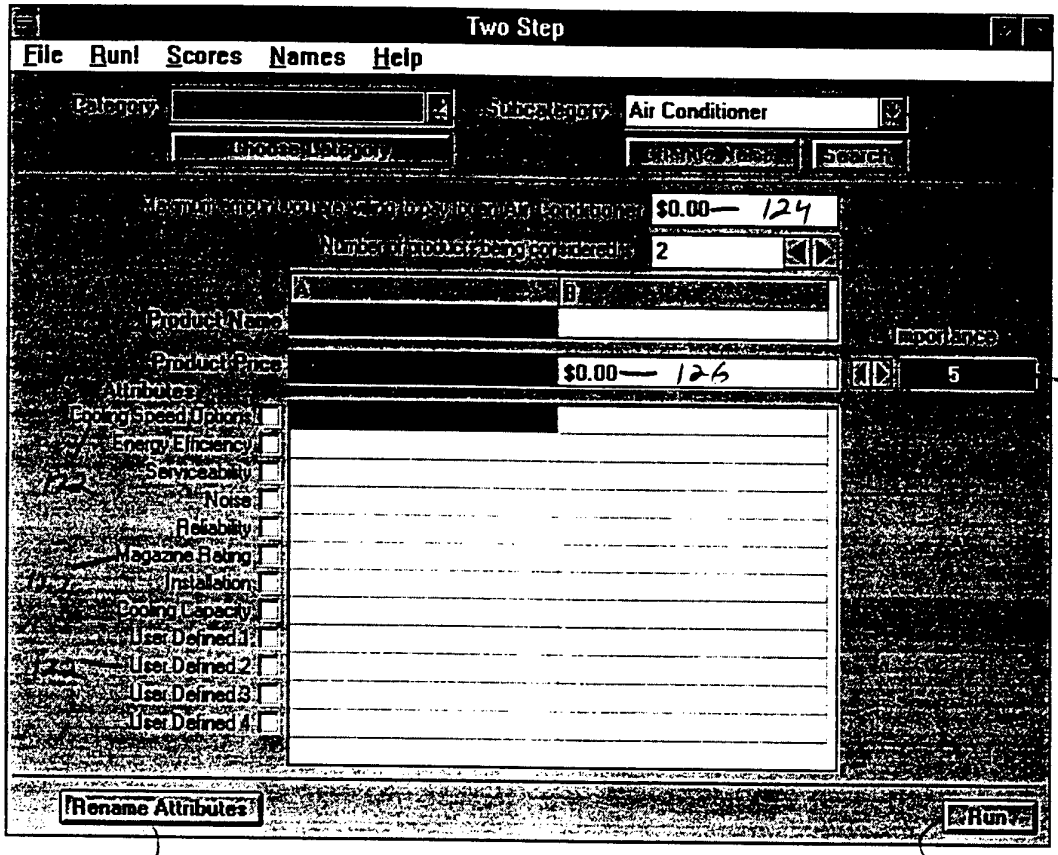

ATM DEVICE / KIOSK
94
TELEPHONE CONNECTION – 800 OR 900 NUMBERS INTERACTIVE VOICE RESPONSE UNIT
90
WIDE AREA COMMUNICATION NETWORKS; INTERNET, WWW, ETC.
88
PALMTOP/HAND-HELD COMPUTERS
82
ALTERNATIVES:
ATTRIBUTE IMPORTANCE
PRODUCT A
PRODUCT B
PRODUCT C
ATTRIBUTES:
ATTRIBUTE A
8
A
C+
C
ATTRIBUTE B
7
B
D+
B
ATTRIBUTE C
5
D-
A
A+
ATTRIBUTE D
10
C
B+
A-
LOCAL AREA COMPUTER NETWORK
86
LAP TOPS + DESKTOP COMPUTERS
84
CALCULATOR
92
INTERACTIVE TELEVISION
96
80

Fig. 4


Two Step
File Run! Scores Names Help
Category
Sub-Category
Air Conditioner
Browse Category
Search
$0.00
124
Number of product ratings generated:
2
Product Name
Importance
Product Price
$0.00
126
5
132
Attributes
Energy Speed Options
Energy Efficiency
Serviceability
Noise
Reliability
Magazine Rating
Installation
Cooling Capacity
User Defined 1
User Defined 2
User Defined 3
User Defined 4
122
Rename Attributes
Run
130
120
128

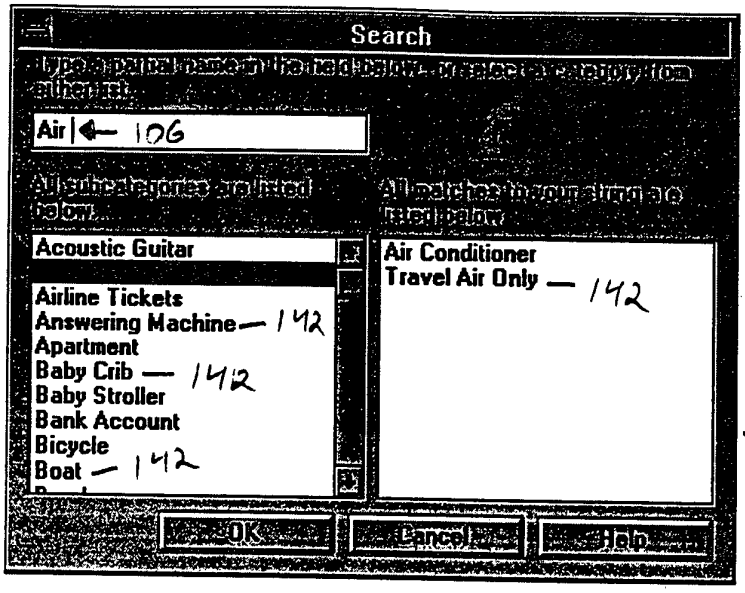

Search
Air
106
Acoustic Guitar
Airline Tickets
Answering Machine
142
Apartment
Baby Crib
142
Baby Stroller
Bank Account
Bicycle
Boat
142
Air Conditioner
Travel Air Only
142
140
OK
Cancel
Help

Fig. 5

Fig. 6

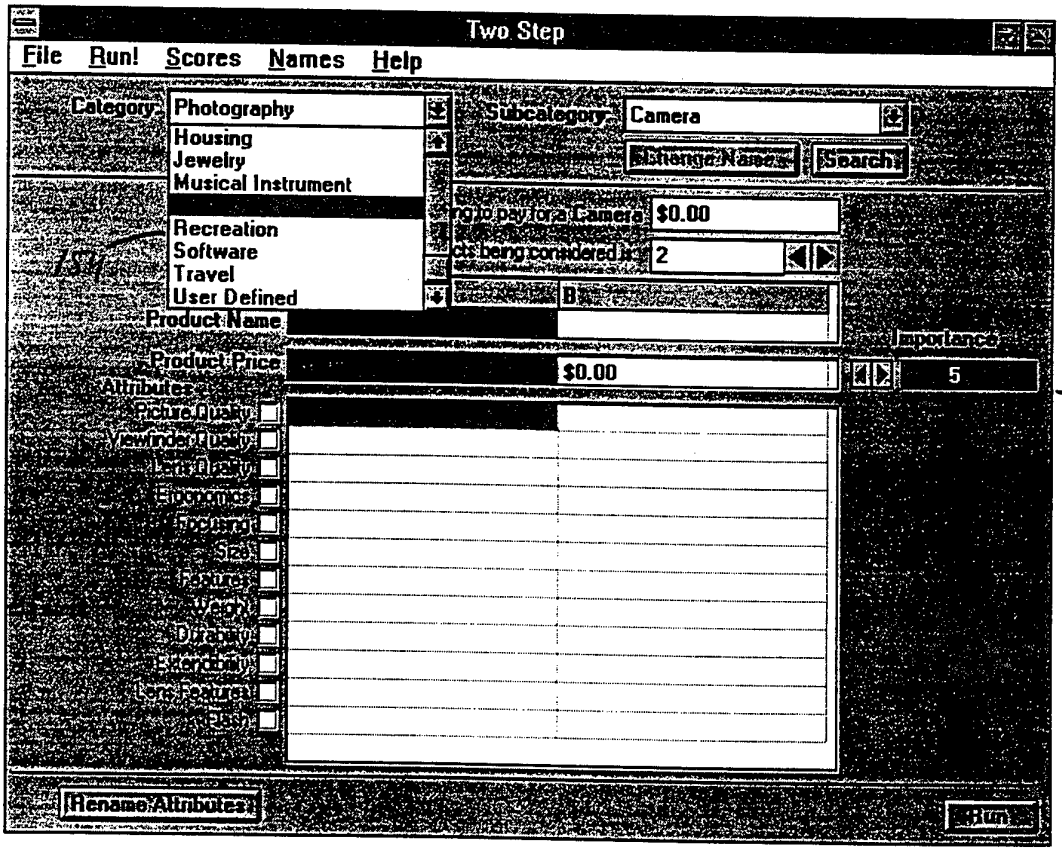
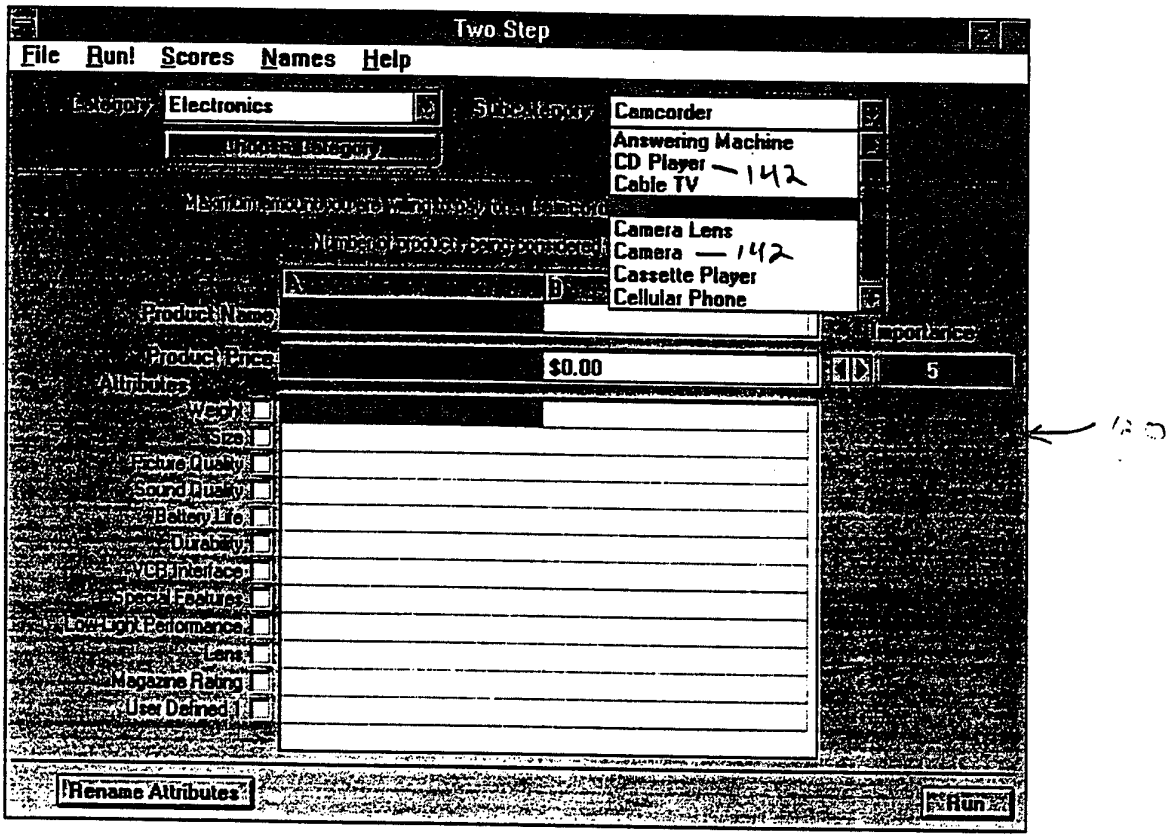

Two Step
File
Run!
Scores
Names
Help
Category
Photography
Housing
Jewelry
Musical Instrument
Recreation
Software
Travel
User Defined
154
Subcategory
Camera
Search
$0.00
2
Product Name
Product Price
$0.00
5
120
Rename Attributes
Run

Fig. 7(a)


Two Step
File Run! Scores Names Help
Category
Electronics
Subcategory
Camcorder
Answering Machine
CD Player
Cable TV
142
Camera Lens
Camera
142
Cassette Player
Cellular Phone
Product Name
Product Price
$0.00
5
Attributes
Weight
Size
Picture Quality
Sound Quality
Battery Life
Durability
IBM Interface
Special Features
Low Light Performance
Lens
Magazine Rating
User Defined 1
Rename Attributes
Run
150

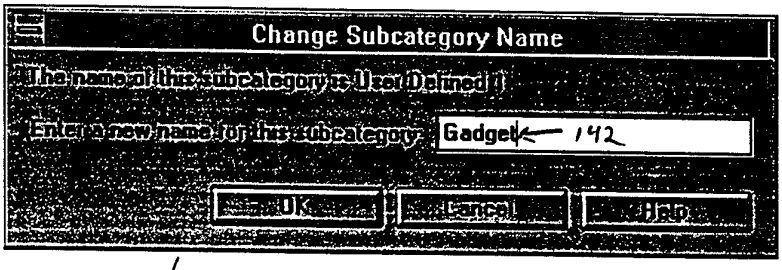
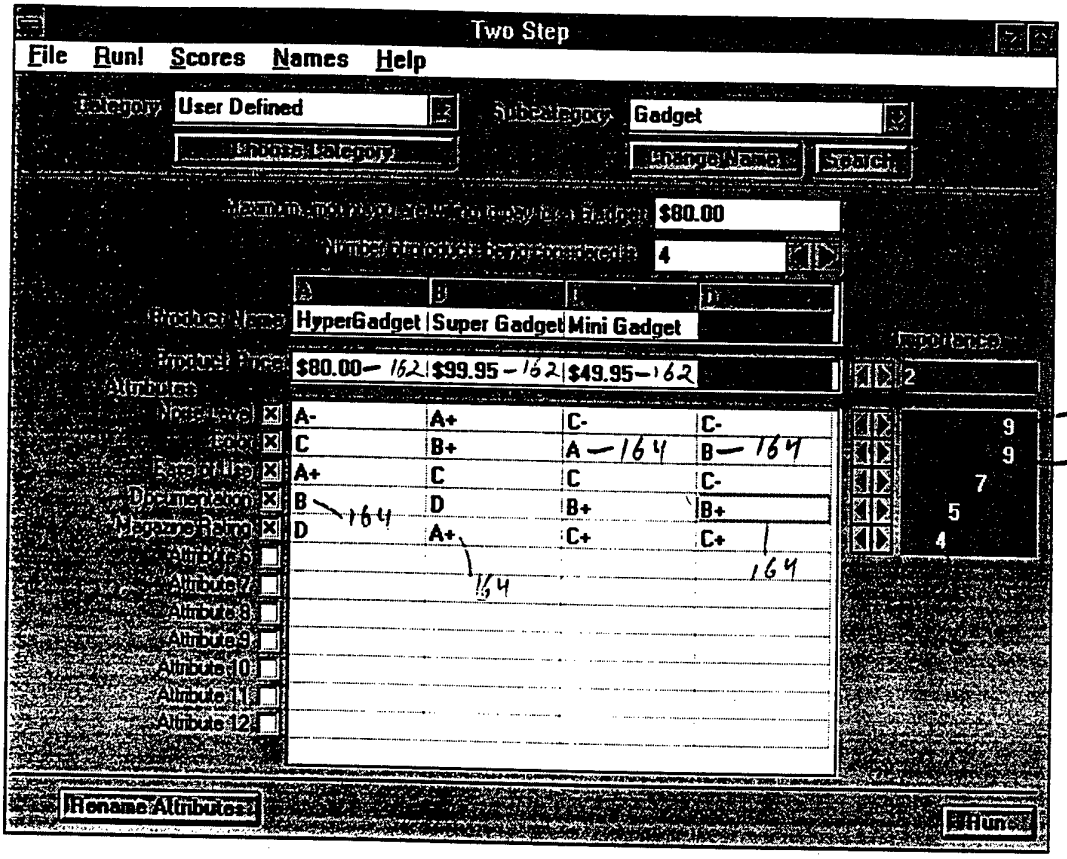

Change Subcategory Name
The name of this subcategory is User Defined 1
Enter a new name for this subcategory:
Gadget
142
OK
Cancel
Help
160

Fig. 7(b)

Fig. 8


Two Step
File Run! Scores Names Help
Category User Defined
Subcategory Gadget
Browse Category
Browse Names
Search
$80.00
4
HyperGadget
Super Gadget
Mini Gadget
$80.00 – 162
$99.95 – 162
$49.95 – 162
2
Noise Level
Color
Ease of Use
Documentation
Magazine Rating
Attribute 5
Attribute 6
Attribute 7
Attribute 8
Attribute 9
Attribute 10
Attribute 11
Attribute 12
A- A+ C- C-
C B+ A 164 B 164
A+ C C C-
B 164 D B+ B+
D A+ C+ C+
164
164
9
9
7
5
4
166
166
Rename Attributes
Run!

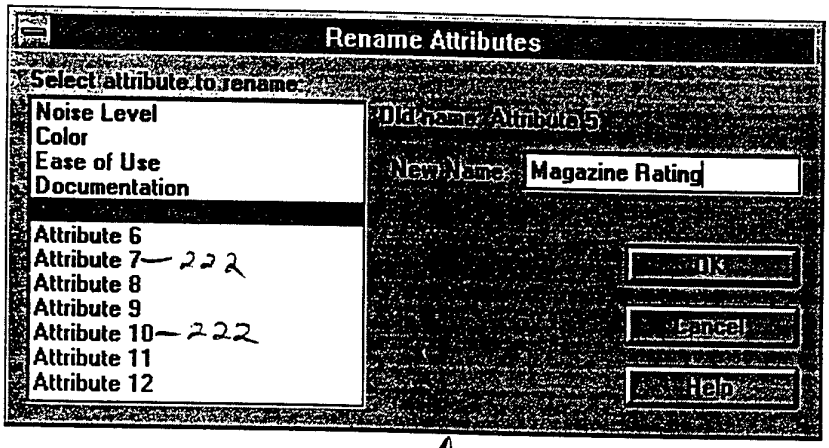

Rename Attributes
Select attribute to rename:
Noise Level
Color
Ease of Use
Documentation
Attribute 6
Attribute 7 222
Attribute 8
Attribute 9
Attribute 10 222
Attribute 11
Attribute 12
Old name: Attribute 5
New Name: Magazine Rating
OK
Cancel
Help
220

Fig. 11

Fig. 9

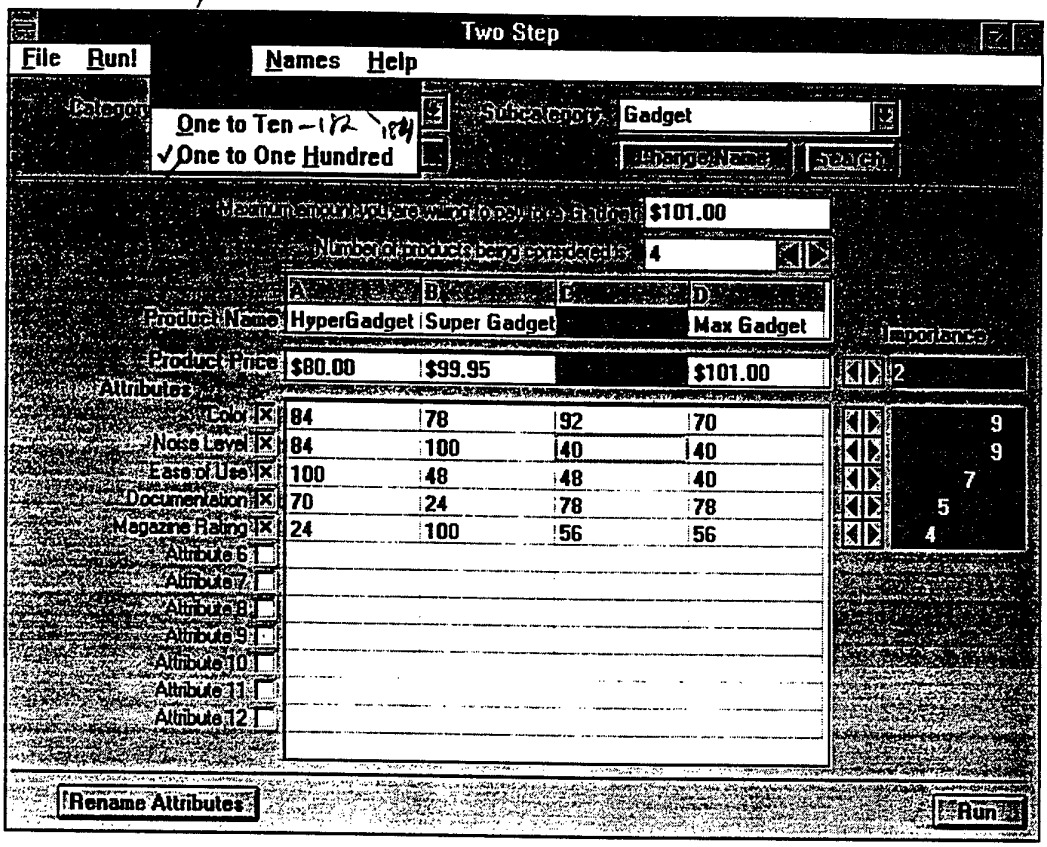

100
Two Step
File
Run!
Names
Help
One to Ten
One to One Hundred
Gadget
SEARCH
$101.00
4
Product Name
HyperGadget
Super Gadget
Max Gadget
Product Price
$80.00
$99.95
$101.00
Importance
2
Attributes
Color
Noise Level
Ease of Use
Documentation
Magazine Rating
84 78 92 70
84 100 40 40
100 48 48 40
70 24 78 78
24 100 56 56
9
9
7
5
4
Attribute 6
Attribute 7
Attribute 8
Attribute 9
Attribute 10
Attribute 11
Attribute 12
Rename Attributes
Run
120

Fig. 10(a)

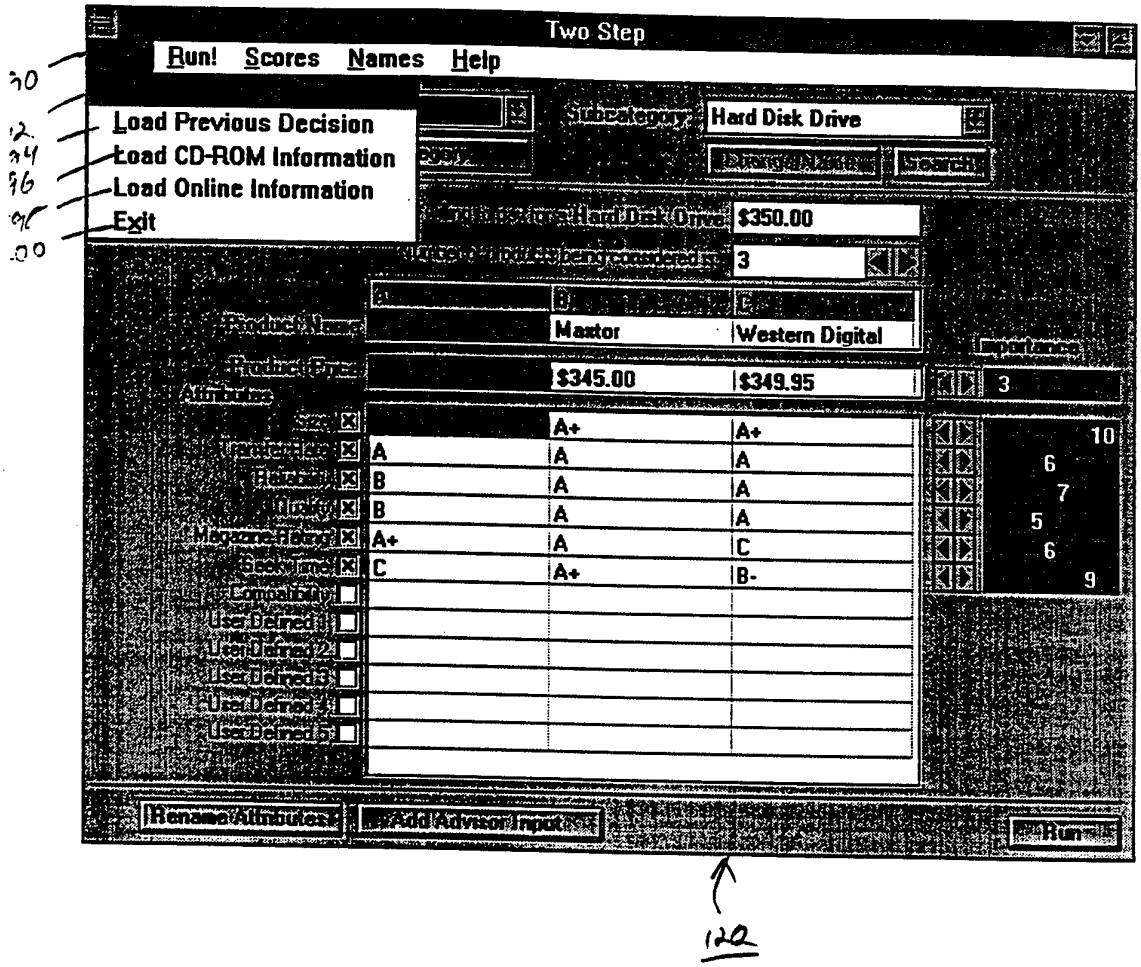

Two Step
Run! Scores Names Help
Load Previous Decision
Load CD-ROM Information
Load Online Information
Exit
Hard Disk Drive
$350.00
3
Maxtor
Western Digital
$345.00
$349.95
3
A+
A+
A
A
A
B
A
A
B
A
A+
A
C
C
A+
B-
10
6
7
5
6
9
Rename Attributes
Add Advisor Input
Run
120

Fig. 10(b)

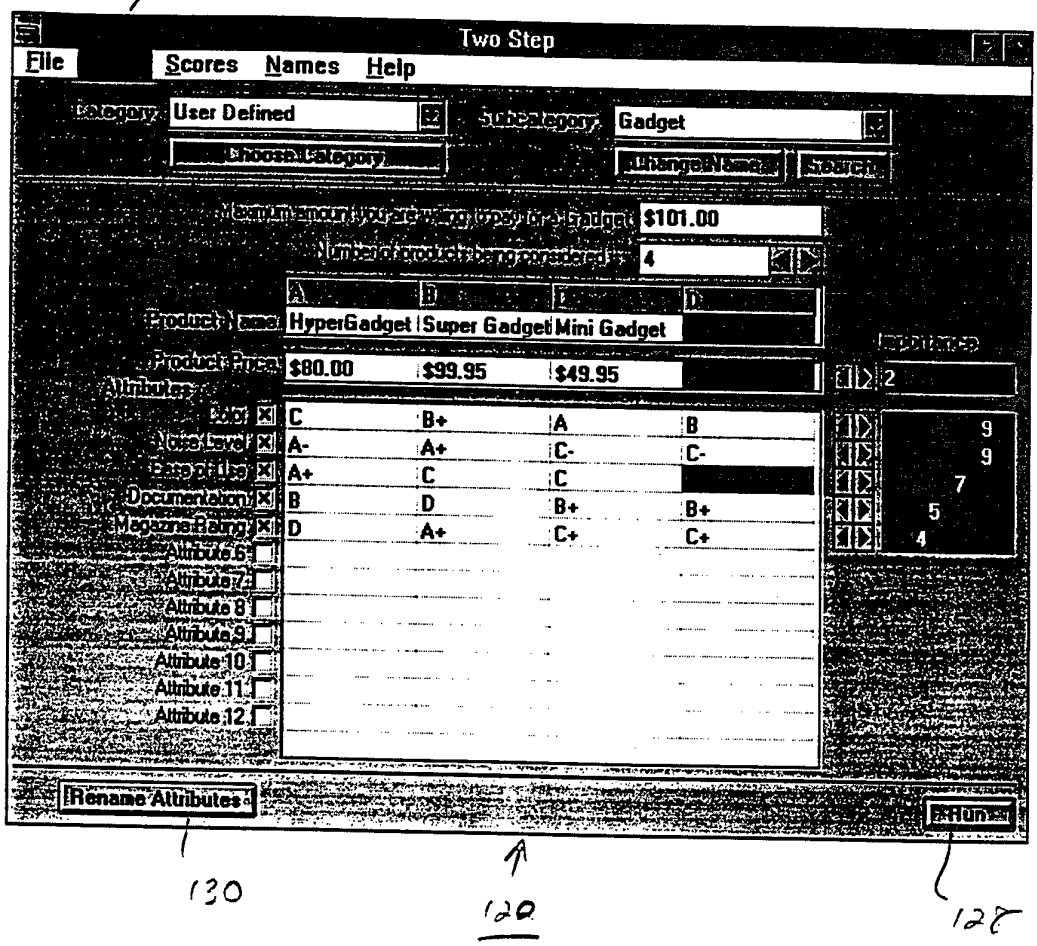
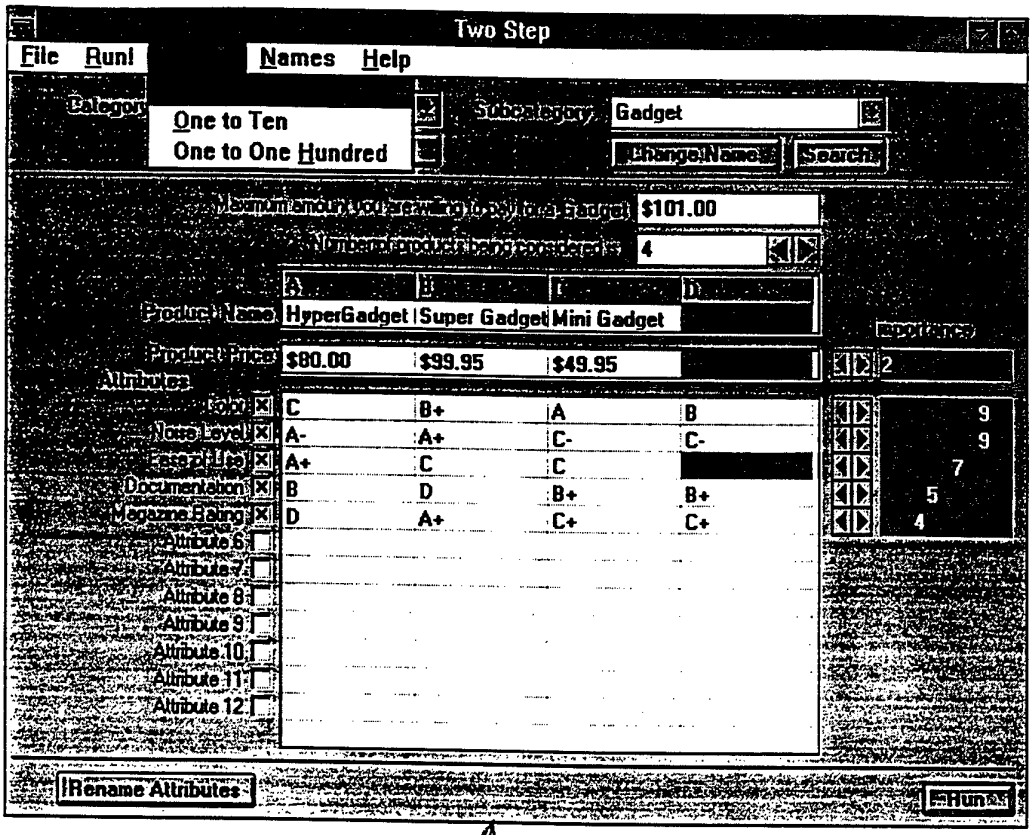
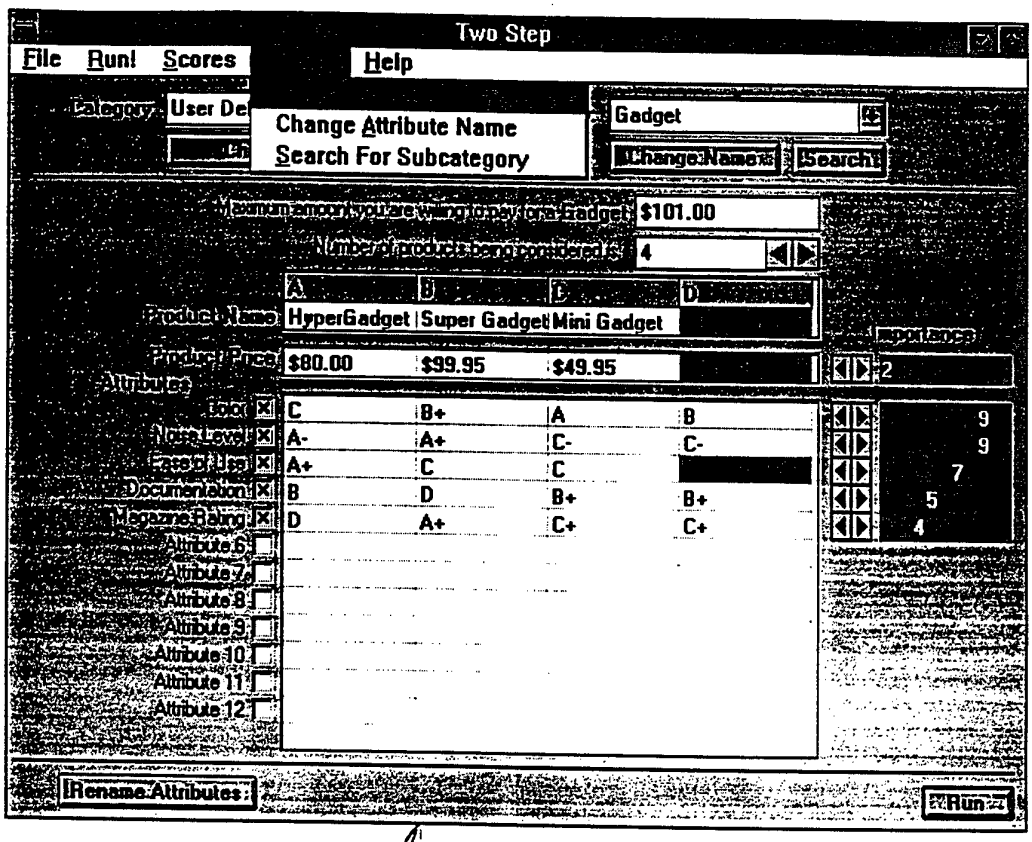

202
Two Step
File
Scores
Names
Help
Category:
User Defined
Subcategory:
Gadget
Choose Category
Change Name
Store It
Number of products being considered:
4
A
B
C
D
Product Name:
HyperGadget
Super Gadget
Mini Gadget
Product Price:
$80.00
$99.95
$49.95
Attributes:
Cost:
Noise Level:
Ease of Use:
Durability:
Maintainability:
Attribute 6:
Attribute 7:
Attribute 8:
Attribute 9:
Attribute 10:
Attribute 11:
Attribute 12:
C
B+
A
B
A-
A+
C-
C-
A+
C
C
B
D
B+
B+
D
A+
C+
C+
2
9
9
7
5
4
Rename Attributes
Run
130
120
125

Fig. 10(c)


Two Step
File Run!
Names Help
One to Ten
One to One Hundred
Gadget
Change Names
Search
$101.00
4
HyperGadget
Super Gadget
Mini Gadget
$80.00
$99.95
$49.95
Attributes
Color
Noise Level
Easy of Use
Documentation
Magazine Rating
Attribute 6
Attribute 7
Attribute 8
Attribute 9
Attribute 10
Attribute 11
Attribute 12
C
B+
A
B
A-
A+
C-
C-
A+
C
C
B
D
B+
B+
D
A+
C+
C+
9
9
7
5
4
Rename Attributes

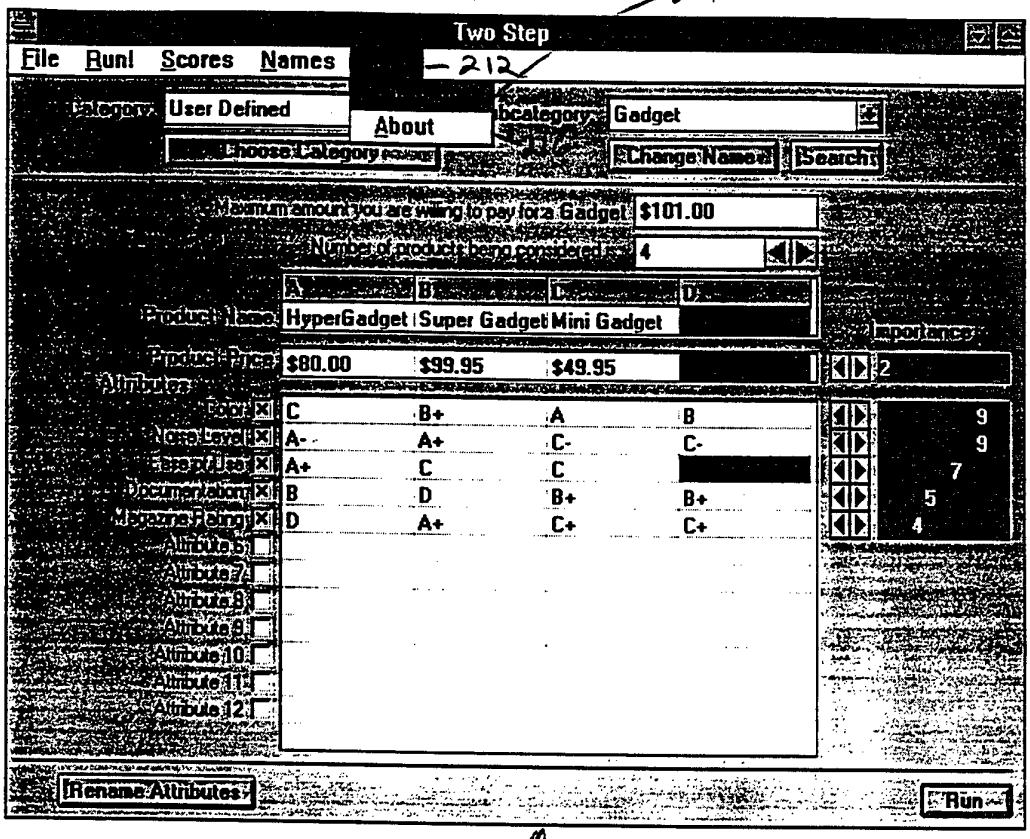
120

Fig. 10(d)


Two Step
File
Run!
Scores
Help
Change Attribute Name
Search For Subcategory
Gadget
Change Name
Search
$101.00
4
HyperGadget
Super Gadget
Mini Gadget
$80.00
$99.95
$49.95
Rename Attributes
Run

120

Fig. 10(e)


214
Two Step
File
Run!
Scores
Names
212
Category:
User Defined
About
Subcategory:
Gadget
Choose Category
Change Name
Search
Maximum amount you are willing to pay for a Gadget:
$101.00
Number of products being considered:
4
A
B
C
D
Product Name:
HyperGadget
Super Gadget
Mini Gadget
Importance
Product Price:
$80.00
$99.95
$49.95
2
Attributes
Color
C
B+
A
B
9
Noise Level
A-
A+
C-
C-
9
Ease of Use
A+
C
C
7
Documentation
B
D
B+
B+
5
Maximum Power
D
A+
C+
C+
4
Attribute 5
Attribute 6
Attribute 7
Attribute 8
Attribute 9
Attribute 10
Attribute 11
Attribute 12
Rename Attributes
Run
120

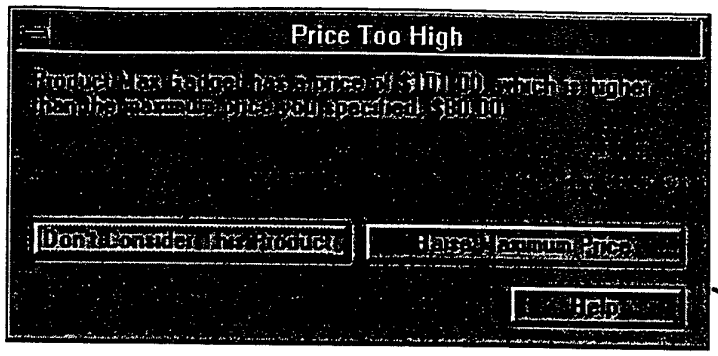


Fig. 12

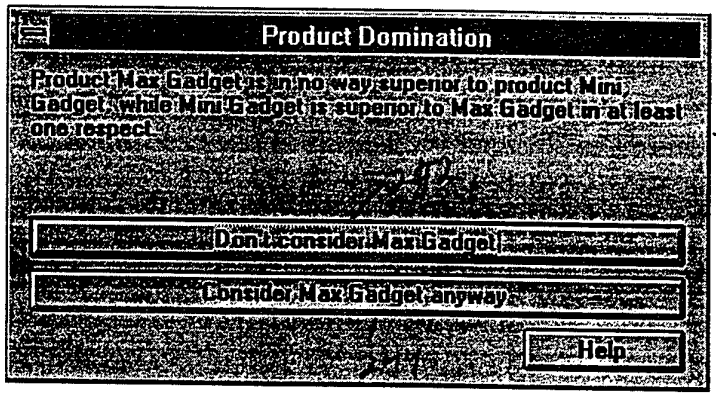


Fig. 13

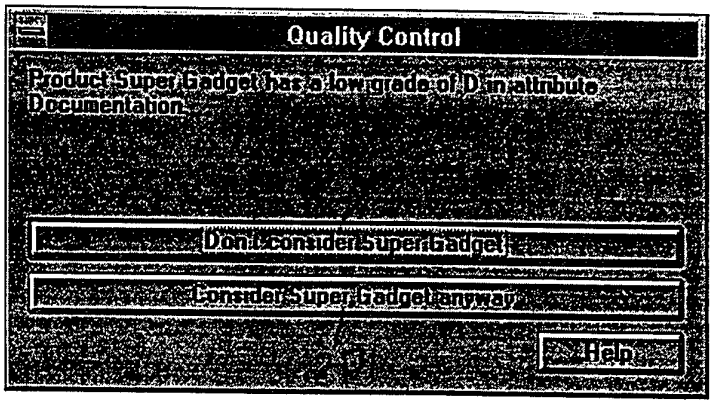


Fig. 14

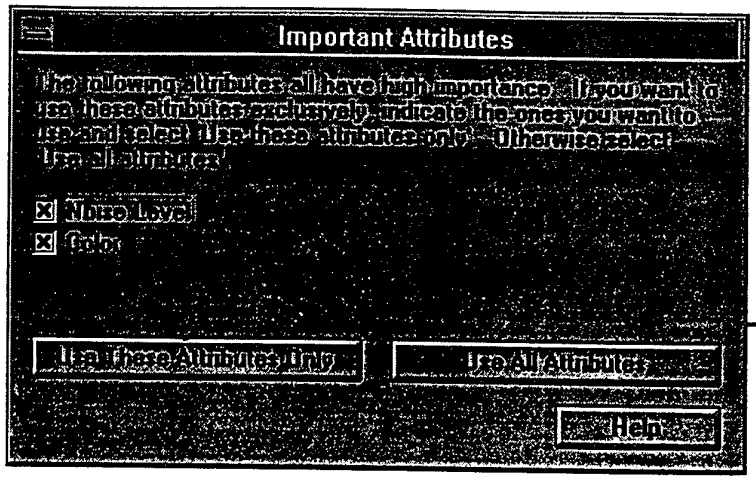


Fig. 15

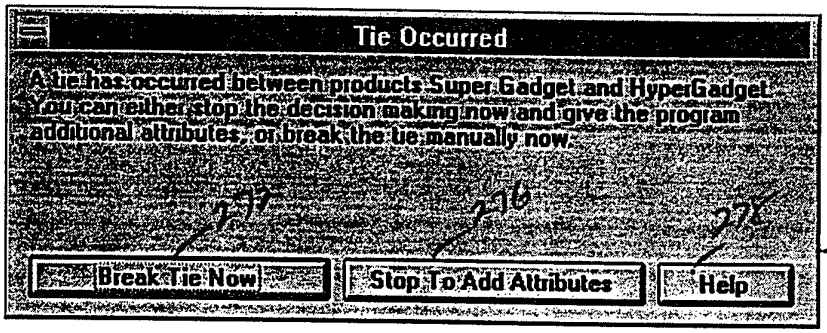


Fig. 16(a)

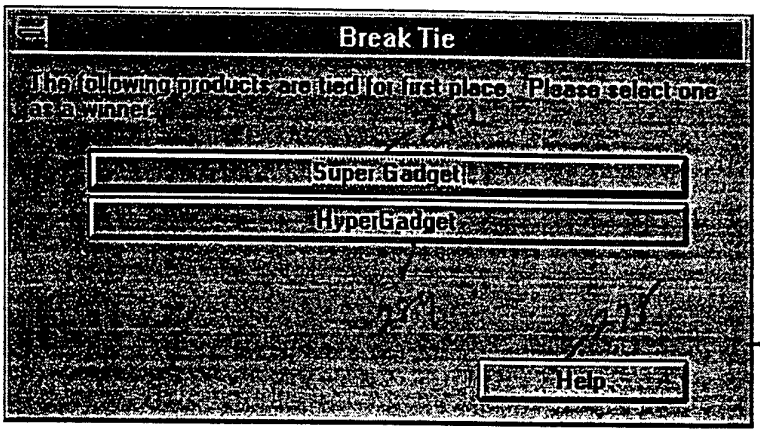


Fig. 16(b)

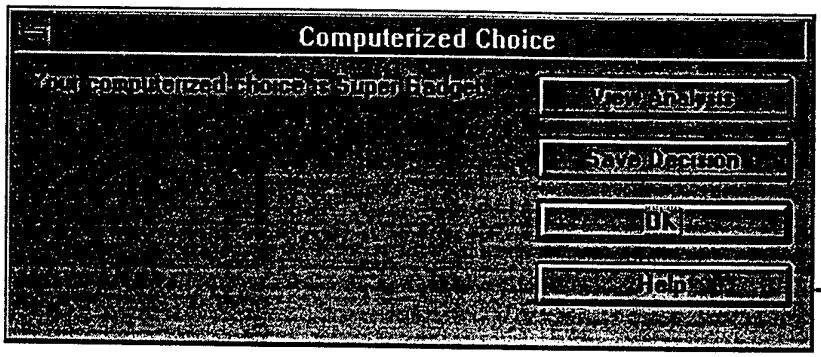


Fig. 17

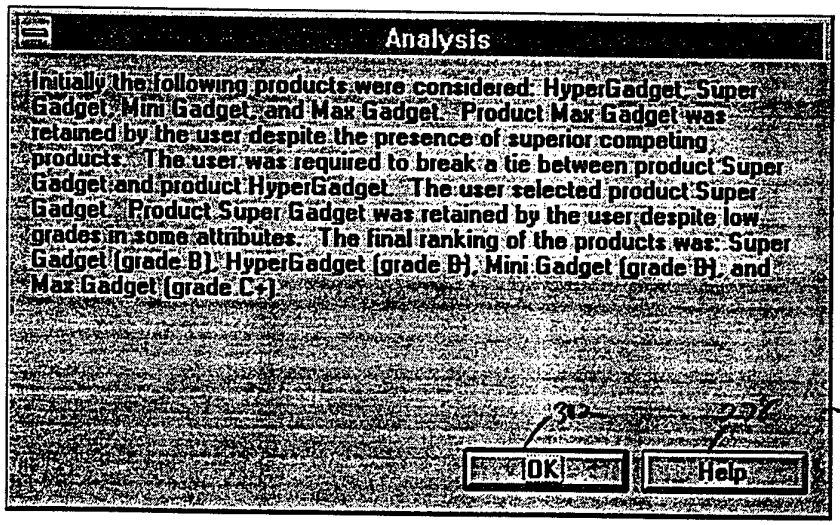


Fig. 18

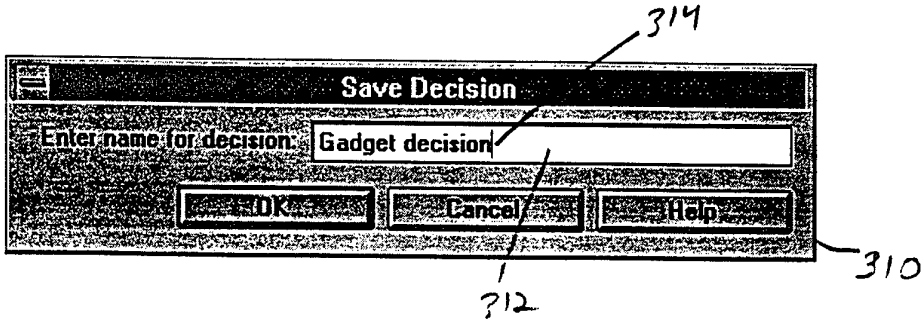


Fig. 19

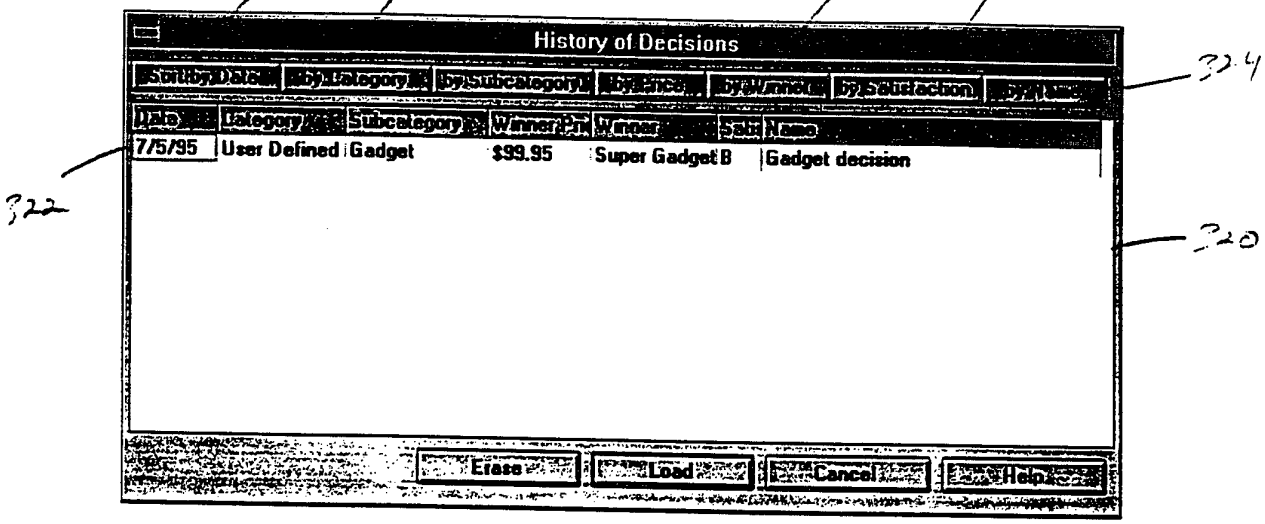


Fig. 20(a)

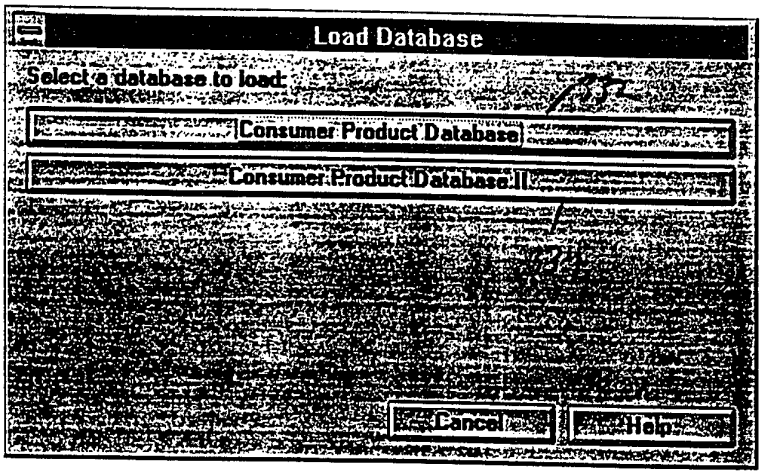


Fig. 20(b)

Fig. 20(c)

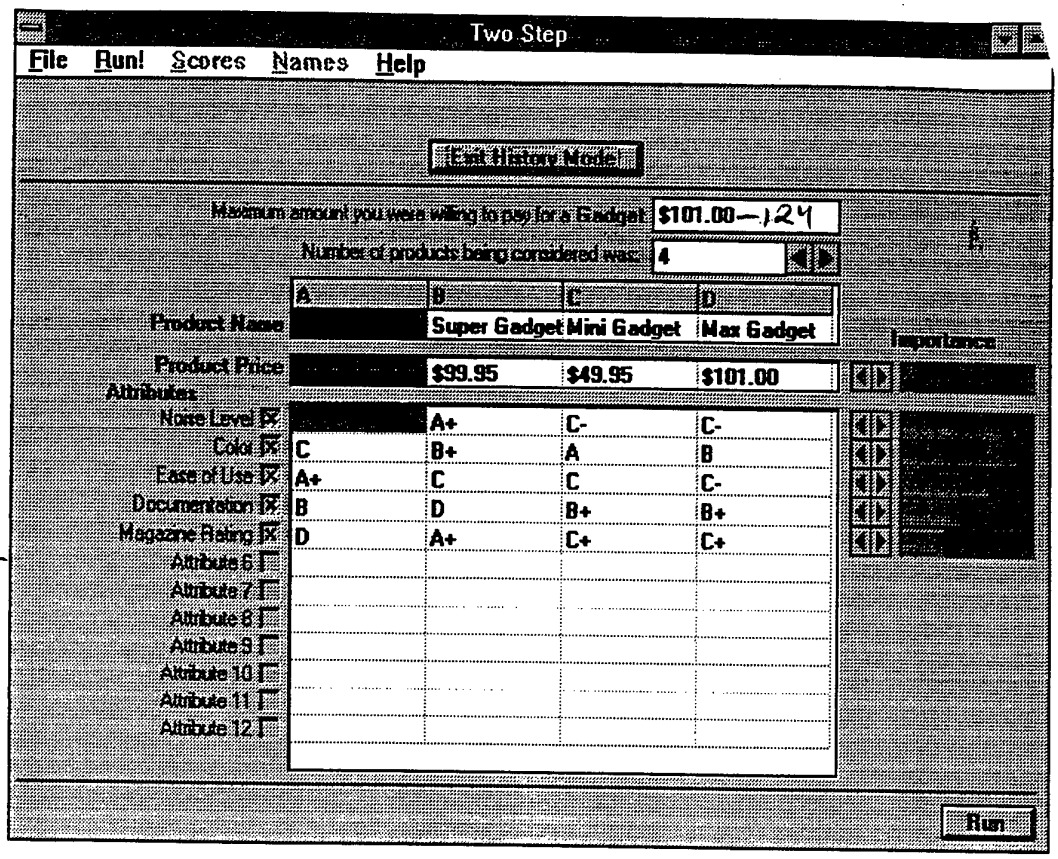

Two Step
File Run! Scores Names Help
Fast History Mode
Maximum amount you were willing to pay for a Gadget: $101.00—124
Number of products being considered was: 4
A B C D
Product Name Super Gadget Mini Gadget Max Gadget
Importance
Product Price $99.95 $49.95 $101.00
Attributes
Noise Level A+ C- C-
Cola C B+ A B
Ease of Use A+ C C C-
Documentation B D B+ B+
Magazine Rating D A+ C+ C+
Attribute 6
Attribute 7
Attribute 8
Attribute 9
Attribute 10
Attribute 11
Attribute 12
Run
330

Fig. 21

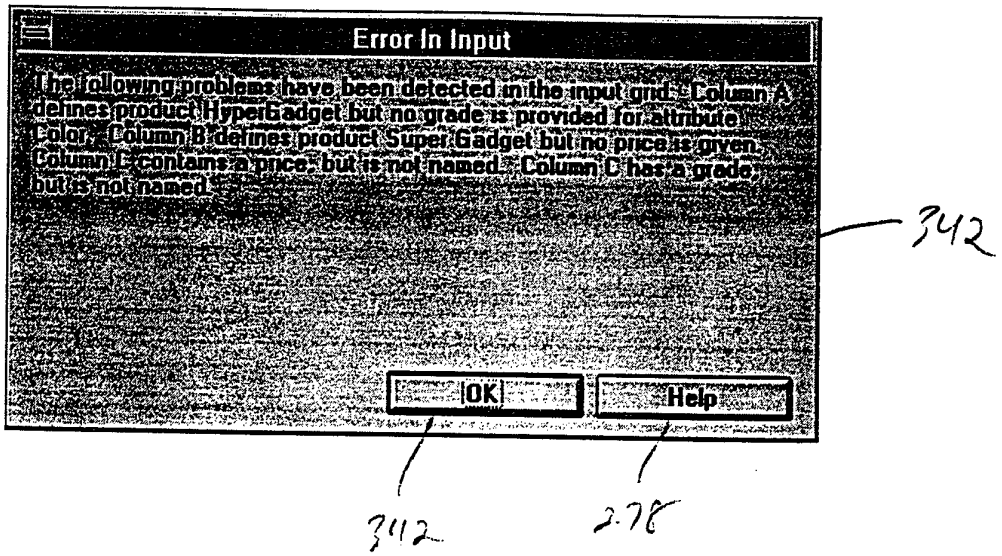

Error In Input
The following problems have been detected in the input grid: Column A defines product HyperGadget but no grade is provided for attribute Color. Column B defines product Super Gadget but no price is given. Column C contains a price, but is not named. Column C has a grade, but is not named.
OK
Help
342
342
278

Fig. 22

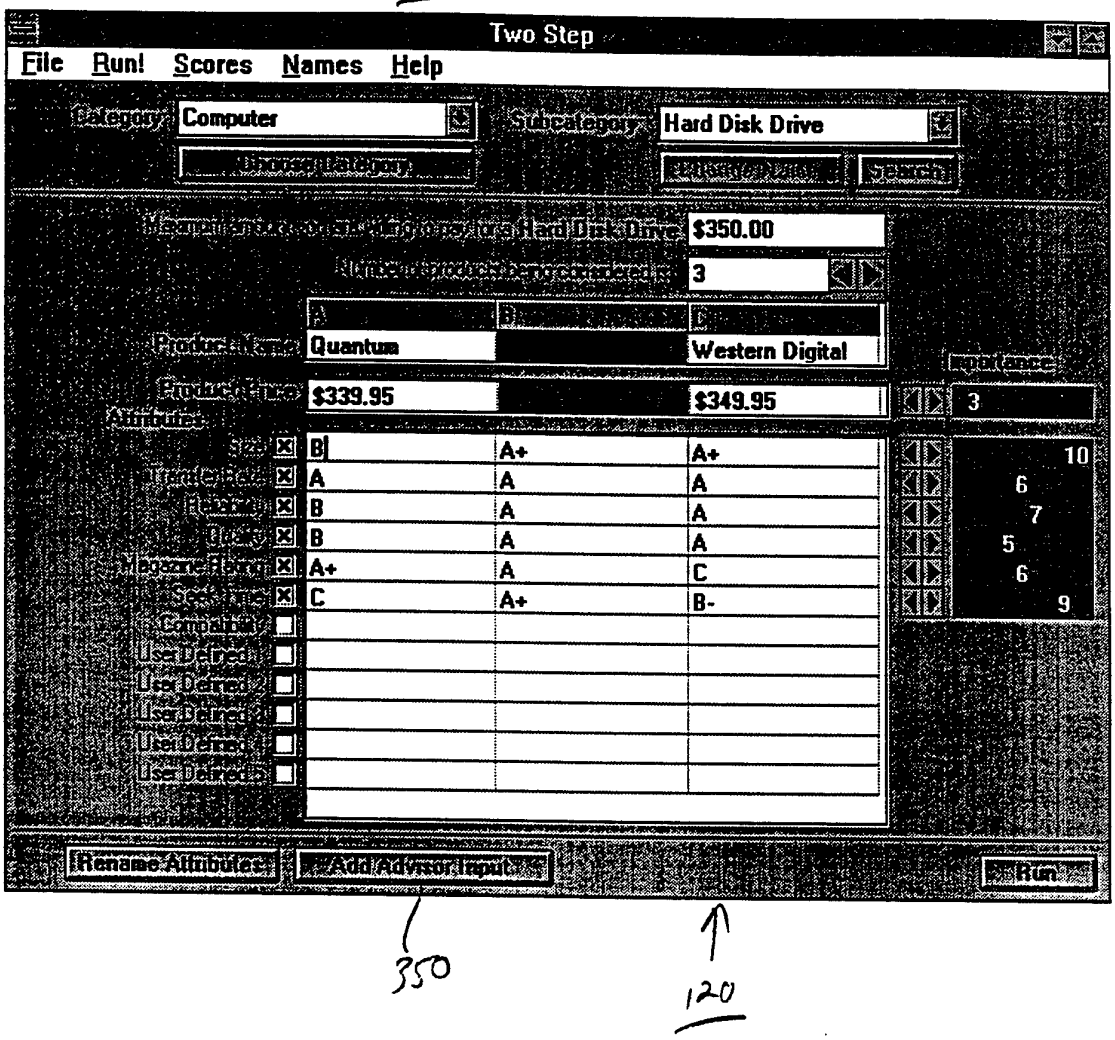
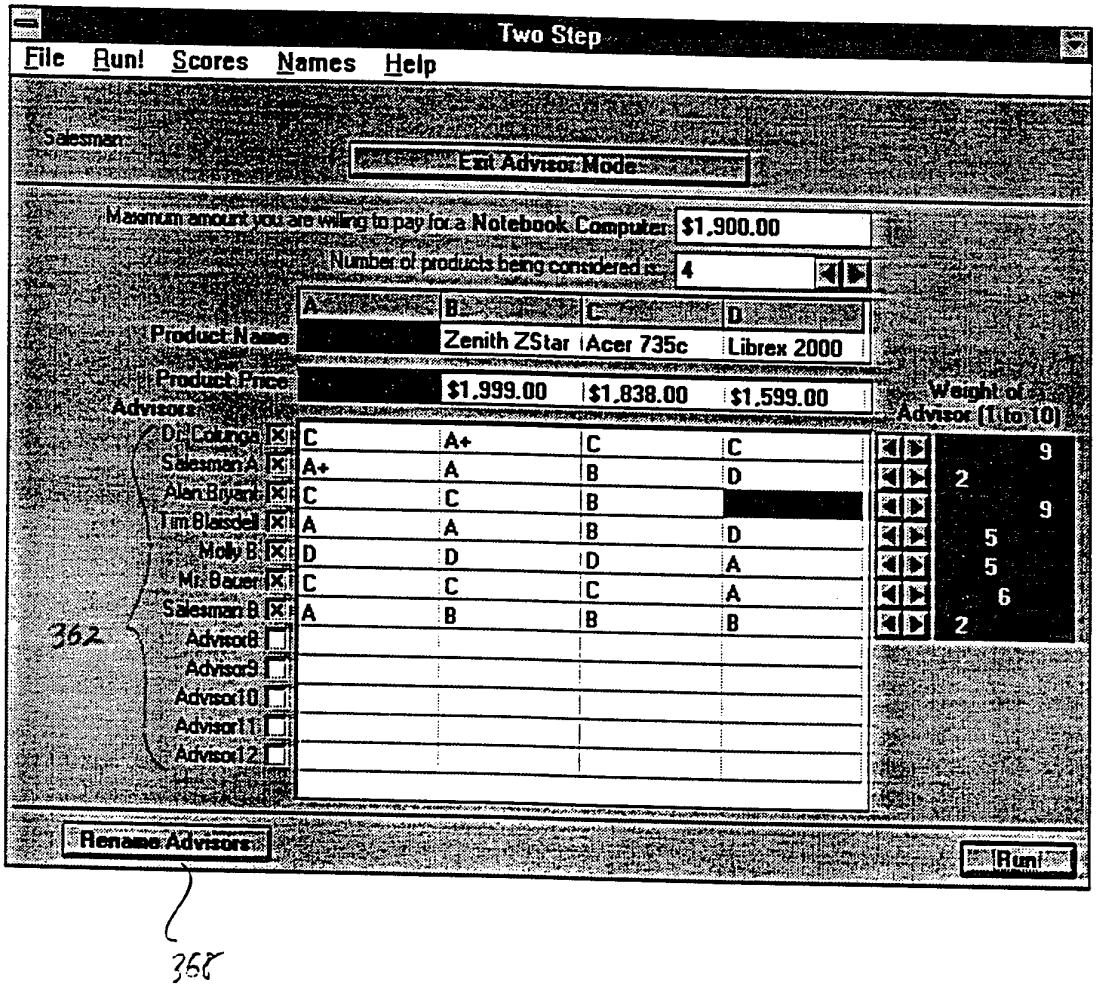

Two Step
File
Run!
Scores
Names
Help
Category
Computer
Subcategory
Hard Disk Drive
Search
Hard Disk Drive
$350.00
3
A
B
C
Quantum
Western Digital
$339.95
$349.95
3
B
A+
A+
10
A
A
A
6
B
A
A
7
B
A
A
5
A+
A
C
6
C
A+
B-
9
Rename Attributes
Add Advisor Input
Run
350
120

Fig. 23


Two Step
File Run! Scores Names Help
Salesman
Exit Advisor Mode
Maximum amount you are willing to pay for a Notebook Computer: $1,900.00
Number of products being considered is: 4
Product Name
Product Price
Advisors
A
B
C
D
Zenith ZStar
Acer 735c
Librex 2000
$1,999.00
$1,838.00
$1,599.00
Weight of a Advisor (1 to 10)
Dr. Calunga
Salesman A
Alan Bryant
Tim Blasdell
Molly B
Mr. Bauer
Salesman B
Advisor8
Advisor9
Advisor10
Advisor11
Advisor12
C A+ C C
A+ A B D
C C B
A A B D
D D D A
C C C A
A B B B
9
2
9
5
5
6
2
362
364
Rename Advisors
Run!
358

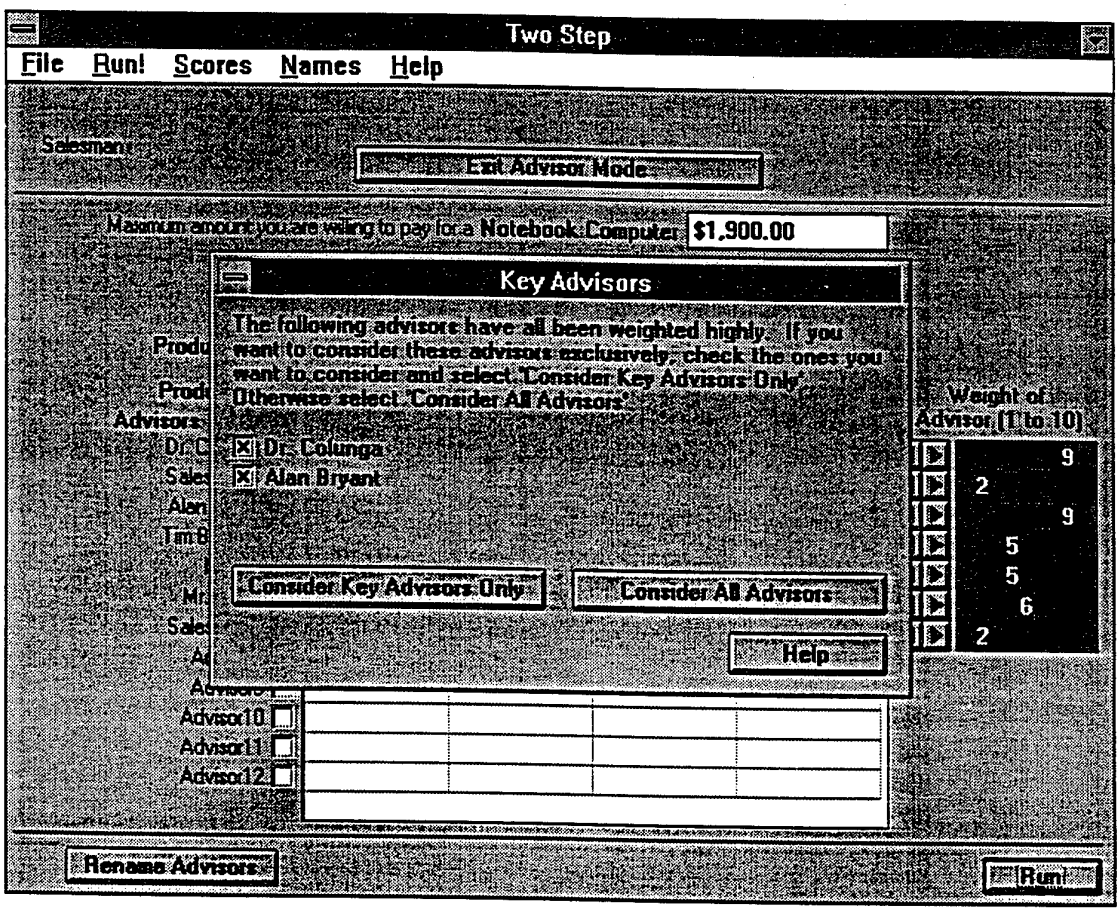

Two Step
File Run! Scores Names Help
Salesman:
Exit Advisor Mode
Maximum amount you are willing to pay for a Notebook Computer: $1,900.00
Key Advisors
The following advisors have all been weighted highly. If you want to consider these advisors exclusively, check the ones you want to consider and select 'Consider Key Advisors Only'. Otherwise select 'Consider All Advisors'.
Dr. Columga
Alan Bryant
Consider Key Advisors Only
Consider All Advisors
Help
Weight of Advisor (1 to 10)
9
2
9
5
5
6
2
Advisor10
Advisor11
Advisor12
Rename Advisors
Run!

Fig. 21(a)

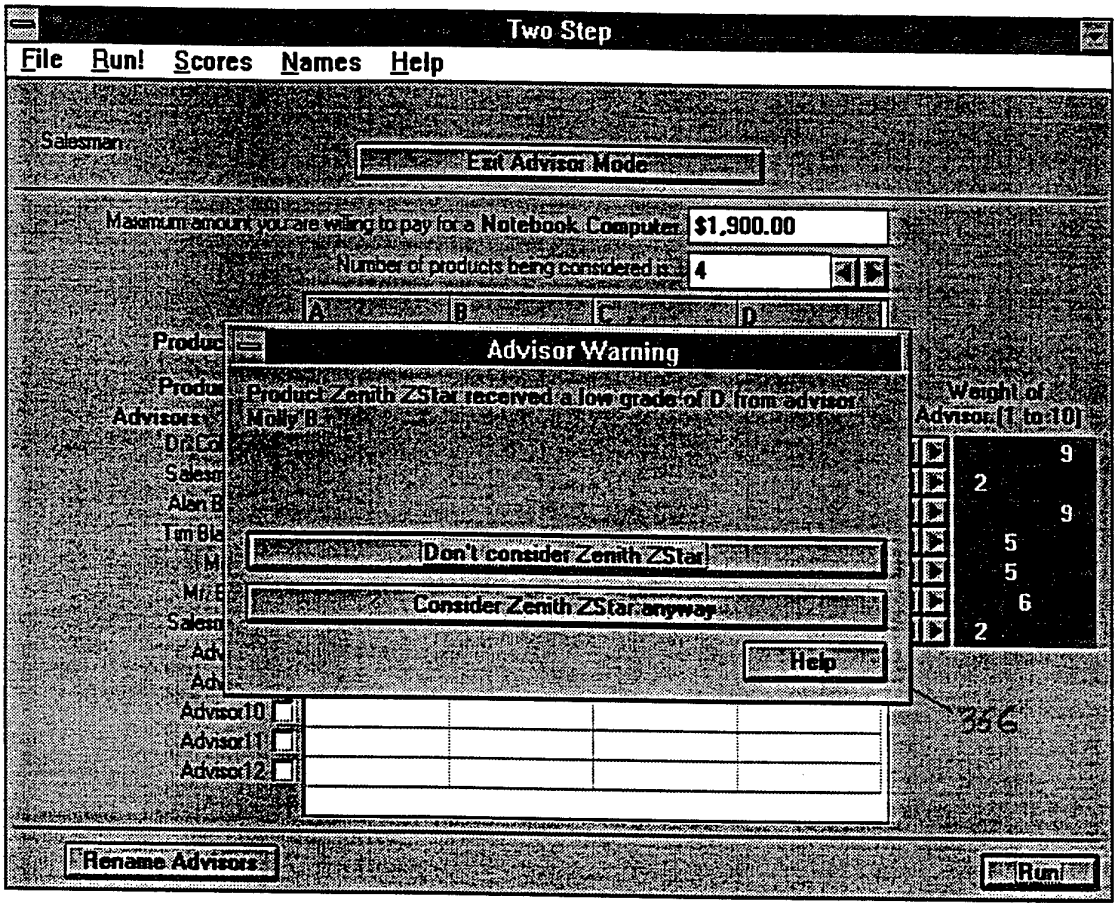
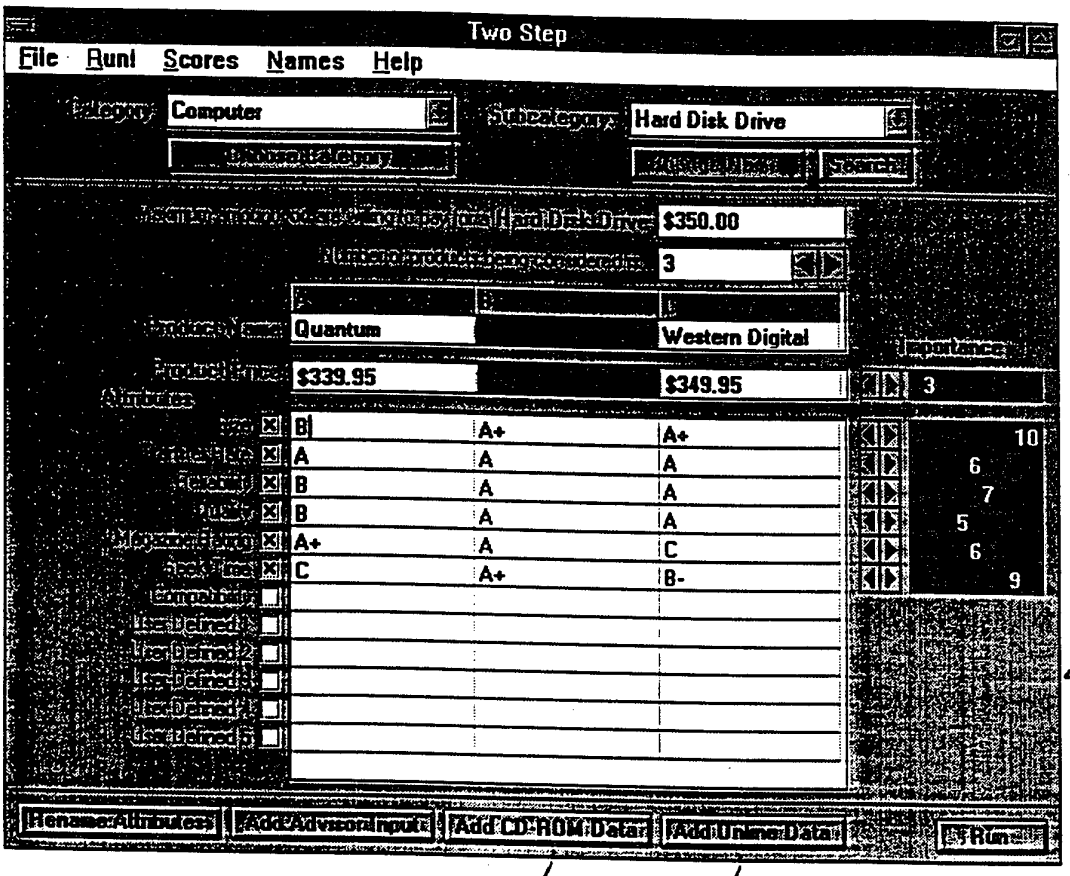

Two Step
File Run! Scores Names Help
Salesman:
Exit Advisor Mode
Maximum amount you are willing to pay for a Notebook Computer:
$1,900.00
Number of products being considered is:
4
A
B
C
D
Advisor Warning
Product Zenith ZStar received a low grade of D from advisor
Molly B
Don't consider Zenith ZStar
Consider Zenith ZStar anyway
Help
Weight of Advisor (1 to 10)
9
2
9
5
5
6
2
356
Advisor10
Advisor11
Advisor12
Rename Advisors
Run!

Fig. 24(b)

Fig. 25


Two Step
File Run! Scores Names Help
Category: Computer
Subcategory: Hard Disk Drive
$350.00
3
Quantum
Western Digital
$339.95
$349.95
Importance
3
B
A+
A+
10
A
A
A
6
B
A
A
7
B
A
A
5
A+
A
C
6
C
A+
B-
9
Rename Attributes
Add Advisor Input
Add CD-ROM Data
Add Online Data
Run!
100
374
372

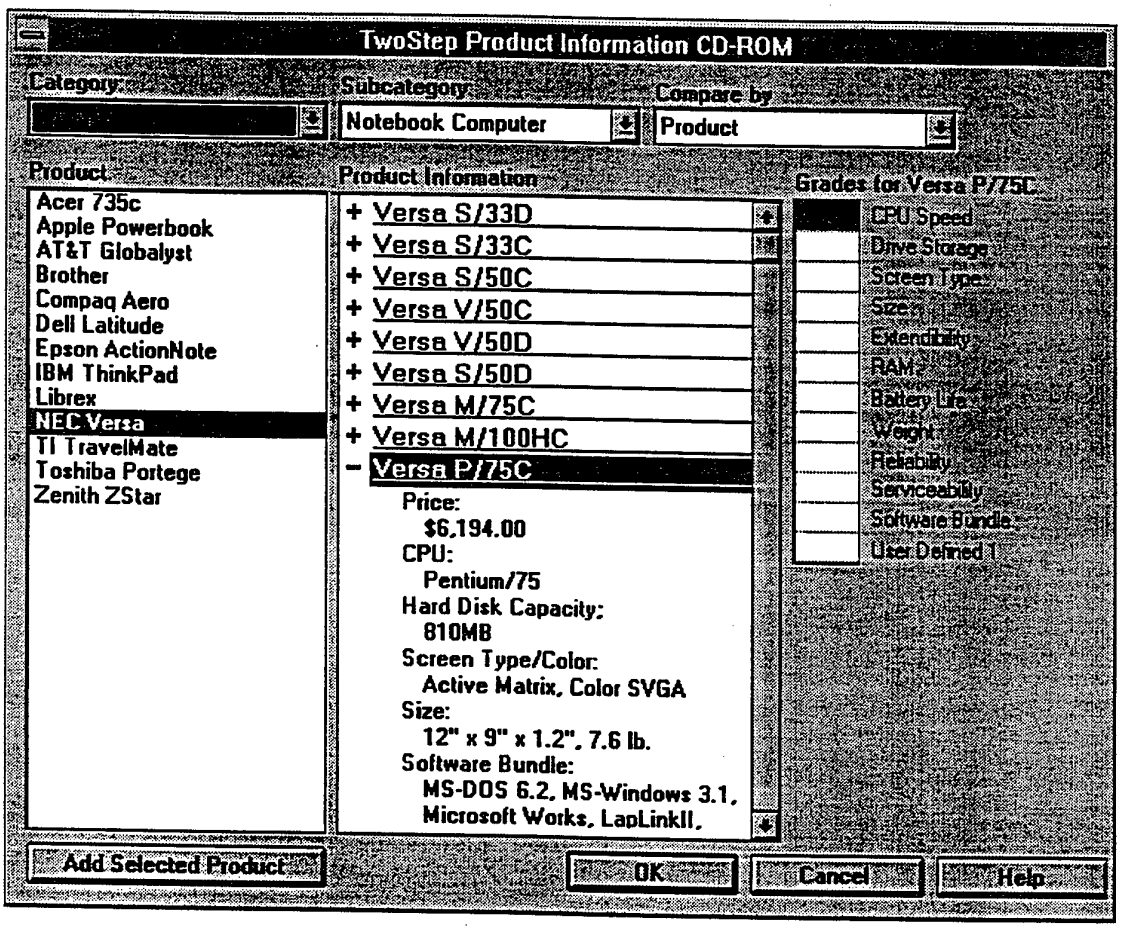

TwoStep Product Information CD-ROM
Category:
Subcategory:
Notebook Computer
Compare by
Product
Product
Acer 735c
Apple Powerbook
AT&T Globalyst
Brother
Compaq Aero
Dell Latitude
Epson ActionNote
IBM ThinkPad
Librex
NEC Versa
TI TravelMate
Toshiba Portege
Zenith ZStar
Product Information
+ Versa S/33D
+ Versa S/33C
+ Versa S/50C
+ Versa V/50C
+ Versa V/50D
+ Versa S/50D
+ Versa M/75C
+ Versa M/100HC
- Versa P/75C
Price:
$6,194.00
CPU:
Pentium/75
Hard Disk Capacity:
810MB
Screen Type/Color:
Active Matrix, Color SVGA
Size:
12" x 9" x 1.2", 7.6 lb.
Software Bundle:
MS-DOS 6.2, MS-Windows 3.1, Microsoft Works, LapLinkII,
Grades for Versa P/75C
CPU Speed
Drive Storage
Screen Type
Size
Extendibility
RAM
Battery Life
Weight
Reliability
Serviceability
Software Bundle
User Defined 1
Add Selected Product
OK
Cancel
Help

Fig. 26(a)

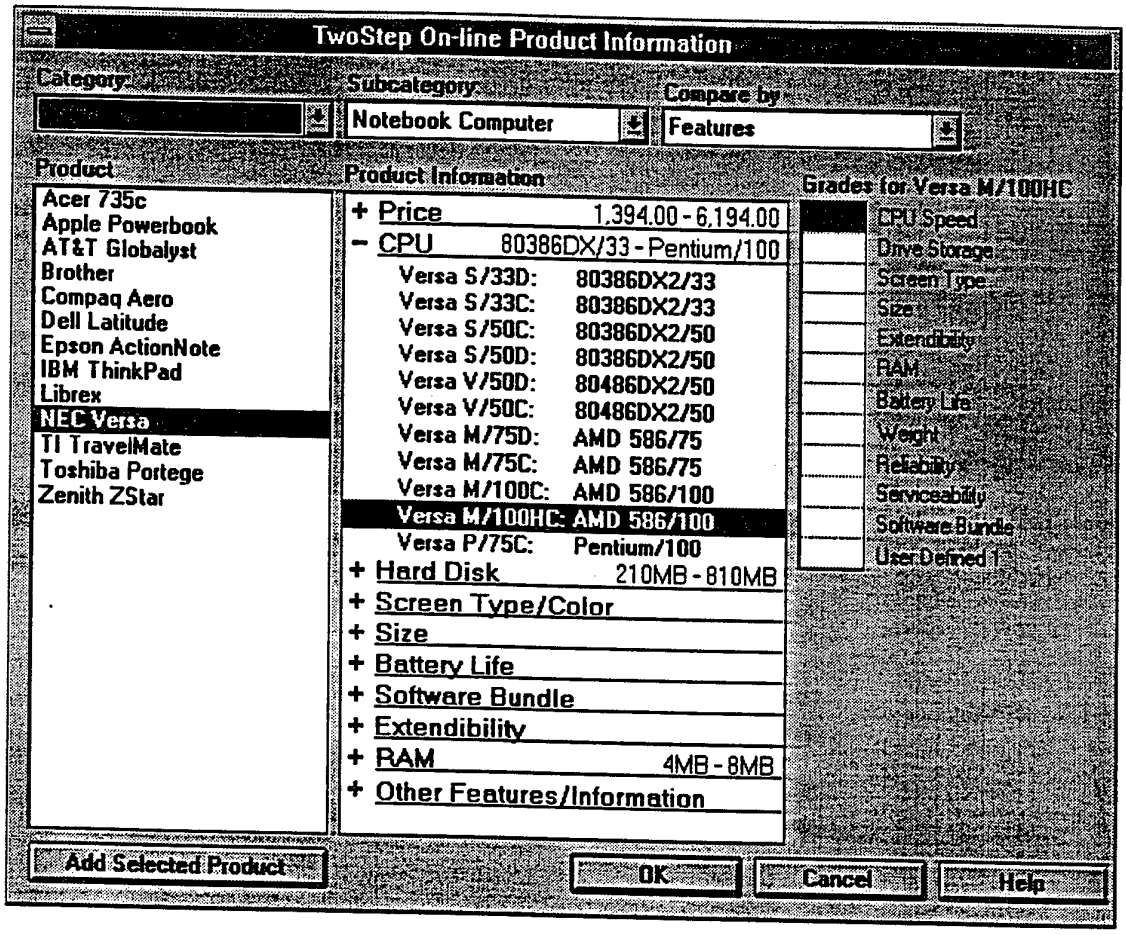
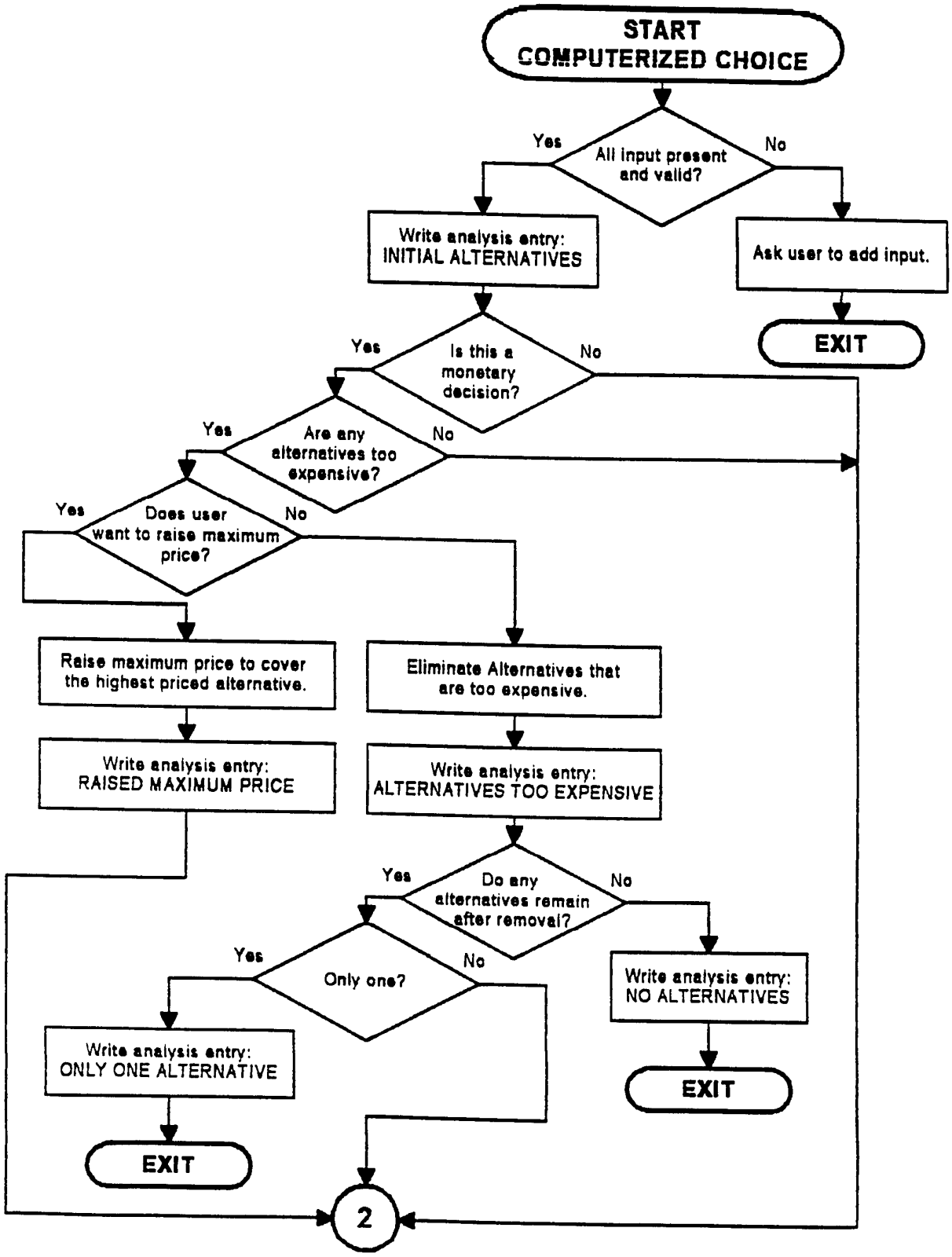

TwoStep On-line Product Information
Category:
Subcategory:
Notebook Computer
Compare by:
Features
Product
Acer 735c
Apple Powerbook
AT&T Globalyst
Brother
Compaq Aero
Dell Latitude
Epson ActionNote
IBM ThinkPad
Librex
NEC Versa
TI TravelMate
Toshiba Portege
Zenith ZStar
Product Information
+ Price 1,394.00 - 6,194.00
- CPU 80386DX/33 - Pentium/100
Versa S/33D: 80386DX2/33
Versa S/33C: 80386DX2/33
Versa S/50C: 80386DX2/50
Versa S/50D: 80386DX2/50
Versa V/50D: 80486DX2/50
Versa V/50C: 80486DX2/50
Versa M/75D: AMD 586/75
Versa M/75C: AMD 586/75
Versa M/100C: AMD 586/100
Versa M/100HC: AMD 586/100
Versa P/75C: Pentium/100
+ Hard Disk 210MB - 810MB
+ Screen Type/Color
+ Size
+ Battery Life
+ Software Bundle
+ Extendibility
+ RAM 4MB - 8MB
+ Other Features/Information
Grades for Versa M/100HC
CPU Speed
Drive Storage
Screen Type
Size
Extendibility
RAM
Battery Life
Weight
Reliability
Serviceability
Software Bundle
User Defined 1
Add Selected Product
OK
Cancel
Help

Fig. 26(a)

Fig. 27(a)


START COMPUTERIZED CHOICE
All input present and valid?
Yes
No
Write analysis entry: INITIAL ALTERNATIVES
Ask user to add input.
EXIT
Is this a monetary decision?
Yes
No
Are any alternatives too expensive?
Yes
No
Does user want to raise maximum price?
Yes
No
Raise maximum price to cover the highest priced alternative.
Write analysis entry: RAISED MAXIMUM PRICE
Eliminate Alternatives that are too expensive.
Write analysis entry: ALTERNATIVES TOO EXPENSIVE
Do any alternatives remain after removal?
Yes
No
Only one?
Yes
No
Write analysis entry: ONLY ONE ALTERNATIVE
EXIT
Write analysis entry: NO ALTERNATIVES
EXIT
2

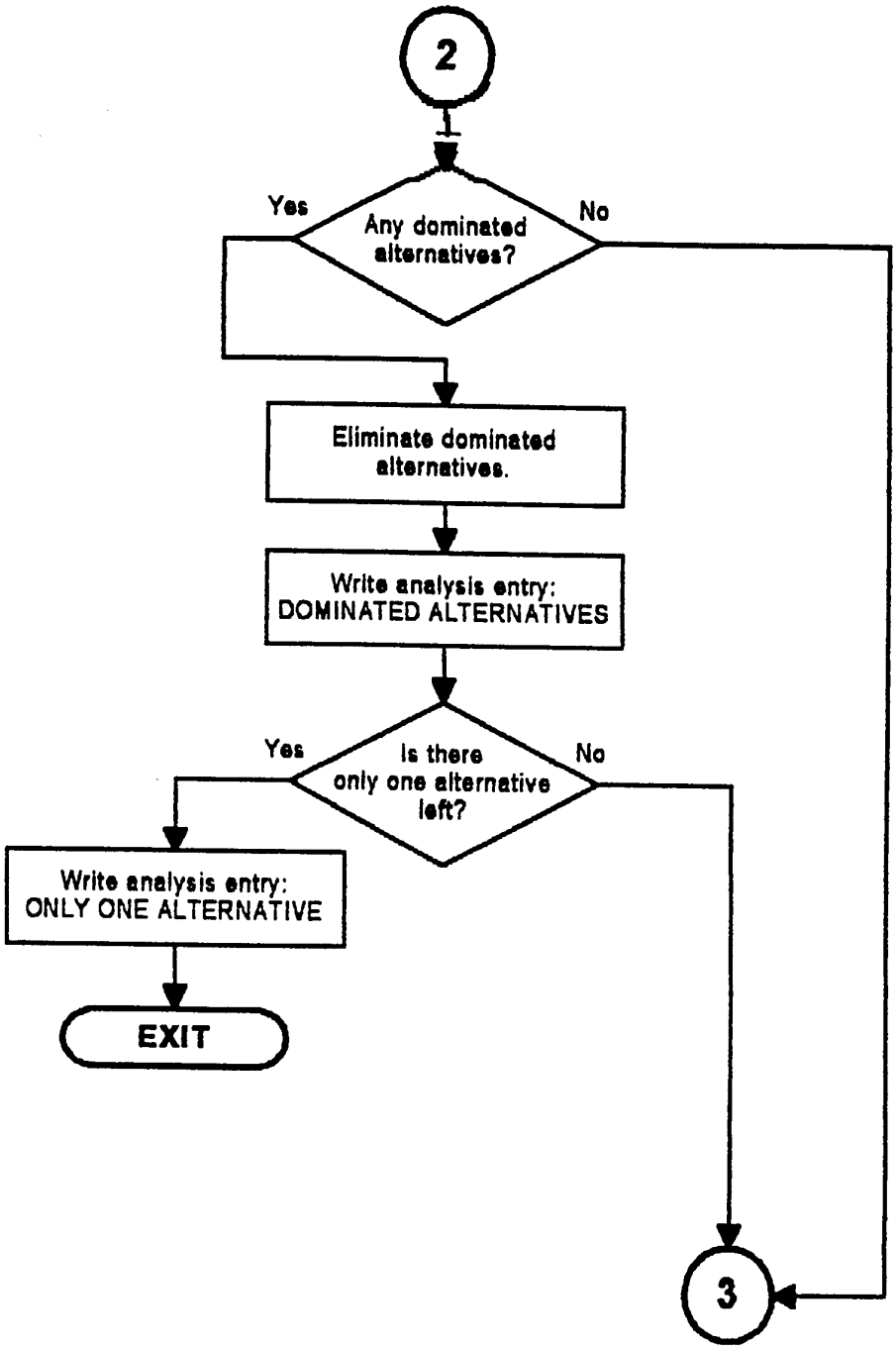

2
Yes
Any dominated alternatives?
No
Eliminate dominated alternatives.
Write analysis entry: DOMINATED ALTERNATIVES
Yes
Is there only one alternative left?
No
Write analysis entry: ONLY ONE ALTERNATIVE
EXIT
3

Fig. 27(6)

Fig. 27(c)

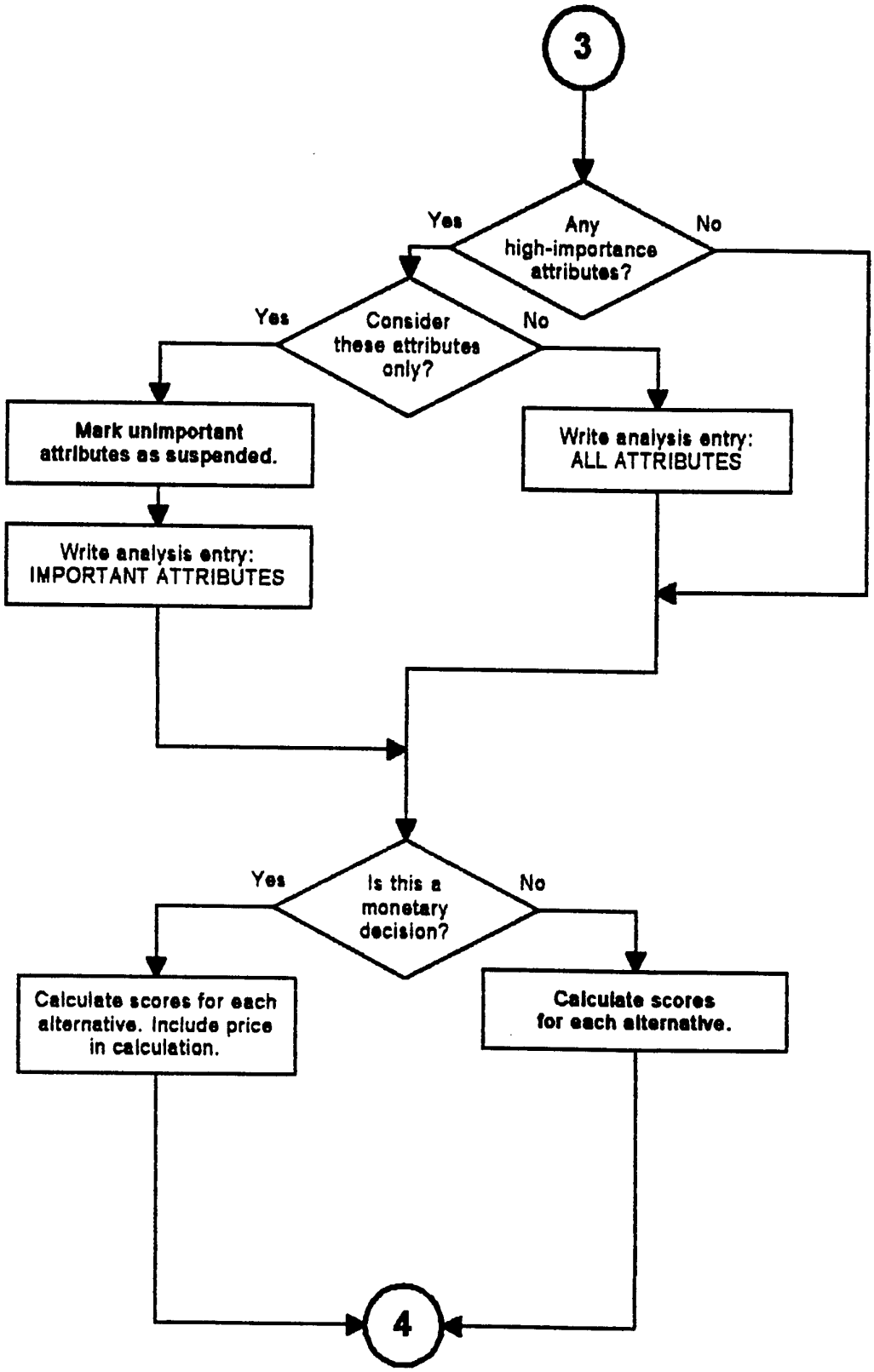

3
Any high-importance attributes?
Yes
No
Consider these attributes only?
Yes
No
Mark unimportant attributes as suspended.
Write analysis entry: IMPORTANT ATTRIBUTES
Write analysis entry: ALL ATTRIBUTES
Is this a monetary decision?
Yes
No
Calculate scores for each alternative. Include price in calculation.
Calculate scores for each alternative.
4

Fig. 27(d)

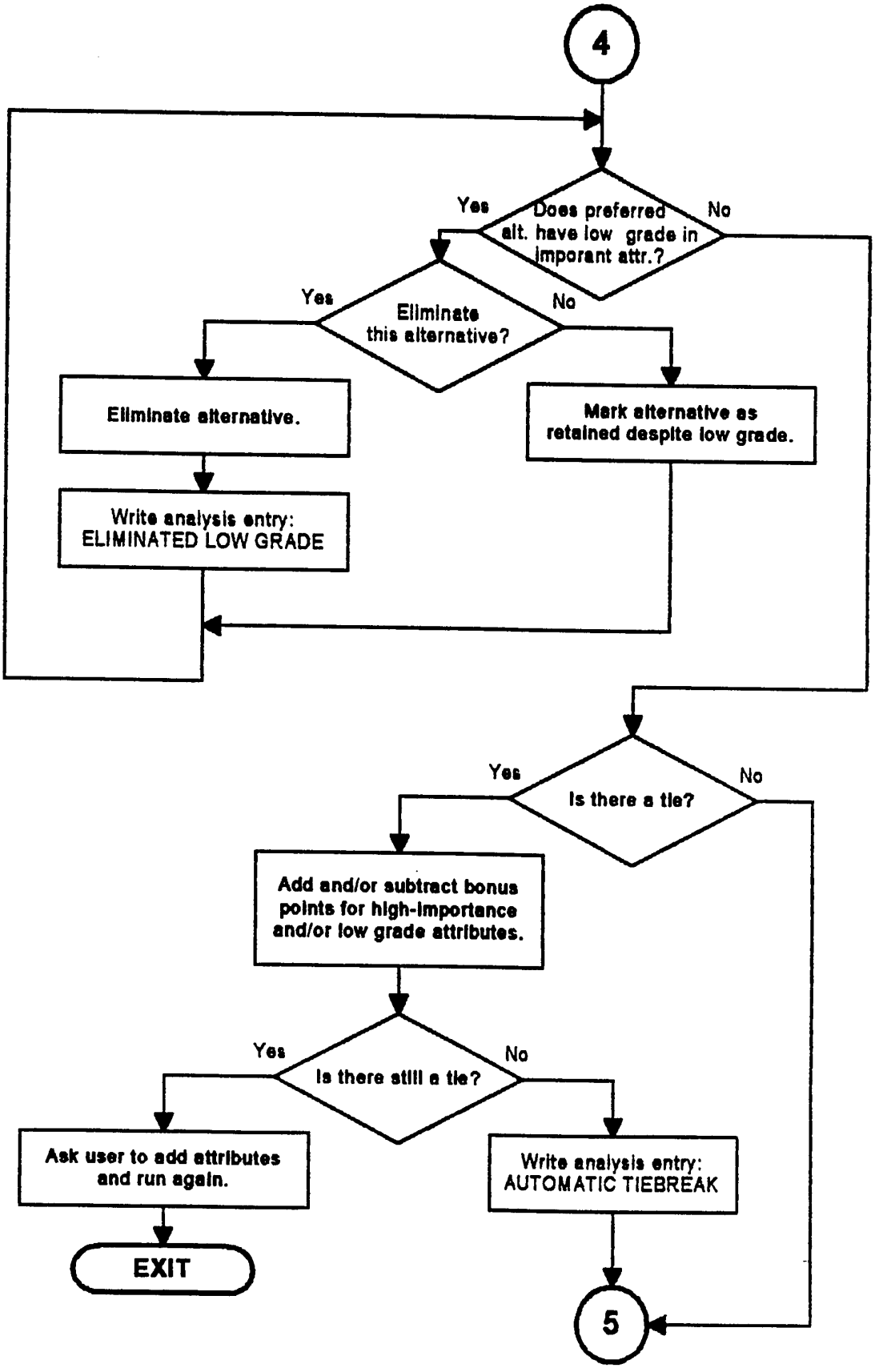
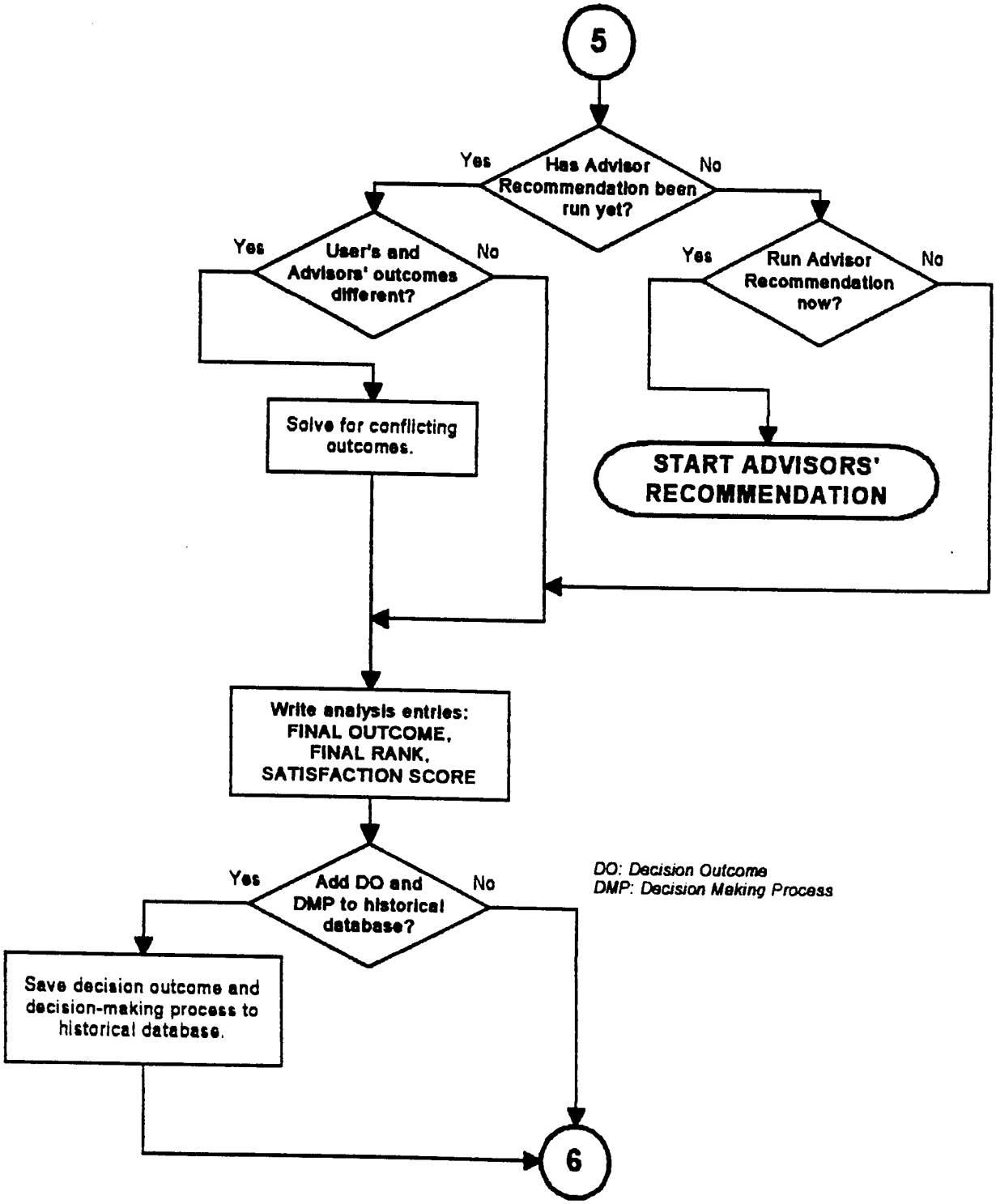

4
Does preferred alt. have low grade in imporant attr.?
Yes
No
Eliminate this alternative?
Yes
No
Eliminate alternative.
Write analysis entry: ELIMINATED LOW GRADE
Mark alternative as retained despite low grade.
Is there a tie?
Yes
No
Add and/or subtract bonus points for high-importance and/or low grade attributes.
Is there still a tie?
Yes
No
Ask user to add attributes and run again.
EXIT
Write analysis entry: AUTOMATIC TIEBREAK
5

Fig. 27(e)


5
Has Advisor Recommendation been run yet?
Yes
No
User's and Advisors' outcomes different?
Yes
No
Run Advisor Recommendation now?
Yes
No
Solve for conflicting outcomes.
START ADVISORS' RECOMMENDATION
Write analysis entries: FINAL OUTCOME, FINAL RANK, SATISFACTION SCORE
Add DO and DMP to historical database?
Yes
No
Save decision outcome and decision-making process to historical database.
6
DO: Decision Outcome
DMP: Decision Making Process

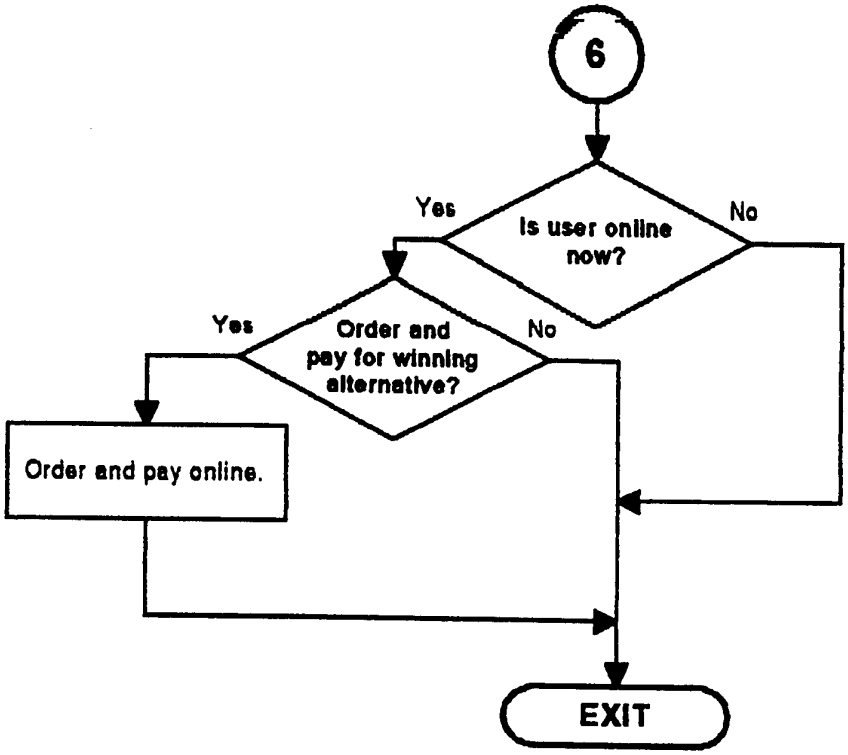
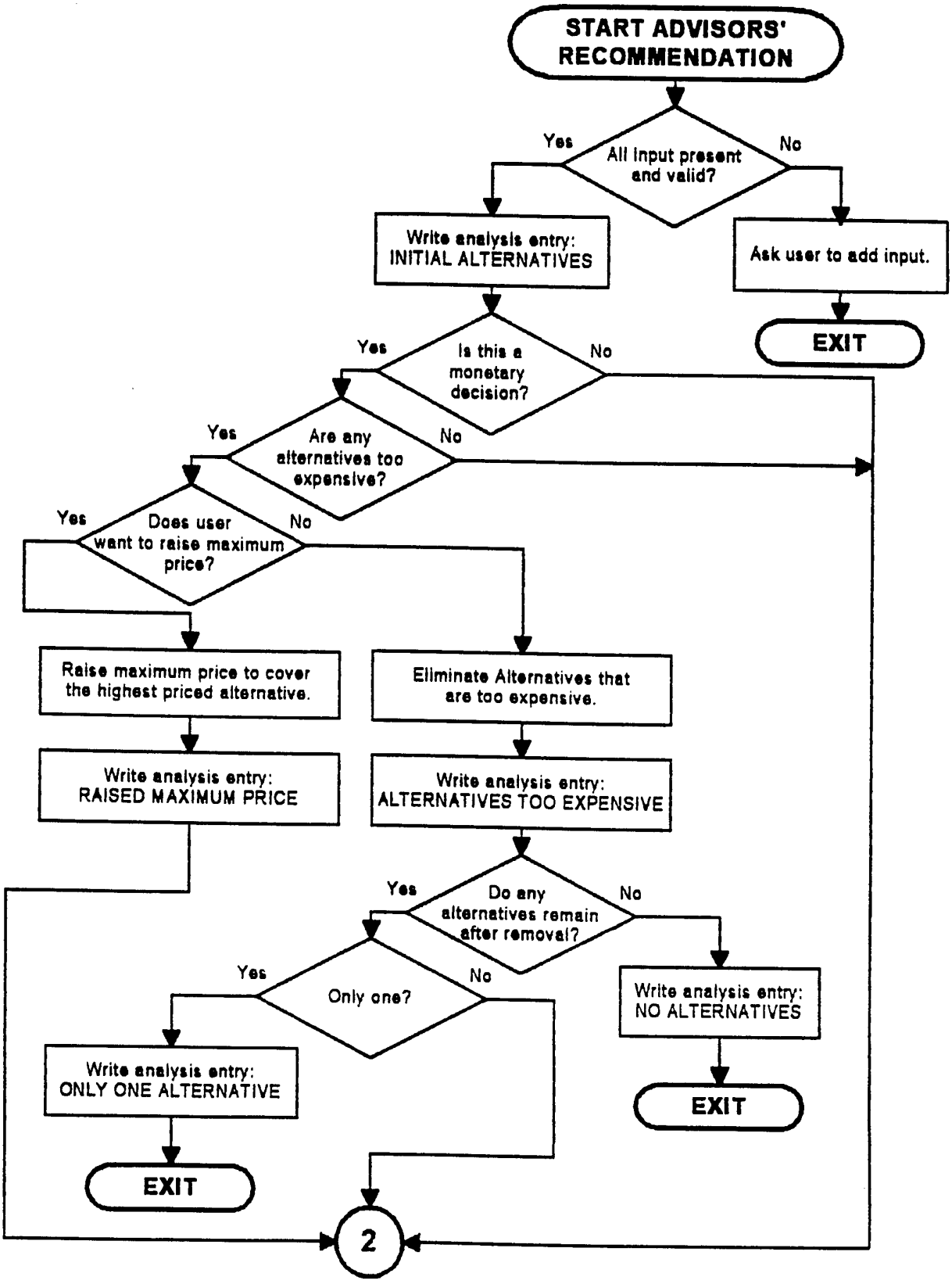

6
Is user online now?
Yes
No
Order and pay for winning alternative?
Yes
No
Order and pay online.
EXIT

Fig. 27(f)

Fig. 27(g)


START ADVISORS' RECOMMENDATION
All Input present and valid?
Yes
No
Write analysis entry: INITIAL ALTERNATIVES
Ask user to add input.
EXIT
Is this a monetary decision?
Yes
No
Are any alternatives too expensive?
Yes
No
Does user want to raise maximum price?
Yes
No
Raise maximum price to cover the highest priced alternative.
Write analysis entry: RAISED MAXIMUM PRICE
Eliminate Alternatives that are too expensive.
Write analysis entry: ALTERNATIVES TOO EXPENSIVE
Do any alternatives remain after removal?
Yes
No
Only one?
Yes
No
Write analysis entry: ONLY ONE ALTERNATIVE
EXIT
Write analysis entry: NO ALTERNATIVES
EXIT
2

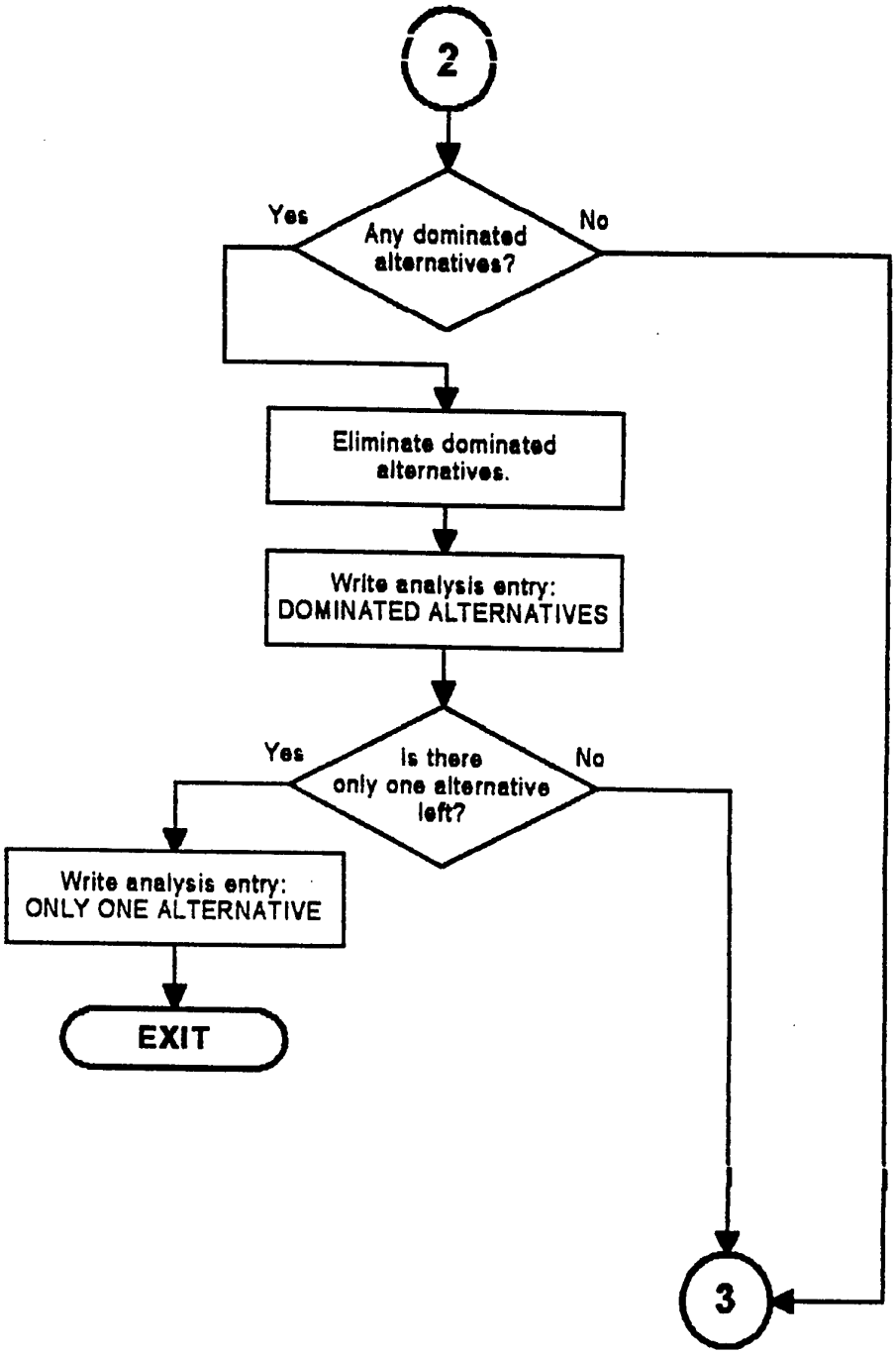

2
Yes
Any dominated alternatives?
No
Eliminate dominated alternatives.
Write analysis entry: DOMINATED ALTERNATIVES
Yes
Is there only one alternative left?
No
Write analysis entry: ONLY ONE ALTERNATIVE
EXIT
3

Fig. 27(h)

Fig. 27(i)

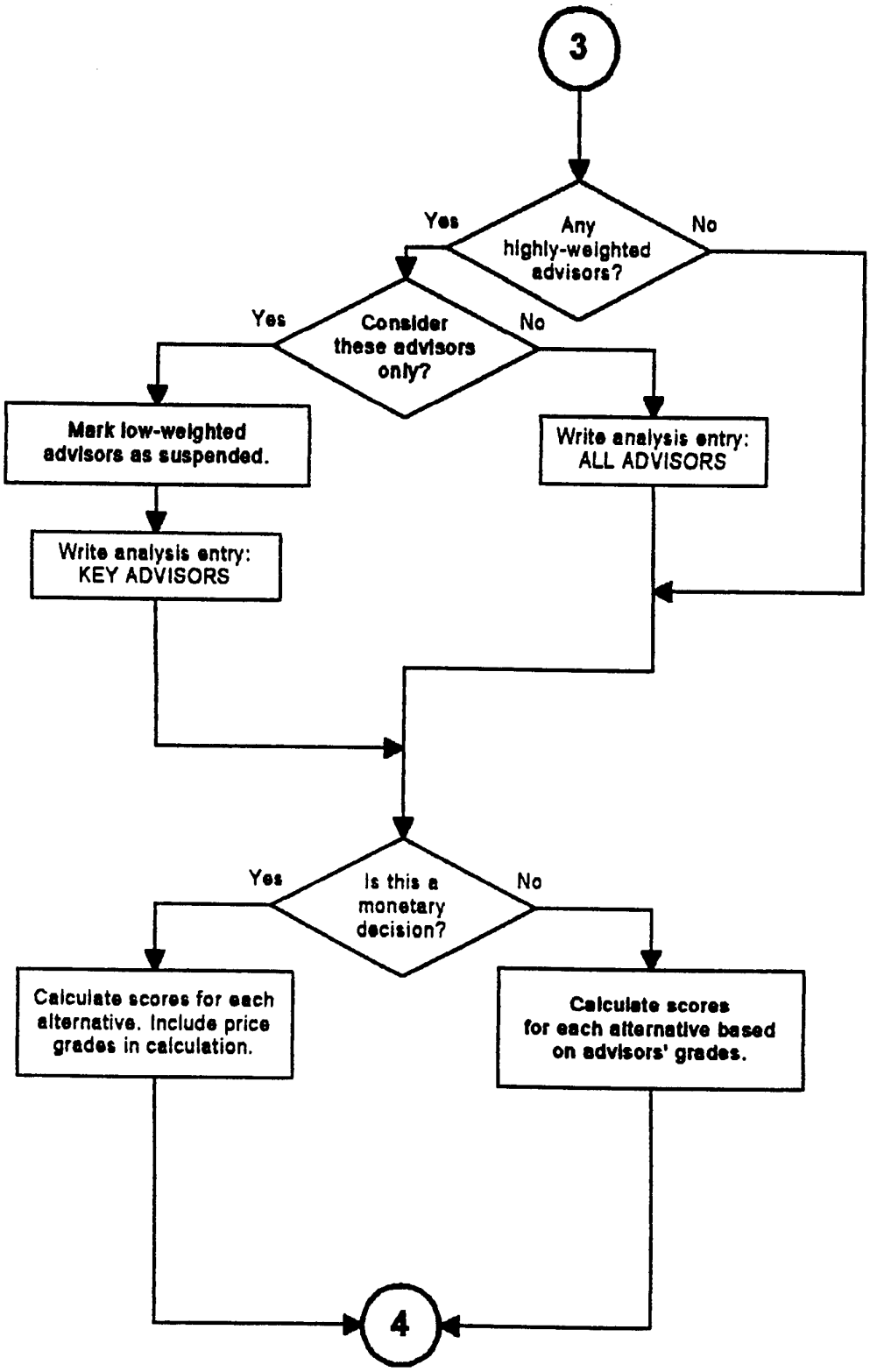

3
Any highly-weighted advisors?
Yes
No
Consider these advisors only?
Yes
No
Mark low-weighted advisors as suspended.
Write analysis entry: KEY ADVISORS
Write analysis entry: ALL ADVISORS
Is this a monetary decision?
Yes
No
Calculate scores for each alternative. Include price grades in calculation.
Calculate scores for each alternative based on advisors' grades.
4

Fig. 27(j)

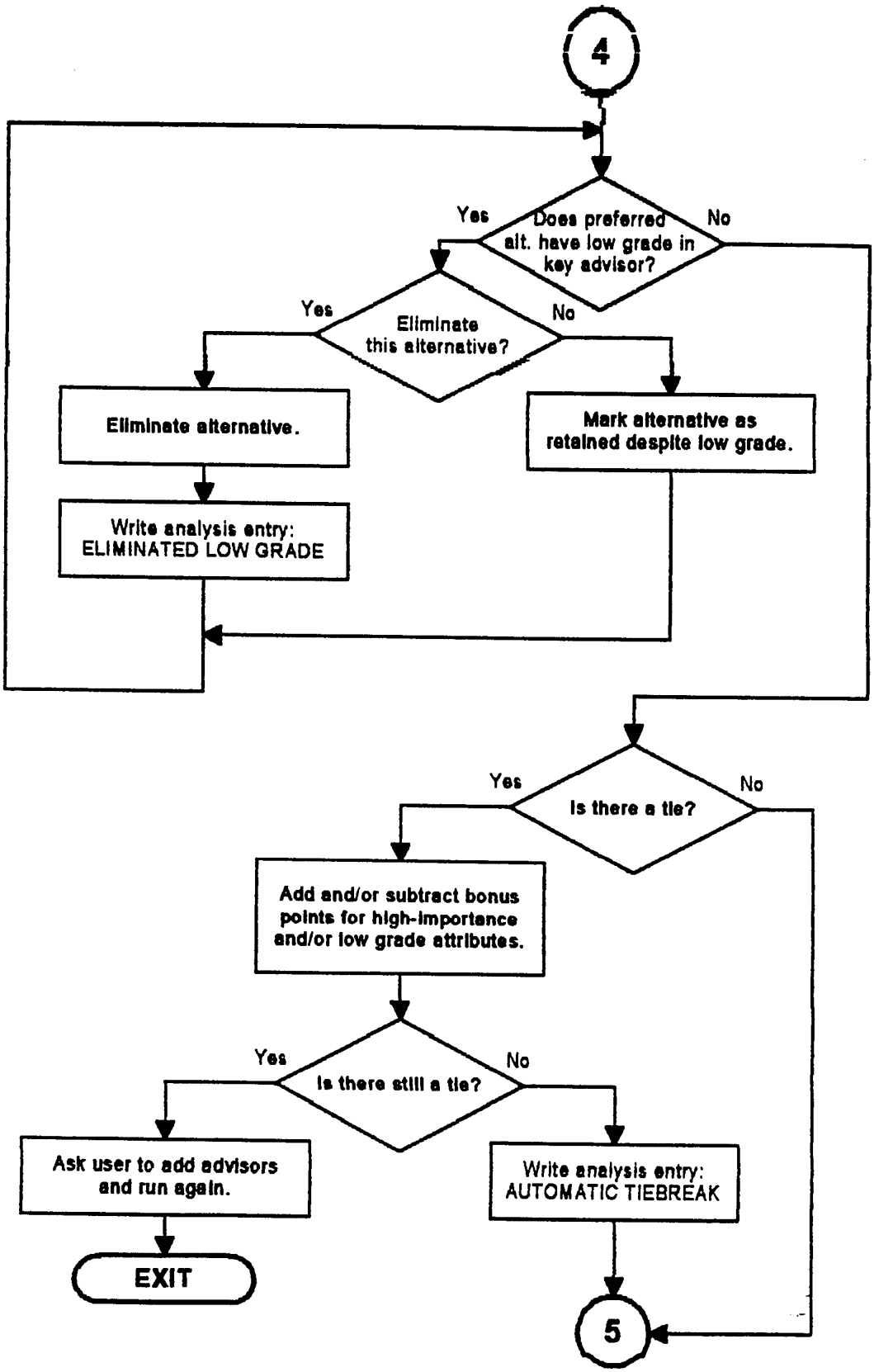
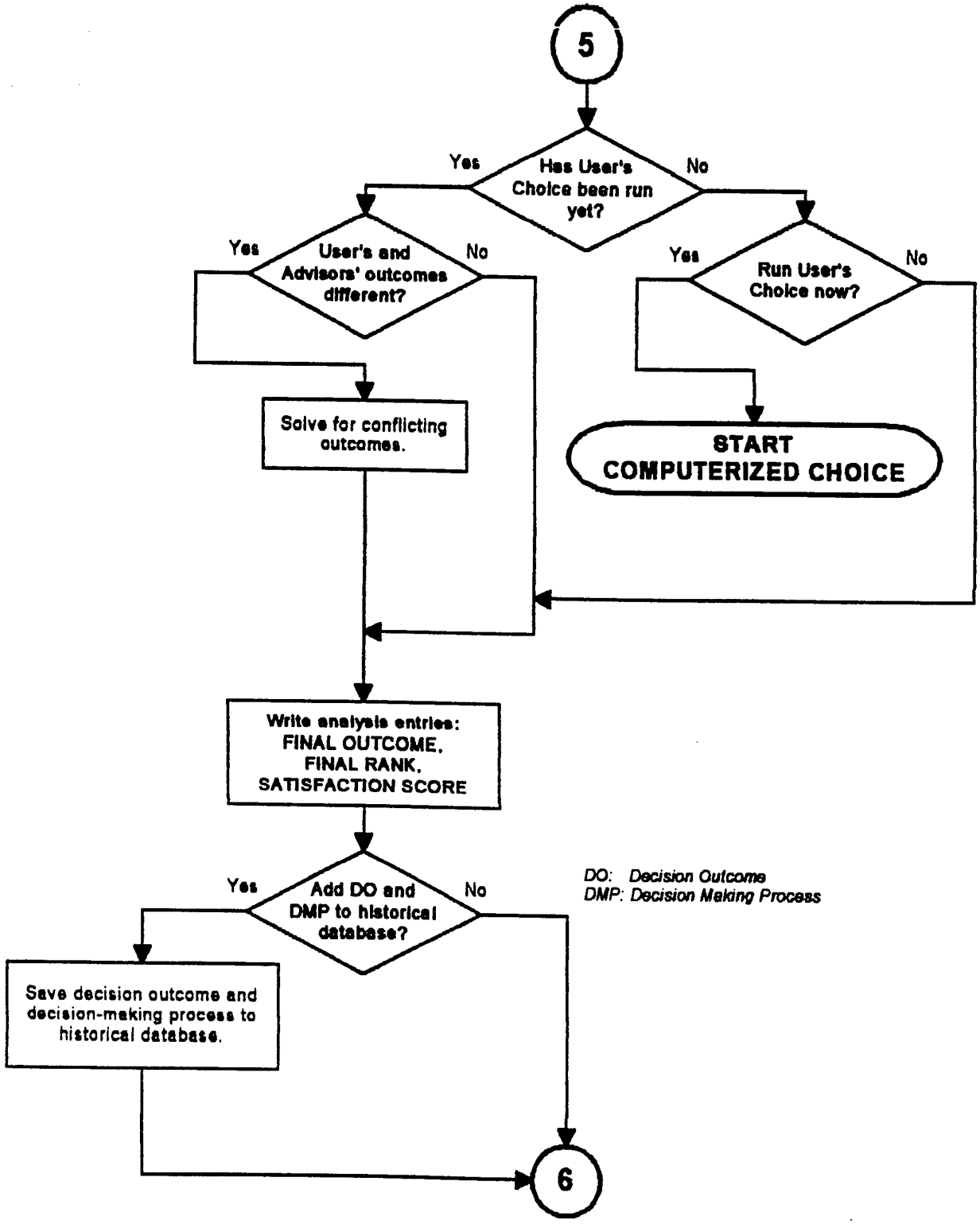

4
Does preferred alt. have low grade in key advisor?
Yes
No
Eliminate this alternative?
Yes
No
Eliminate alternative.
Write analysis entry: ELIMINATED LOW GRADE
Mark alternative as retained despite low grade.
Is there a tie?
Yes
No
Add and/or subtract bonus points for high-importance and/or low grade attributes.
Is there still a tie?
Yes
No
Ask user to add advisors and run again.
EXIT
Write analysis entry: AUTOMATIC TIEBREAK
5

Fig. 27(k)


5
Has User's Choice been run yet?
Yes
No
User's and Advisors' outcomes different?
Yes
No
Run User's Choice now?
Yes
No
Solve for conflicting outcomes.
START COMPUTERIZED CHOICE
Write analysis entries: FINAL OUTCOME, FINAL RANK, SATISFACTION SCORE
Add DO and DMP to historical database?
Yes
No
Save decision outcome and decision-making process to historical database.
6
DO: Decision Outcome
DMP: Decision Making Process

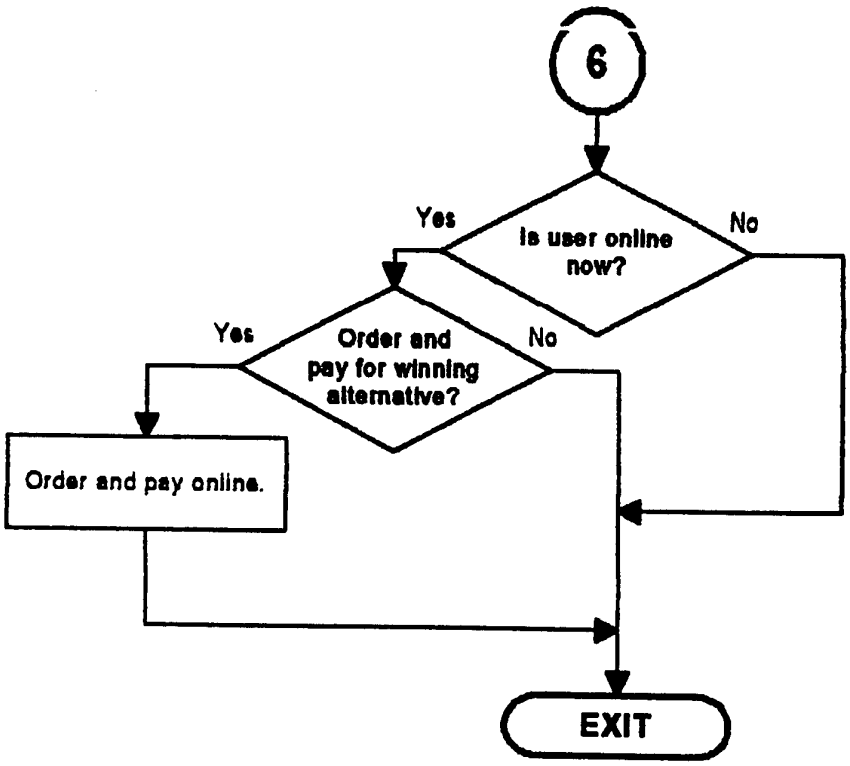

6
Is user online now?
Yes
No
Order and pay for winning alternative?
Yes
No
Order and pay online.
EXIT

Fig. 27(L)

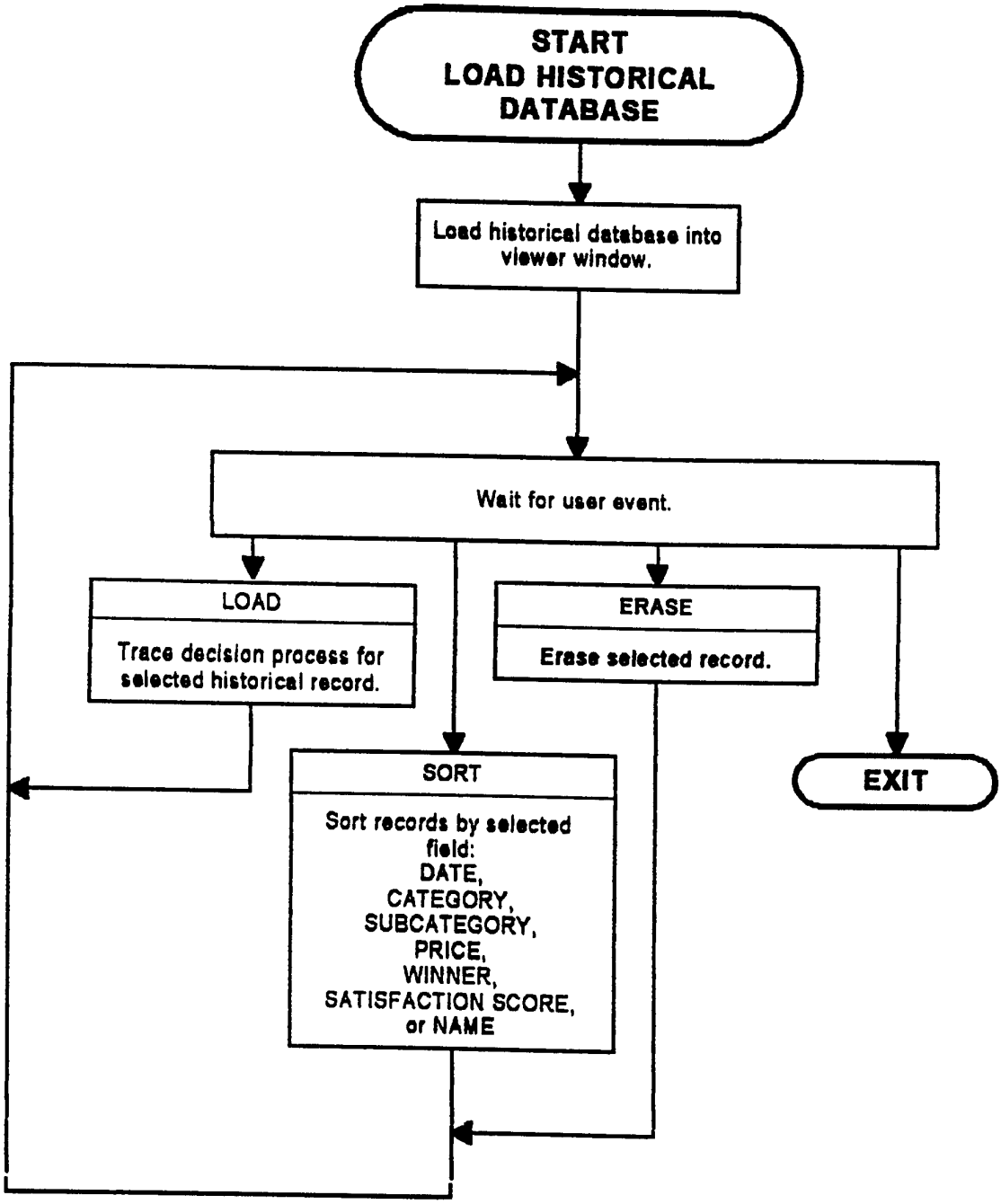
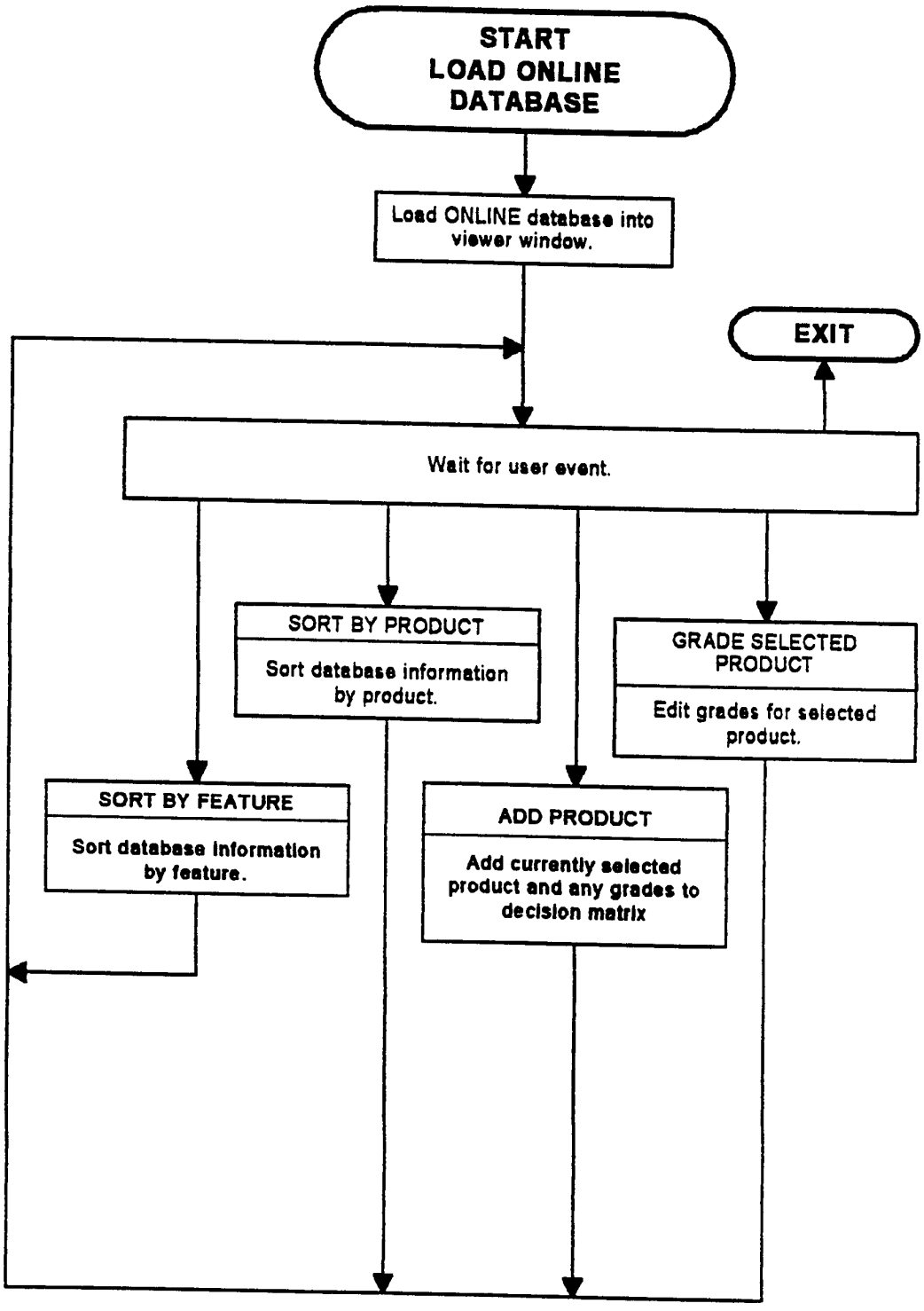

START
LOAD HISTORICAL DATABASE
Load historical database into viewer window.
Wait for user event.
LOAD
Trace decision process for selected historical record.
ERASE
Erase selected record.
EXIT
SORT
Sort records by selected field:
DATE,
CATEGORY,
SUBCATEGORY,
PRICE,
WINNER,
SATISFACTION SCORE,
or NAME

Fig. 27(m)

Fig. 27(n)


START
LOAD ONLINE
DATABASE
Load ONLINE database into viewer window.
EXIT
Wait for user event.
SORT BY PRODUCT
Sort database information by product.
GRADE SELECTED PRODUCT
Edit grades for selected product.
SORT BY FEATURE
Sort database information by feature.
ADD PRODUCT
Add currently selected product and any grades to decision matrix

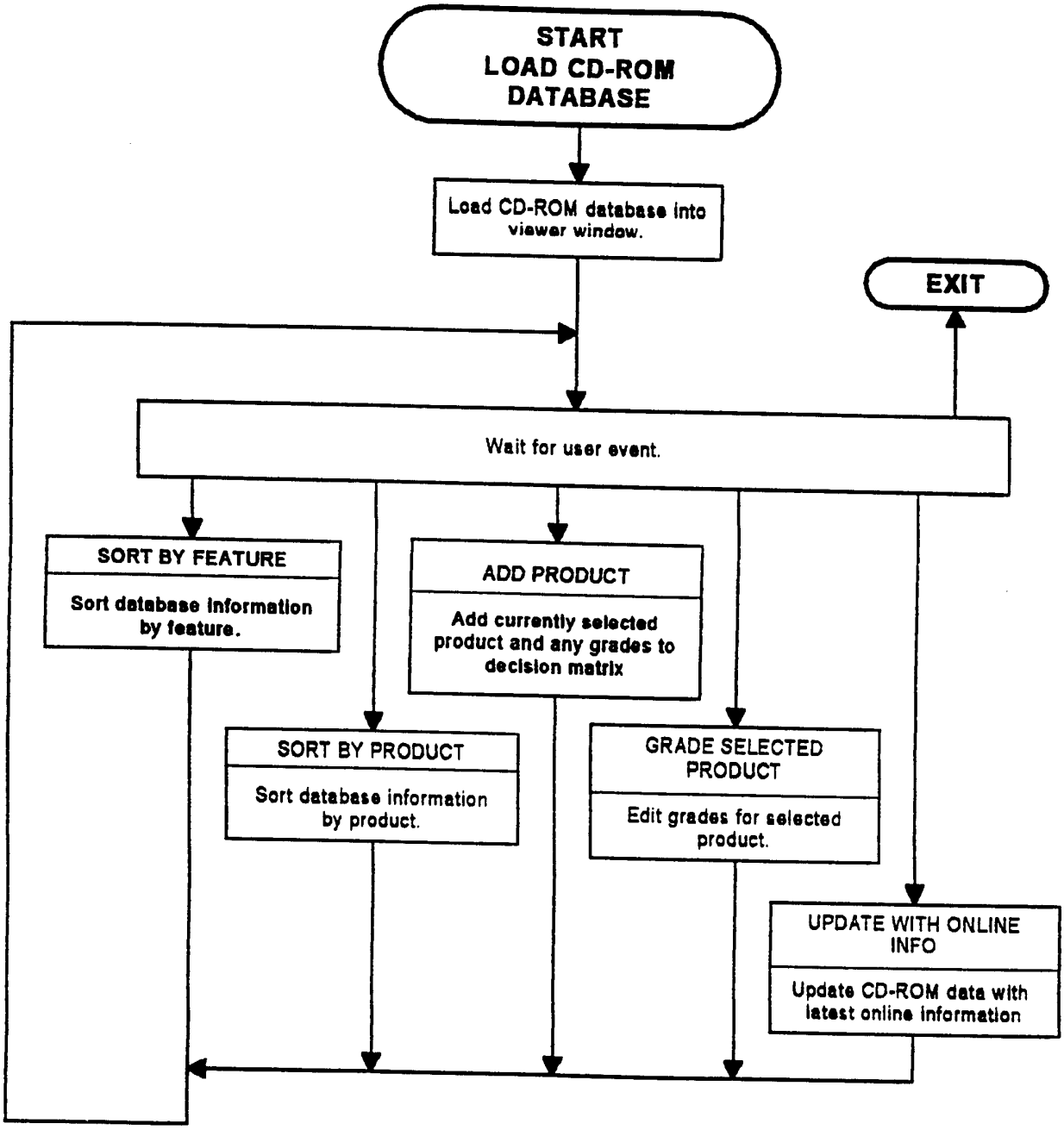

START
LOAD CD-ROM DATABASE
Load CD-ROM database into viewer window.
EXIT
Wait for user event.
SORT BY FEATURE
Sort database information by feature.
ADD PRODUCT
Add currently selected product and any grades to decision matrix
SORT BY PRODUCT
Sort database information by product.
GRADE SELECTED PRODUCT
Edit grades for selected product.
UPDATE WITH ONLINE INFO
Update CD-ROM data with latest online information

Fig. 27(o)