Configurable Multi-Lingual Advisory System and Method Thereof

Field of the Invention

[0001] The present invention relates to a data processing system. More particular, the invention relates to a configurable advisory system in any expert domain and the method thereof.

Background

[0002] Books and manuals contain tremendous amounts of human knowledge. To gather the knowledge in any expert domain, great amount of time and effort are often spent on reading and interpreting what has to be done to gain the expertise in the field of interest.

[0003] With the advancement of computer technology, information processing of knowledge is becoming automated. Advisory systems are now implemented in computer for providing expert knowledge and advices. These "expert" can be mass produced to benefit the public.

[0004] Knowledge-based systems, or simply advisory systems, simulate human interpretations of advisory guidelines on computer for providing solution/advisory to problem/issue based on collections of knowledge. Such advisory systems represent expertise knowledge as data or rules. These data and rules can be called upon when needed.

[0005] Knowledge-based advisory systems are custom-built systems for a particular domain of expertise. They are generally programs with a specific programming language, which are coded in the forms of decision matrixes. The data containing the knowledge and rules or instructions controlling the output are hard coded and tagged to the decision matrixes. Any changes to advisory rules or to the order of the data of knowledge may cause a cascading chain effect on the nodes in the decision

matrix. To modify advisory rules requires re-coding of the entire decision matrix and/or program.

[0006] It can thus be seen that there exists a need for a system, which is generic, and yet intelligent to provide easy implementation of an advisory system.

Summary

[0007] In one embodiment, the present invention provides a configurable advisory system for generating an advisory report, the system comprises a database for storing pre-defined data, wherein the pre-defined data is organized and classified as individual entries based on information and functions defined therein; a rule builder operable with the database for receiving and processing pre-defined inputs, and storing the processed pre-defined inputs in the database as the pre-defined data; and a rule analyzer, upon receiving an instruction and attribute value inputs, operable to generate the advisory report based on the pre-defined data, wherein the attribute value inputs is defined based on the pre-defined data, and the instruction includes selections of the entries defined in the pre-defined data.

[0008] Preferably, the attribute value inputs are stored in the database as attribute value data. The system may adapt to operate under a plurality of languages, which may be defined under the individual entries of the pre-defined data.

[0009] Also, it is preferred that the pre-defined data of the system comprises paragraph entries for defining output texts, attribute entries for defining the attribute value inputs and common rule entries for defining conditions and instructions for operations and outputting an intermediate value. Further each paragraph entry may include a language field for defining the language of the output texts and each paragraph entry may have at least one corresponding paragraph entry with output texts adapted in a language different from that of the paragraph entry. Also, the attribute value inputs may be defined based on the attribute entries, wherein each attribute entry may output at least one of the paragraph entries for acquiring attribute value inputs. Further, each attribute entry may define a data format of the attribute value input where the data

format may include float, integer, strings, date and options list. Yet, the conditions and instructions of the common rule entries may include inference rule.

[0010] It is also preferred that the pre-defined data further comprises rule entries for defining conditions and instructions for executing one common rule entry. Also, the pre-defined data may further comprise section entries, which comprise one rule entry and at least one paragraph entry for each section entry.

[0011] It is further preferred that the pre-defined data further comprises advisory models which include at least one section entry and at least one attribute entry for each advisory model. Accordingly, the advisory report may comprise at least one section entry and at least one attribute entry.

[0012] It is also preferred that the pre-defined data is accessible only by a system administrator.

[0013] In another embodiment, the present invention provides a method of generating an advisory report comprises inputting pre-defined inputs; processing the pre-defined inputs; storing the pre-defined inputs as pre-defined data in a database, wherein the pre-defined data is organized and classified as individual entries based on information and functions defined therein; providing an instruction and attribute value inputs, wherein the attribute value inputs is defined based on the pre-defined data and the instruction includes selections of the entries defined in the pre-defined data; analyzing the attribute value inputs against the selected entries of the pre-defined data; and generating the advisory report based on the analyzed results.

[0014] Preferably, the method further comprises storing the attribute value inputs as attribute value data. The method may further comprise selecting a language for generating the advisory report.

[0015] It is also preferred that the step of processing the pre-defined inputs comprises defining paragraph entries containing output texts, defining attribute entries which defines attribute value inputs and defining common rule entries for defining conditions and instructions for operation and outputting an intermediate value. Each paragraph entry may be defined to include a language field for defining the language of

the output texts. Also, each paragraph entry may have at least one corresponding paragraph entry with output texts adapted in a language different from that of the paragraph entry. Further, the attribute value inputs may be defined based on the attribute entries. Also, it is preferred that the method further comprises outputting at least one of the paragraph entries defined under each attribute entry for acquiring attribute value inputs. Each attribute entry may also be defined to include a data format of the attribute value input, where data format may include float, integer, strings, date and options list. Also, the method may further comprise defining inference rule as the conditions and instructions of the common rule entries.

[0016] It is also preferred that the method further comprises defining rule entries, which defines conditions and instructions for executing one or more common rule entry. The method may also comprise defining section entries, which may comprise one rule entry and at least one paragraph entry for each section entry. The method may further comprise defining advisory models, which may comprise at least one section entry and at least one attribute entry for each advisory model. Preferably, the advisory report comprises at least one section entry and at least one attribute entry.

Brief Description of the Drawings

[0017] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0018] FIG.1 illustrates a schematic block diagram of a configurable advisory system in accordance with an embodiment of the present invention;

[0019] FIG.2 exemplifies semantic of entries used in the configurable advisory system of FIG. 1;

[0020] FIG. 3 illustrates a flow diagram of operations of a rule builder of FIG. 1;

[0021] FIG. 4 illustrates a flow diagram of operations of generating an advisory report via a configurable advisory system of FIG. 1;

[0022] FIG. 5 illustrates a flow diagram of operations of a rule analyzer of FIG. 1;

[0023] FIGs. 6a-6p exemplify screenshots of the configurable advisory system of FIG. 1 applied in a clinical decision support system; where,

[0024] FIGs. 6a-f are example screenshots of creating a configurable advisory system of FIG. 1 for used in clinical decision support system.

[0025] FIGs. 6g-p are example screenshots of processing an advisory report based on the entries created as shown in FIGs 6a-f.

Detailed Description

[0026] In the following description, a number of specific and alternative embodiments are provided to understand the inventive features of the present invention. It shall be apparent to one skilled in the art, however that this invention may be practiced without such specific details. Some of the details may not be described at length so as not to obscure the invention. For ease of reference, common reference numerals will be used throughout the figures when referring to the same or similar features common to the figures.

[0027] Referring to FIG. 1, there is provided a configurable advisory system **100** in accordance with one embodiment of the present invention. The configurable advisory system **100** includes a database **110**, a rule builder **120** and a rule analyzer **130**. Briefly, the database **110** is used for storing data, which includes a pre-defined data **111** and an attribute value data **112**; the rule builder **120**, generally a privileged and controlled process provides a collaborative environment for system administrators **190** to concurrently generate and process pre-defined information for storing in the database **110**; and the rule analyzer **130** is adapted for processing and outputting an advisory report **150**. Depending on the applications, the configurable advisory system **100** provides a generic system platform adapted to receive input and thereafter outputs an advisory report. To generate advisory reports **150**, the database **110** is required to be

populated. The pre-defined data **111** and the attribute value data **112** are collections of data in relation to the applications of the configurable advisory system **100**. The pre-defined data **111** is a set of preset data, defining the structure, operations/logics, paragraphs and etc. for outputting the advisory report **150**. Before the system **100** can be used, the pre-defined data **111** is required to be entered into the database **110**. The pre-defined inputs **160** include pre-defined texts in different languages, and rules and guidelines in relation to the nature of the applications. The attribute value data **112** is a database of subject specific records. Each record contains multiple entries in different class. User of the system **100** populates the attribute value data **112** by entering attribute inputs **170** to form records. New records are often entered and existing records are often updated, which makes the attribute data **112** grows in size over time. Upon receiving attribute inputs **170** and/or report customization inputs **180** from the users, an advisory report **150** can be created. While creating the advisory report **150**, the configurable advisory system **100** takes the records of the attribute value data **112** to compare with the pre-defined data **111** in generating matched results in the advisory report **150**. The customized advisory report **150** is generated automatically. The report customization data **180** refers to user selections of the type of advisory output to be generated in the advisory report **150**.

[0028] In FIG. 1, the database **110** includes the pre-defined data **111** and the attribute values data **112**. It is preferred that the pre-defined data **111** is accessible only by the system administrators **190**, whilst the attribute values data **112** is accessible by users of the configurable advisory system **100**. The pre-defined data **111** includes a common rule data **113**, a rule data **114**, a paragraph data **115**, an attribute data **116** and a section data **117**, an advisory model data **118**. The data **113-118** are generally, but not limited to, sets of subject-specified expert knowledge and guidelines for providing expert advisory reports **150**. Meanwhile, the pre-defined data **111** are generally stored in the database and does not require frequent maintenances, thus, it is preferred that the pre-defined data **111** is only accessible by the system administrators **190** to avoid unintentional change of the pre-defined data **111** by users. The attribute value data **112**,

on the other hand, contains records organized in data elements/fields of different classes. The attribute value data **112** archives and indexes the attribute inputs **170** so that users can recall or amend these records should a need arises. The attribute inputs **170** require updates consistently in a manual manner, i.e. user manual input. Preferably, the report customization inputs **180** may also be archived. In an alternative embodiment, the report customization inputs **180** are further archived as templates, herein after referred to as an advisory model **118**, which may be used for generating similar advisory report for other records.

[0029] Still referring to FIG. 1, the rule builder **120** of the configurable advisory system **100** is adapted to receive the pre-defined inputs **160**, which are usually organized in sets of data elements (facts). The rule builder **120** arranges them according to the elements' type and processes the pre-defined inputs **160** for storing and indexing in the pre-defined data **111**. When the pre-defined data **111** is populated, an advisory report **150** is generated via the rule analyzer **130** with an appropriate attribute input **170**. The rule analyzer **130**, upon receiving the report customization input **180**, which reference to the pre-defined data **111** generates an advisory report **150** based on the user's selections of the output advices, appropriate to the record of the attribute value data **112**. The report customization input **180**, in accordance with an alternative embodiment, may be an algorithm, which determines the valid entries of the record and generates an advisory report **150** based on the detected valid entry automatically.

[0030] In the above, the "system administrator" **190** refers to any person, who is authorized to access and modify the pre-defined data **111** of the database **110**. For any reasons, if the system is to be used to allow any persons, with or without authority, to modify the database **100** at will, the system administrator includes these persons. Similarly, the "user" is referring to a general user, who is given a task to enter inputs **170** for generating an advisory report **150**. These users only have the limited access and modified the attribute value data **112** stored in the database **110**, and provide the report customization input **180**, for generating the advisory report **150**. In addition, "accessible" to a person means that the subject is fully controllable, editable, and

modifiable by that person. Further, "readable" to a person means that person can only read the subject for its usage, but not alters the subject.

[0031] Referring now to FIG. 2, there is provided data structural explanations of possible data entries used in accordance with the present embodiment. The possible type of data entries used including common rule entries **213**, rule entries **214**, paragraph entries **215**, attribute entries **216**, section entries **217**, and the advisory model **218**. In conjunction with FIG. 1, the common rule entries **213** are stored in the common rule data **113**, the rule entries **214** are stored in the rule data **114**, the paragraph entry **215** are stored in paragraph data **115** and the attribute entries **216** are stored in attribute data **116**, the section entries **217** are stored in the section data **117** and the advisory module **218** is stored in the advisory module data **218**. Each of the entries has a unique identity (ID), and a description describing the entry. The ID serves at a pointer to which, when the other type of entries referring, refers to the corresponding ID. For the purpose of this description, when one entry is referring to another, only the corresponding ID of the other entry is indicated in that particular entry and not the entire contents of the other entry to which it refers.

[0032] In addition, the paragraph entry **215** has a language field and a text field. The language field defines the type of language of the text field and the text field contains strings of text or paragraphs, which are to be displayed to the user or to be outputted on the advisory report **150**. Examples of the paragraph entries **215** are shown in Table 1. One of exemplified paragraph entries **215** with ID PA_1 shows a prompt of number of legs in two different languages, i.e. English and Chinese.

[0033] Referring again to FIG. 2, the attribute entry **216** contains a data type field and one or more paragraphs **215**. The data type field defines the format required for attribute value input, which include float, integer, string value, date and option list. The attribute entry **216** defines the attribute input **170**, when the user is prompted, the one or more paragraphs **215** are shown to acquire inputs from the user in the format defined in the data type field. In other embodiments, the data type may be selection of options, which are provided upon prompting. For example, the data elements of the

attribute value data **112** are defined by a plurality of attribute entries **216**. Example of the attribute entries **216** are shown in Table 1. One of exemplified attribute entries **215** with ID AT_1 shows an attribute which prompts PA_1 for providing an integer value for this attribute entry.

[0034] Again in FIG. 2, the common rule entry **213** has a rule procedure field and a result field. The rule procedure field defines conditions and/or logics for operations, whilst the result field defines effects or products of the operations. In other words, the rule procedure field is the cause of the results field. In accordance with the present embodiment, the rule procedure include inference rule, i.e. if-clause and then-clause, which operationally provide results if the conditions and/or logics found to be "true"; for-loop statement, which allows iterative evaluation of codes within the rule procedure ; do-while loop or the like. Further, the common rule **213** may contains mathematical formula(s) for outputting mathematical result. The common rule may also contain paragraph entries, if necessary. Examples of the common rule entries **213** are also shown in Table 1. One of exemplified common rule entries **213** ID CR_1 shows rule procedure for testing whether the input variable gets a value "TRUE". If so, the common true entry **213** returns value "TRUE".

[0035] Once again in FIG. 2, similarly, the rule entry **214** has a rule procedure field and a result field, wherein its rule procedure field defines conditions and logics for outputting values. The output may include operations which trigger/execute one or more common rules **213**. The result of evaluation of rule procedure of the common rule entries **213** is returned to rule entry **214**. The result is further evaluated by the rule procedure of rule entry **214**. Examples of the rule entries **214** are also shown in Table 1. One of exemplified rule entries **214** with ID R_1 shows rule procedure for returning a value "TRUE". There is no specific rule or condition assigned to this rule procedure as it is intended for this rule to always return a value of "TRUE".

[0036] The section entry **217** contains one rule entry **214** and one or more paragraph entries **215**. Similarly, if the rule entry **214** of the section entry **217** returns a positive result, the section entry **217** outputs the one or more paragraph entries **215**

therein contained. An advisory report **150** is formed by the output of one or more section entries **217**. One of exemplified section entries **217** with ID S_1 used for outputting results.

[0037] The advisory model **218** defines the skeleton of the advisory report **150**. It contains one or more section entries **217** and one or more attribute entries **216**. The advisory model **218** outputs the paragraph entries **215** provided by the section entries **217** with the attribute value input. One of exemplified advisory model **218** with ID AR_1 for prompting AT_1 and AT_2 and outputting S_1 and S_2.

[0038] **Table 1** provides examples of the fields described above.

Paragraph Entries

ID	Desc.	Language	Text
PA_1	Prompt for number of legs.	English	How many legs does the animal has?
PA_1	Prompt for number of legs	Chinese	这动物有多少只脚?
PA_2	Prompt for stripe	English	Does the animal has stripes?
PA_2	Prompt for stripe	Chinese	这动物有斑纹吗?
PA_3	Output number of legs	English	Animal has $ATR_1 legs
PA_3	Output number of legs	Chinese	这动物有$ATR_1只脚
PA_4	Output Zebra	English	It is a zebra.
PA_4	Output Zebra	Chinese	它是斑马.

Attribute Entries

ID	Desc.	Type	Paragraph
AT_1	Number of legs	Integer	PA_1
AT_2	Has stripes	Boolean	PA_2

Common Rule Entries

ID	Desc.	Rule Procedure	Result
CR_1	Test for stripe	If $AT_2=TRUE	TRUE

Rule Entries

ID	Desc.	Rule Procedure	Results
R_1	Output details		TRUE
R_2	Test for zebra	If $CR_1=TRUE and $AT_1=4	TRUE

Section Entries			
ID	**Desc.**	**Rule**	**Paragraph**
S_1	An animal	R_1	PA_3
S_2	A zebra	R_2	PA_4

Advisory Model			
ID	**Desc.**	**Section**	**Attribute**
AR_1	Advisory template	S_1, S_2	AT_1, AT_2

[0039] FIG. 3 shows in a sequential algorithmic of operations for constructing the pre-defined data **111** of FIG. 1 in accordance with one embodiment of the present invention. FIG. 3 is herewith illustrated with reference to FIG. 1. The construction of the pre-defined data **111** is performed by the rule builder **120**. At start **300**, the configurable advisory system **100** (the rule builder **120**) of FIG. 1 prompts and accepts pre-defined input **160**. The rule builder **120**, in step **310**, extracts relevant contents from the pre-defined inputs **160** to form the paragraph entries **215** and store them in paragraph data **115**. The language of the paragraph entries **215** is identified in step **310**. In step **320**, the rule builder **120** further extracts attributes from the pre-defined data **160** to form attribute entries **216**. Each of the attribute entries **216** is defined with reference to a corresponding paragraph entry **215** and the type of data. Once the attributes entries **216** are defined, they are stored and indexed in the attribute data **116**. At step **330**, the advisory rules are generated from the pre-defined input **160**. The advisory entries include common rule entries **213** and rule entries **214**. In step **330**, rule procedures and results of the common rule entries **213** and the rule entries **214** are defined. In step **340**, the rule builder **120** generates section entries **217** by reference to appropriate rule entries **214** and appropriate paragraph entries **215**. The section entries **217** are then stored and indexed in the section data **117**. In step **350**, the rule builder **120** defines the advisory models **218**, each of which contains one or more attribute entries **216** and section entries **217**. The processes **310-350** are repeated to build up a collection of the pre-defined data **111** for the configurable advisory system **100**.

[0040] FIG. 3 illustrates the operations of creating and generating the pre-defined data **111** according to the present embodiment. It is possible that the constructions of the pre-defined data **111** may not involve all of the step **310-350**, but only selective steps. For example, when creating new section entry **217** with existing rule entries **214** and paragraph entries **215** may only involve step **340**.

[0041] Referring now to FIG. 4, there is provided a flow diagram illustrates operations of generating the advisory report **150**. At step **410**, user is prompted to provide input data for the attribute entries **216**. The acquired data are stored and sorted accordingly in the attribute value data **112**. In step **420**, the user is prompted to input customization input **180** for customizing the advisory report **150**. The customization input **180** includes selections of one or more section entries **217** or the advisory model **218**. The report customization input **180**, at any point of time, is stored as an advisory model **218** in the advisory data **118**. In step **430**, the rule analyzer **130** maps the relevant attribute values onto the selections of section entries **217** and/or the advisory module **218** values and outputs the advisory report **150** in step **440**.

[0042] It is understood that the user may proceed with any of the steps in FIG. 4 without executing the other steps. For example, when the user needs to update the attribute value without generating any advisory report **150**, only step **410** is applicable. In a further example, it is possible that the user wishes to generate a customized advisory report **150** based on the stored attribute values, and steps **420-440** are required. Further, the sequence for steps **410** and **420** is interchangeable as long as this two inputs are present.

[0043] In accordance with an alternative embodiment of the present invention, the advisory system is configured to provide a relatively simple and straight forward advisory report, or output, for which, storing the attribute value inputs is not required. The advisory system in accordance with the present embodiment may proceed with the step **420** to prompt user for report customization data first, then step **410** to prompt user for attribute value inputs. For that, the user requires to select the relevant common rules and attributes, then input the required attribute inputs to the advisory system.

The system then processes the selections and inputs in step **430** and an advisory report, or simply an output is produced.

[0044] Referring now to FIG. 5, there is provided a flow diagram illustrating operations of the rule analyzer **130**. The rule analyzer **130** starts at step **500** when users' commands are received. These commands include receiving a new report customization input **180** from user, or user selection of a stored advisory module **218** to generate the advisory report **150** for records stored in the attribute value data **112**. The rule analyzer **130**, in step **510**, scans through the inputted/selected advisory module **218** and extracts the attribute entries **216**, rules (including common rule entries **213**) and section entries **217** from the pre-defined data **111**. The rule analyzer **130** reads the attribute value data **112** for the relevant record at step **520**. The rule analyzer **130** scans and processes each section entry of the advisory module **218** sequentially at step **530**. In the step **540**, the rule analyzer **130** executes the rule entries **214** of the section entries **217** against values of that record and generates intermediate rule values **505**. At step **550**, the rule analyzer **130** performs testing on the relevant records entry against the rule entry **214** (including common rule entry **213**) to produce a result in the nature of "yes" or "true", which means the relevant entry is valid or satisfied; or "no" or "false", which means the user input parameters in invalid or unsatisfied. If valid, step **560** is performed. If the result is invalid, step **555** is performed. In step **560**, the advisory section's paragraph is appended. In step **570** subsequently, the intermediate rule value and the attributes are inserted into the appended paragraphs, if necessary. The rule analyzer **130**, in step **580**, checks whether more sections are available. If in the affirmative, i.e. more section entries **216** available, the rule analyzer loops back to step **530** to process the next section entries **216** and steps **540-580** are repeated sequentially. Back to the step **550**, if the result is invalid, step **555** is performed to indicate the rule result is "false". Step **555**, when necessary, the system may prompt the user for reason of that invalid result, for example, the relevant attribute value is not present. After the step **555**, the operation proceeds to step **580** to check if there are further

section to process. If there is none, the operation ends, and the advisory report **150** is generated.

[0045] **Example 1 exemplifies** the operations of FIGs. 4 and 5 with the examples listed in Table 1. It is understood that for establishing a advisory system via the configurable advisory system **100**, it requires more entries **213-218**. The examples in Table 1 is provided by way of illustration, not limitations. Further, this advisory system does not require the system to store any inputs.

[0046] The examples in Table 1 is an multi-lingual advisory system for determining the species of an animal based on the input values and conditions. The advisory system is adapted to provide two languages. In this example, the advisory model AR_1 is selected at step **420**, which output section entries S_1 and S_2 by acquiring attribute values required by attribute entries AT_1 and AT_2.

[0047] At step **410**, the user is first prompted to input a type of prefer language. The two choices is English and Chinese. For illustrating purpose, the selected language for the present language is English. Therefore, the system will prompt the relevant paragraph entries with "English" in the language field. Likewise when in the selected language is "Chinese". It is also preferred that the user may select/change the preferred language along the processing. A window (not shown) prompts users for inputting attribute values for attribute entries AT_1 and AT_2. The AT_1 prompts by displaying paragraph PA_1, "How many legs does the animal has?", and AT_2 prompts by displaying PA_2, "Does the animal has stripes?". For AT_1, the user is required to input integer input and for AT_2, Boolean input "Yes" or "No" is required. For illustrating, the input for AT_1 is 4, and the input for AT_2 is "Yes". Once the input for step **410** and **420** is obtained, the inputs are processed against the pre-defined data **111** in step **430**.

[0048] In step **510**, the advisory system loads the S_1 and S_2 for processing with the attribute values "4" and "Yes". As mentioned, the system does not required to store input data. Therefore, step **520** is passed over. In step **530**, S_1 is processed by executed R_1, which returns an intermediate value "TRUE" in step **540**. The

intermediate value "TRUE" is being evaluated in step **550**, and proceed to the step **560**. The paragraph entry PA_3, "The animal has $AT_1 legs", is outputted in the advisory report where "$AT_1" is the attribute value input 4 and the value 4 is inserted into the paragraph PA_1 and accordingly resulting output is "The animal has 4 legs". The operation then proceed to check if AR_1 contains more sections in step **580** and in this case, the operation loops back to step **530** to process S_2.

[0049] In step **530**, the R_2 of S_2 is executed for evaluating if the common rule $CR_1 has a value of "TRUE" and $AT_1 has a value of 4. Accordingly, the CR_1 is being evaluated if $AT_2 has a value of "TRUE". As provided above, as $AT_2 returns "TRUE" for $CR_1, and $AT_1 has a value of 4, R_2 returns a value "TRUE". Accordingly, PA_4 is being outputted as "It is zebra." As AR_1 does not have any further section entry, the system output the advisory report as: "The animal has 4 legs. It is a zebra."

[0050] FIGs. 6a-6p are screenshots of the configurable advisory system **100** applicable in a clinical decision support system. Briefly, FIG. 6a shows a screenshot for an constant string window **610**, where the paragraph entry **215** is created therein; FIG. 6b shows a screenshot of an attribute window **620**, where the attribute entry **216** is created therein; FIG. 6c shows a screenshot of a common rule window **630**, where the common rule entry **213** is created therein; FIG. 6d shows a screenshot of a section window **640**, where a "rule" tab **641** is active to allow the system administrator **190** to input logic of rule entry **214**; FIG. 6e shows screenshots of the section window **640**, where a "output text" tab **642** is active, each screenshot shows the entered texts in three languages respectively, and the section entry **217** is created therein; FIG. 6f shows a screenshot of a advisory report window **660**, where the advisory model **218** is created therein; FIG. 6g shows a selection window **670**, whereby a stored advisory model **218** and the attribute values can be retrieved from, for generating an advisory report **150**; FIG. 6h shows a Data Entry window **690**, where the system 100 prompts user for attribute value inputs; FIG. 6i shows a Run Report window **680** with a "CodeStr" tab **681** active, showing details of the code string; FIG. 6j shows the Run Report window

680 with a "attribute" tab **682** active, showing details of the attributes; FIG. 6k shows the Run Report window **680** with a "rules" tab **683** active, showing details of the rules (including common rules); FIG. 6l shows the Run Report window **680** with a "sections" tab **684** active, showing details of the section entries; FIG. 6m shows the Run Report window **680** with a "rule engine" tab **685** active, showing details of the all applicable the rules for advisory model FIG. 6n shows the Run Report window **680** with a "trace" tab **686** active, showing results and step-by-step execution of the rule logic; FIG. 6o shows the Run Report window 680 with the HTML tab **687** active, showing the generated advisory report in hyper text markup language; FIG. 6p shows the Run Report window **680** with a "report" tab **688** active, showing details of generated advisory report.

[0051] In FIG. 6a, the constant string window **610** is organized in selectable fields and fill-in fields for creating the paragraph entry **215**. A Group field **611** is a key-in and drop down box of options for identifying the group of this paragraph entry **215**. The available options for the Group field **611** are prompt or other definable group entry. User is allowed to key-in text in the Group field **611**, when desired. Right beneath the Group field **610**, is a Code field **612**, which is provided for the system administrator **190** to assign an ID for this paragraph entry. If desired, comments or descriptions may be entered into a comment field **613**. A language selection field **614** is provided for the system administrator **190** to identified the language of this paragraph entry, and following this, the system administrator **190** may enter the texts of desired in an Actual Value field **615**. The contact string window **610** provides two separate fields **615** and **616** for entering texts, of which, the system administrator **190** may choose to display texts in the Display Value field **616** rather than the texts entered in the Actual value field **615**. As shown in the screenshot, this is a paragraph field for prompting user with text "Weight (in kg) :)" in English". The system administrator **190** can then save this entry in to the paragraph data **115** by clicking the button **617**.

[0052] In FIG. 6b, the attribute window **620** is organized in selectable fields and fill-in fields for creating the attribute entry **216**. The system administrator **190** assigns

an ID for this attribute entry in Code field **621**, and a description to this attribute is entered in a field **622**. The category type of this attribute entry is selectable in a Category field **623**, which is a key-in and drop down box with options of user-definable category. A Reference field **624** is provided for documentary purpose. The Category field **623** and the Reference field **624** are provided for easy categorizing and referencing. If desired, additional comments and description may be entered in a Comment field **625**. A Display Prompt field **626** with entry IDs is provided for selections of display text from the paragraph entries **215**. A data type field **627** is also provided in the form of check selection for selecting the relevant type. The available selections in the data type field **627** are float, integer, string, date value, option list, particulars test info and site info. An additional panel **628** is provided for further defining formats and options for the data type field **627**. This panel **628** changes the available option according to the selection of the data type field **627**. In the provided screenshot, this attribute is a prompt for acquiring weight by prompting the text of the paragraph entry **215** having an ID of `Prmt_For_Weight`, i.e. the text shown in fill-in field **615** of FIG. 6a. This attribute entry **216** specifies that the input is to be in float with one decimal point.

[0053] In FIG. 6c, the common rule window **610** is organized in selectable fields and fill-in fields for creating the common rule entry **213**. An ID can be assigned to this common rule entry in Code field **631** and its description can be entered in the field **632**. A Category field and a Reference field **633** are also provided for documentary purpose. A text box **638** is provided for entering rule logic codes for the operations of this common rule, whilst aselection list **637** is provided for the system administrator's **190** selection for the available entries when coding the common rule entry. A check box **639**, if checked, instructs the advisory system **100** to store the output results as the intermediate rule value. The attribute list **637** is organized in three rows showing the type, the ID code and description of the selectable entries. When necessary, the system administrator may select to enter the corresponding window of the selected

entry for details by selecting the button **634**. As shown in FIG. 6c, this common rule entry is for defining criteria for calculating body mass index with the code:

[0054]

```
if zzAttr("Height" > 0) and zzAttr("Weight")
> 0 then
$RULERESULT =
18.5*(zzAttr("Height")*zzAttr("Height"))
```

[0055] , where,

[0056] the above example is an if-then statement that outputs `$RULERESULT` when the condition `zzAttr("Height") >0` and `zzAttr("Weight") > 0` is met.

[0057] In FIGs. 6d and 6e, the section window **640** is organized in selectable fields and fill-in fields for creating the section entry **217**. An ID can be assigned to this section entry in Code field **643** and its description can be entered in the field **644**. Two tabs, a Rule tab **641** and an Output Text tab **642**, are presented one over another when active. In FIG. 6d, the active tab is the Rule tab **641** which is provided for entering Rule entries **214**. The Rule tab **641** provides a text field **646** for entering rule logic codes for operations of this Rule entry. A selection list **647** is available for system administrator **190** selections for the available entries. FIG. 6e, provides three section windows **640** their Output Text tab **642** active. Each of the Output Text tab **642** is organized into one selectable field **648** and one fill-in field **649**. The selectable field **648** provides options for selecting language. The fill-in field **649** provides field for the entering of the output text in the selected language. In FIG. 6e, the top left screenshot shows that Chinese is selected at field **648**, and the text in Chinese is provided in the field **649**. The top right screenshot shows that English is selected at field **648**, and the text in English is provided in the field **649**. The center bottom screenshot shows that Malay is selected at field **648**, and the text in Malay is provided in the field **649**. A selection list **647** is provided for the system administrator's **190** selection when coding the rule entry in the Rule tab **641**. The attribute list **647** is organized in three rows showing the type, the ID code and description of the selectable entries. As shown in

FIGs. 6d, the section entry **217** with an ID of BMI_OVERWEIGHT is for displaying advisory text when the calculated BMI value falls within the range of 23-27.45. The range and conditions for this section is defined in the Rule field **641**.

[0058] In FIG. 6f, the Report window **660**, is organized in selectable fields and fill-in fields for creating the report model **218**. An ID can be assigned to this report model **218** in the Code field **661** and description may be provided in a field **662**. A Category field, a Reference field and an Auth. Code field collectively as fields **663** are also provided for documentary purpose. A section list **666** and an attribute list **667** are provided for selections of the available section entries and attribute entries. A section field **668** and an attribute field **669** are provided, right beside of the section list **666** and the attribute list **667** respectively, for entering the selection of sections and attributes for this report model. As shown in the screenshot, this advisory model, with an ID of OBESITY_SCREENING is for screening for obesity. Five section entries and two attribute entries are selected from the lists **666** and **667**. The two attributes entries are for prompting for input of height and weight respectively. One of the section entries, BMI_HEADER, is selected for displaying the calculated BMI results, and the other four entries, are for evaluating against the BMI result. Upon matching the BMI result with the conditions of the four entries, the paragraphs or the advisory texts of the matched section entry will be displayed on the advisory report. Buttons **664** and **665** are provided for removing the selected sections and attributes respectively, when necessary.

[0059] FIGs. 6g-6p exemplify screenshots of generating an advisory report **150**. FIG. 6g shows a selection window **670** for starting up the generation of an advisory report **150**. The upper portion of the screen is provided for selecting an advisory model **218** of interest. The lower portion of the screen provides a list of test cases for the advisory model **218**. Each test case in contains the attribute value record stored in the attribute data. A button **671** is used for searching the available advisory report, and the fill-in field besides the button **671** is for entering the search terms. A button **672** is to retrieve the test cases for a selected advisory model; a button **673** is to create a new

customized advisory report; a button **674** is to modify an existing customized advisory model; a button **676** is to create a new test case or record; a button **677** is to edit the existing attribute values; a button **659** is for generating an advisory report based on the selected test case/record and the selected advisory model; a button **677** is for printing the generated report.

[0060] FIG. 6h shows a Data Entry window **690** for inputting attribute value for processing the advisory report. In window **690**, a drop down field **691** is provided for user selections on the preferred language. The default language is generally the selected language when the advisory model is created. In this case, English is the default language. A field **692** of the window **690** is provided for displaying the attributes' prompt selected in the advisory report. This field displays the paragraph entries specified in the selected attribute entries, and provides an appropriate field for each attribute entry for user input. As shown in the screenshot, the field **692** prompts for weight (in kg) and height (in meter), and the inputs provided by user are 70.0 (kg) and 1.85 (meter) respectively. The user may then select a button **693** to conclude the data entry and the advisory system may start generating an advisory report based on the inputs.

[0061] FIGs. 6i-6p show a Run Report window **680** showing screenshots of the configured advisory system **100** when generating the advisory report **150**.A status bar **689** shows the processing status of the advisory report generation. If desired, the user may stop the process anytime by selecting a "stop" button right beside the status bar. Locating right beneath the status bar, there is provided a CodeStr tab **681**, an Attributes tab **682**, a Rules tab **683**, a Sections tab **684**, a Rule Engine tab **685**, a Trace tab **686**, a HTML tab **687** and a Report tab **688**. The CodeStr tab **681** lists all the code values used in rule procedures for user or system administrator's references. . The Attributes tab **682** lists all the selected attribute entries and corresponding values inputted earlier. The Rules tab **683** lists all the rule entries. The Sections tab **684** lists all the required section entries. The Rule Engine tab **685** shows the execution plan of the rules **214** and common rules **213**. The Trace tab **686** shows all the values, which are calculated and

evaluated in sequence, during the advisory report generation process. The HTML tab **688** provides the output text in an HTML language form, which is suitable for outputting to any internet web browser should the advisory system be implemented as a web application. The Report tab **687** shows the actual text of the generated advisory report in English

[0062] In accordance with a further embodiment of the present invention, the configurable advisory system **100** may be connected to other data resources, of which, the attribute data **112**, or even the pre-defined data **113**, are updated automatically. An example of these shared data resources is the government registers.

[0063] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations and combinations thereof could be made to the present invention without departing from the scope of the invention.

Claims

1. A configurable advisory system for generating an advisory report, the system comprising:

a database for storing pre-defined data, wherein the pre-defined data is organized and classified as individual entries based on information and functions defined therein;

a rule builder operable with the database for receiving and processing pre-defined inputs, and storing the processed pre-defined inputs in the database as the pre-defined data; and

a rule analyzer, upon receiving an instruction and attribute value inputs, operable to generate the advisory report based on the pre-defined data, wherein the attribute value inputs is defined based on the pre-defined data, and the instruction includes selections of the entries defined in the pre-defined data.

2. The system according to claim 1, wherein the attribute value inputs are stored in the database as attribute value data.

3. The system according to claim 1, wherein the system is adapted to operate under a plurality of languages, which are defined under the individual entries of the pre-defined data.

4. The system according to claim 1, wherein the pre-defined data comprising:

paragraph entries for defining output texts;

attribute entries for defining the attribute value inputs; and

common rule entries for defining conditions and instructions for operations and outputting an intermediate value.

5. The system according to claim 4, wherein each paragraph entry include an language field for defining the language of the output texts.

6. The system according to claim 5, wherein each paragraph entry has at least one corresponding paragraph entry with output texts adapted in a language different from that of the paragraph entry.

7. The system according to claim 4, wherein the attribute value inputs are defined based on the attribute entries.

8. The system according to claim 7, wherein each attribute entry outputs at least one of the paragraph entries for acquiring attribute value inputs.

9. The system according to claim 7, wherein each attribute entry defines a data format of the attribute value input.

10. The system according to claim 9, wherein the data format includes float, integer, strings, date and options list.

11. The system according to claim 4, wherein the conditions and instructions of the common rule entries include inference rule.

12. The system according to claim 4, wherein the pre-defined data further comprising rule entries and common rule entries for operations and outputting an intermediate value.

13. The system according to claim 12, wherein the pre-defined data further comprising section entries which comprise one rule entry and at least one paragraph entry for each section entry.

14. The system according to claim 13, wherein the pre-defined data further comprising advisory models which comprise at least one section entry and at least one attribute entry for each advisory model.

15. The system according to claim 13, wherein the advisory report comprising at least one section entry and at least one attribute entry.

16. The system according to claim 1, wherein the pre-defined data is accessible only by a system administrator.

17. A method of generating an advisory report comprising:

inputting pre-defined inputs;

processing the pre-defined inputs;

storing the pre-defined inputs as pre-defined data in a database, wherein the pre-defined data is organized and classified as individual entries based on information and functions defined therein;

providing an instruction and attribute value inputs, wherein the attribute value inputs is defined based on the pre-defined data and the instruction includes selections of the entries defined in the pre-defined data;

analyzing the attribute value inputs against the selected entries of the pre-defined data; and

generating the advisory report based on the analyzed results.

18. The method according to claim 17, further comprising storing the attribute value inputs as attribute value data.

19. The method according to claim 17, further comprising selecting a language for generating the advisory report.

20. The method according to claim 17, wherein the step of processing the pre-defined inputs comprising:

defining paragraph entries containing output texts;

defining attribute entries which defines attribute value inputs; and

defining common rule entries for defining conditions and instructions for operation and outputting an intermediate value.

21. The method according to claim 20, further comprising defining each paragraph entry to include a language field for defining the language of the output texts.

22. The method according to claim 21, wherein each paragraph entry has at least one corresponding paragraph entry with output texts adapted in a language different from that of the paragraph entry.

23. The method according to claim 20, wherein the attribute value inputs are defined based on the attribute entries.

24. The method according to claim 23, further comprising outputting at least one of the paragraph entries defined under each attribute entry for acquiring attribute value inputs.

25. The method according to claim 23, further comprising defining each attribute entry to include a data format of the attribute value input.

26. The method according to claim 25, wherein the data format includes float, integer, strings, date and options list.

27. The method according to claim 20, further comprising defining inference rule as the conditions and instructions of the common rule entries.

28. The method according to claim 20, further comprising defining rule entries and common rule entries which defines conditions and instructions for operations and outputting an intermediate value.

29. The method according to claim 28, further comprising defining section entries, which comprise one rule entry and at least one paragraph entry for each section entry.

30. The method according to claim 29, further comprising defining advisory models, which comprise at least one section entry and at least one attribute entry for each advisory model.

31. The method according to claim 29, wherein the advisory report comprising at least one section entry and at least one attribute entry.