INFORMATION SYSTEM

FIELD OF THE INVENTION

The invention relates to information systems, and more particularly to an information system that provides computed results on the basis of values derived from a plurality of uncontrolled information sources.

BACKGROUND OF THE INVENTION

In conventional information systems, like automatic control systems the input subsystem is formed of a plurality of information sources that are controllable entities, wherein the content and the timing of the input from each entity follows a predefined rule. The output of the information system thus reflects directly the status of process, and basically the sole source of uncertainty introduced by the input subsystem lies in the operational reliability of the entities. Operational defects of entities are relatively easy to detect and prior art provides numerous procedures and methods for diagnosing and locating defective entities in information systems. These methods do not, however, apply to assuring reliable performance in information systems where operation of the information sources is not directly controllable by the operator of the information system.

In lack of predefined control mechanisms directly acting on the input subsystem, the accuracy of the results of such information systems correlates to the number of values available for the computations by the information sources. This, however, imposes a technical problem to the information system. In order to be commercially viable, the points of interest to be valued within the information system should cover as many areas of interest as possible. On the other hand, in order to maintain continuous flow of incoming values, the information system should allow unlimited bursts of information in order to maintain the voluntary level of freedom for the independent information sources. This means that the input and/or the output of the information system needs to be dynamically adaptable so as to allow focusing to the areas of interest of the information source that currently interacts with it.

Prior art information systems that provide results on the basis of values derived from a plurality of uncontrolled information sources comprise essentially two categories: researches and questionnaires. In the first type of a information system, the information sources essentially comprise parties that independently release printed or electronic material, for example articles, sta-

tistics, recommendations etc. for public use. The information in the publications is collected by a service provider from a variety of sources, compiled into a research result, which is then made commercially available. This procedure comprises bringing the data from a number of various different sources into mutual conformance and the stage of processing data is thus extremely laborious. Consequently, though the focus of inputs positively remains in the area of interest of the information sources, the area that may be covered by such information system is typically too limited to be technically and commercially viable for industrial use.

In the second type of an information system, the information sources comprise respondents of a questionnaire and the values comprise responses, typically numerical representations illustrating the opinion of the respondents. When the questionnaire is implemented by means of an information system that provides results on the basis of values derived from a plurality of voluntary respondents, the primary reward is the valuable information formed by such computed results. However, if the respondent is required to submit a completely filled form, or filled up to some predefined level, he or she has to provide answers also on several areas that he or she is not familiar with or not at all interested in. On the other hand, if the respondent is not required to submit a completely or nearly filled form, he may hoax the reward by providing answers only here and there. This leads to deficient amount of values to be computed, severely disrupts the accuracy of the results, and thus deteriorates the technical performance of the information system.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

An object of the present invention is thus to define an information system where the above technical problem is alleviated. The objects of the invention are achieved by an information system, a server, a method, and a computer program product, which are characterized by what is stated in the independent claims. The preferred embodiments of the invention are disclosed in the dependent claims.

The invention is based on an interactive reciprocity mechanism arranged between the input subsystem, the output subsystem, and the processing subsystem between them. The processing subsystem has a database comprising a plurality of records, each comprising an identity field. Each point

of interest in the real world corresponds to a unique factor in the database, and a factor is identified by the value in the identity field of a record. The mutual hierarchy of the points of interest is replicated into the mutual hierarchy of the factors in the database. The values in the identity field are predefined by the operator of the information system and each identity value comprises a predefined position indicator that allows determining of the position of the factor in the layered hierarchical structure of the factors. The records comprise one or more value fields for storing input values and/or result values computed on the basis of the values in the input records from a plurality of information sources.

The input subsystem thus receives an input from a particular user, and generates an input record thereof. The input record comprises an identity field that identifies the point of interest, and one or more input values for that point of interest. The input record is delivered to the database, and a new result value of each of the factors is computed on the basis of the result value of the factor currently in the database and the value for the factor received in the input record. At the same time, in response to submitting values for a particular point of interest, the user is provided with access to a record field that comprises the result values for the factor corresponding to the original point of interest.

An advantage of the invention is that is simultaneously enables offering points of interest in a plurality of areas of interest, and controlling of the input and output operations so that a source of information is rewarded only in proportion to his or her submitted information. Through the invented use of attribute fields in the database and in the inputs from the information sources a service provider may model the hierarchy of the points of interest in the plurality of areas of interest, and limit the provision of results to the points of interest included in the inputs of that particular information source.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described in greater detail by means of preferred embodiments with reference to the attached drawings, in which

Figure 1 illustrates the functional architecture of an information system according to an embodiment of the invention;

Figure 2 comprises a functional description of an application server according to an embodiment of the invention;

Figure 3 comprises a functional description of a client workstation according to an embodiment of the invention;

Figure 4 the information structure applied in the present embodiment of the invention;

Figure 5 illustrates an example of the hierarchical information structure in the context of assessing listed companies;

Figure 6 illustrates an example of an individual user view;

Figure 7 illustrates the information structure of Figure 5 with three exemplary metrics;

Figure 8 shows an example of a polyadaptive attribute matrix corresponding to the information structure of Figure 6; and

Figure 9 illustrates an embodiment of a method according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention can be applied to any information system where computed results on the basis of input values derived from a plurality of independent information sources may be used as a reward output to the same information sources. The term independent in this context refers to a mode of operation where the element receiving the information has no direct control to the timing and extent of the information submitted by the source of information.

An information source may be any element capable of providing a value to a point of interest. In the following, the invention is illustrated by means of an information system where the information source corresponds to a user of the information system. However, the information source may as well be an electrical device, for example a meter, a sensor or the like, which has been arranged to independently feed in values to the information system. Such device may be, for example a measuring device attached to the car, arranged to measure a number of operating parameters (for example, milometer rate, ambient temperature, humidity, etc) of the car whenever the car is started, and to send the parameters to the information system to be utilized for maintenance and/or research purposes.

In order to reach a plurality of information sources, a plurality of users need to be able to access a remote database. The present invention is therefore especially applicable to a client/server infrastructure without, however, excluding the centralized infrastructures of mainframe computers. The

connection for implementing the access may comprise fixed or wireless connection, or a combination of each.

In the following, the invention is illustrated by means of an information system for collecting assessment information on one or more contractors from one or more participators, and for providing consensus information computed on the basis of the received assessments. A contractor represents an object of the assessment, and may thus be, for example, an entity (a company, an organization) or a consumable (product or service). A participator represents a party that, for some reason, has an interest in the company, and is therefore willing to provide opinion on the factors related to the contractor, and to access computed consensus information on such factors. Examples of participators in the present embodiment comprise investors, suppliers, customer, analysts, and the like. Such an information system is particularly applicable to research of subjective opinions on immaterial or immaterial factors, but for a person skilled in the art it is clear that the invented solution may, however, be advantageously applied to creation of any consensus information that is computed based on a plurality of assessments of interested entities. Additionally, due to translating the intangible factors into numerical data, the embodied information system allows parallel utilization of tangible and intangible factors. Typically there are involved a plurality of contractors and participators and the value of the information on a contractor correspond directly with the number of valid assessments thereof. The validity of consensus information, and thus the performance of the system are critically based on the efficiency of collecting assessments.

In the current embodiment the invention is illustrated with an information system employing client/server relationship, without restricting the scope of protection to the terms and physical elements used herein. Alternative models comprise, for example, master/slave, and peer-to-peer configurations. The essential requirement is, however, that the users of the information system may operate remotely and independently from their own workstations. The block chart of Figure 1 illustrates the functional architecture of an information system according to an embodiment of the invention. The system comprises a server 100 and one or more clients 110, 120 mutually interconnected by means of network 130, advantageously, but not restricting to, a packet switched network.

An essential requirement for a system for collecting and distributing evaluated information is that it may be utilized by a plurality of users from distributed locations. In a network, the client/server model provides a convenient way to interconnect users that are distributed across different locations. A server 100 refers herein to a computer device that provides a service for other computers that are connected to it via a network. In the current embodiment, the connection between clients 110, 120 and the server 100 is performed by means of TCP/IP message passing over the IP network 130, and uses http or proprietary protocol to encode the client's requests and the server's responses. While TCP and IP specify two protocols at specific protocol layers, TCP/IP is used herein to refer to the entire protocol suite based upon these, including telnet, FTP, UDP and RDP. The server may run continuously (as a daemon), waiting for requests to arrive or it may be invoked by a higher level daemon controlling a number of servers. For a person skilled in the art it is clear that the network 130 may be implemented as a radio access network or as a fixed network or a combination of each.

The server 100 is configured with server processes 101, 102 corresponding to different types of clients. Client PA 110 illustrates a participator client for participator client processes, corresponding to which there exists an participator server application process PS 101. A participator is a party utilizing the offered service, i.e. the party providing the assessments and utilizing the resulting consensus information. Client CS 120 illustrates a contractor client for contractor client processes, corresponding to which there exists an contractor server application process CS 102. A contractor is a party upon which the assessments are made and to whom the resulting consensus information is also of utmost importance.

The implementation of the described mechanisms and functionalities in the server is illustrated by referring to Figure 2 that comprises a functional description of the application server 100. The network node comprises processing means 21, an element that comprises an arithmetic logic unit, a number of special registers and control circuits. Connected to the processing means are memory means 22, a data medium where computer-readable data or programs or user data can be stored. The memory means typically comprise memory units that allow both reading and writing (RAM), and a memory whose contents can only be read (ROM). The unit also comprises an interface block 23 with input means 24 for inputting data for internal processing in the unit, and

output means 25 for outputting data from the internal processes of the unit. Examples of said input means comprise a plug-in unit acting as a gateway for information delivered to its external connection points. For receiving information from the user of the application server, the application server AS may also comprise a keypad, or a touch screen, a microphone, or the like. Examples of said output means include a plug-in unit feeding information to the lines connected to its external connection points. For outputting information to the user of the application server AS, they may also comprise a screen, a touch screen, a loudspeaker, or the like. The processing means 21, memory means 22, and interface block 23 are electrically interconnected for performing systematic execution of operations on the received and/or stored data according to the predefined, essentially programmed processes of the unit. In a solution according to the invention, the operations comprise functionality for implementing the operations of the server according to the invention, as described herein.

The implementation of the described mechanisms in the client is illustrated by referring to Figure 3 that comprises a functional description of a client workstation 110, 120, acting as a terminal in the embodied information system. The workstation comprises processing means 310, an element that comprises an arithmetic logic unit, a number of special registers and control circuits. Connected to the processing means are memory means 315, a data medium where computer-readable data or programs or user data can be stored. The memory means typically comprise memory units that allow both reading and writing (RAM), and a memory whose contents can only be read (ROM). The workstation also comprises an interface block 320 with input means 325 for inputting data by the user for internal processing in the unit, and output means 330 for outputting user data from the internal processes of the unit. Examples of said input means comprise a keypad, or a touch screen, a microphone, or the like. Examples of said output means comprise a screen, a touch screen, a loudspeaker, or the like. The workstation also comprises a communication unit 335 configured with receiving means 340 for receiving information and processing it for inputting to the processing means 310, as well as with transmitting means 345 for receiving information from the processing means 310, and processing it for sending. The implementation of such a communication unit is generally known to a person skilled in the art. The processing means 310, memory means 315, interface block 320, and the communication unit 335 are electrically interconnected for performing systematic execu-

tion of operations on the received and/or stored data according to predefined, essentially programmed processes of the unit. In a solution according to the invention, the operations comprise the functionality of the client workstation according to the invention, as described herein.

The essential element of the invented information system is the predefined hierarchical structure of the factors that provides a holistic perspective to relevant points of interest in the applied environment and allows reception of information bursts generated according to the scope of interest of and time available to the participator in question. Figure 4 illustrates the information structure of the factors applied in the present embodiment.

A basic element of the embodied information structure is a factor F 41. A factor F refers to assessment information on one unique point of interest and comprises an identity field ID that is predefined by the operator of the information system, and one or more value fields V for values derived for the assessed point of interest. The identity field ID comprises a descriptor part DE and a position indicator PI part. The descriptors DE are predefined for the current contractor group by the operator of the information system and are utilized as such for each of the contractors. The position indicators PI comprise rules, values of characters, based on which the position of the attribute in the layered hierarchic structure may be defined. For example, the position indicator may comprise a reference to a parent factor the current factor is subordinated to. Through the description part DE the factor F is advantageously associated with a verbal definition that, as such, clearly defines the characteristic of a factor to the users of the embodied information system. The one or more values in the value fields V carry the evaluation assigned to or computed for the factor F. In the embodied system, the factors homogenize the conception of the points of interest with respect to a plurality of contractors and participators, especially in continuous, recurring use. On the other hand, the factors can be flexibly adapted to a particular application area and for different types of contractors.

Figure 4 illustrates an exemplary matrix of predefined factors applicable to one group of contractors. The factors are organized into a hierarchical structure, wherein one or more factors 41 forms a factor group 42, which again is a member of a higher-level group 43, and so forth. Each member of any group is a factor and the total depth of the hierarchical structure corresponds to the number of levels of groups on top of the other, when all the predefined factors are taken into account, and each level of groups 42, 43 corresponds to a

layer in the hierarchical structure. The use of position indicators PI allows directing operations controllably either to individual factors or to members of hierarchical layers individually.

Figure 5 illustrates an example of the correspondence between the hierarchy of the factors and the layers of the hierarchical attribute matrix by an example of an industrial application for generating consensual information on non-financial value drivers of listed companies to the equity market.

By definition, consensus reflects the agreement in the judgment or opinion reached by a group as a whole. This means that consensus is essentially associated with human perception and, contrary to the more axiomatic conclusions, typically involves a semantic aspect. This has traditionally made consensus very difficult to manage and practical tools for modeling and thereby utilizing consensus information do not currently exist. As an example, in the equity market, the decisions whether to sell or buy are typically made quickly, primarily based on the latest information available on the company in question and often through an intuitive and instantaneous interpretation on the validity of that information.

The listed companies are strictly obliged to release defined types of news directly to the markets, but most of this information deals with economical fundamentals and technical analysis, which are inherently numeral facts and therefore quite easily applicable in comprehensive analysis. With a brief look at the values of the stock it is, however, clear that valuation of a listed company must be based on a considerably larger amount of factors than the purely metric criteria currently in use. The common aspect of these factors is that, even though they do not directly lend themselves for numerical computations, in one way or another they involve the human perception, and therefore can be approached and/or approximated by means of consensus information.

For the primary actors in the equity markets, the analysts, investors and listed companies increasingly emphasize the true relevance of intangibles in the assessment of businesses has become more and more important. However, for the time being there is no framework for creating, collecting, analyzing, comparing and distributing information that provides a view also on the intangible operational value drivers.

The few questionnaires in the market typically provide their own list of questions, with different scopes and emphasis. Scattered inquires flowing in on a regular basis have not encouraged the analysts to spend the time and

energy to familiarize themselves with the questions, factors and mechanisms related to a new type of questionnaire, and then input a great deal of facts and figures on companies, of which merely a part is somehow relevant to them. This is especially the case where there has not been much certainty on an appropriate reward, i.e. that the number of respondents, or the extent of their answers would reach a limit where a consensus comes out and truly reflects the opinions in the market.

The first level of factors of the exemplary assessment is related to the identification of the Company 5. The next level of factors comprises six main groups of Fundamentals 51, Technicals 52, Extended financials 53, Business performance 54, Management 55, and Miscellaneous 56, the position indicator of each factor comprising a reference to the parent factor Company 5. The main group Business performance 54 is further divided into three subgroups: Market share 541, Product performance 542, and Product selection 543, the position indicator of each factor comprising correspondingly a reference to the parent factor Business performance 54. The subgroup Product selection 543 divides further into six subgroups Innovativeness 543A, Design 543B, Quality 543C, Feature sets 543D, Competitiveness 543E, Customer satisfaction 543F, the position indicator of each factor comprising correspondingly a reference to the parent factor Product selection 543.

Now, for example, a point of interest of the market performance of the assessed company in general, i.e. how the market share is divided, how have the products performed, how does the product selection look like in the competitive terms, may be assessed by a value given to a factor Business performance. The identity field of the factor comprises the descriptor “Business performance” 54 and reference to the parent factor “Company” 5, which positions the attribute to the second highest layer in the matrix. By submitting a value ‘8’, the user may evaluate the business performance of the Company to be satisfactory.

At will of the user, the assessment of this factor may, however, be brought into a deeper level by analyzing separately the particular aspects of the factor. Thus a point of interest of the competitiveness of the selection may be assessed by a value given to the factor Product selection 543. The parent factor to the factor Product selection 543 is the factor Business performance 54, whose parent is the factor Company 5. This positions the attribute Product selection 543 to the third highest layer in the matrix. Analogously, attributes

subgroups Innovativeness 543A, Design 543B, Quality 543C, Feature sets 543D, Competitiveness 543E, Customer satisfaction 543F provide voluntary means for even deeper analysis on this particular aspect of the value driver.

The number of applied layers corresponds to the dimensions of the factor matrix, and the level of analysis may thus be selected and managed automatically at identification of the factor. Furthermore, the decision whether to open a group for more detailed assessment is available to the user at every layer.

The combination of factors and values input within one session are hereinafter referred to as a trace. The block chart of Figure 6 illustrates the factors of an exemplary trace in the embodied information system. The trace is automatically generated through the user's choices during the session. The highest level of the trace corresponds to the choice of the highest level of factors. In exemplary choice of Figure 6, of all the main groups A, B, C, D, the participator decides to assess factors in main groups A, B, and C (marked with black colouring). This means that none of the subgroups of the main group D are included in the trace of the session. On the second layer the user decides not leave out any subgroups, but on the second level decides to leave out two factors 61, 62 of the third subgroup of main group C, and the first subgroup 63 of the first subgroup of the main group A. With this choice the lower layer factors 64 and 65 are automatically left out. The participator further chooses not to provide assessment for third layer factors 66, 67, 68, and 69, which are thus left out of the trace. Through these choices, where the user submitted values only to factors relevant to him, a trace (marked with white boxes) was created for that particular session.

Advantageously the user interface of the client workstation is configured to provide the user with a display that follows the hierarchical structure of the factors. For example, the display may be configured to display factors in such a way that factors of the same layer are vertically aligned, as shown in Figure 5. Subsequently, the relationship to the higher level attributes may be illustrated in the display by connecting lines, intentions, etc.

In its simplest form an assessment comprises step of assigning one or more numeral values to one or more factors. Correspondingly assessment of a contractor comprises assigning numerical values to the factors, based on their personal view on the current status of the points of interest in the company. For a person skilled in the art it is clear that a variety of metrics and re-

lated scales and ranges may be employed with assessments without deviating from the scope of the current invention. In the embodied system the assessment is made by means of numerical values. The embodiment is, however, further enhanced by provision of more than one metrics for each factor.

Figure 7 illustrates the information structure of Figure 5 shown with three exemplary metrics employed in the embodied assessment. The first metric is denoted as the score S and corresponds to a mark in the range of 1-10. The second metric is denoted as the weight W and corresponds to the relative weight of the factor in question in relation to the other factors within the same group in question in relation to the other factors within the same group, in the range of 1-100%. The third metric is denoted as info I and gauges the level of knowledge the participator perceives to possess on the factor in question, in the range of 1-100%. The use of more than one metric provides an inherent averaging mechanism that provides the factors with applied perspectives to the commercial utilization of information in the polyadaptive attribute matrix.

Consequently, in the current embodiment, a user gives his or her input through the user interface of the client workstation for one or more factors. This generates an input record, the input record comprising identification of the factor and values for one or more of the metrics S, W, I applied to that factor. The client workstation may comprise a pre-processing unit for pre-processing the records in the user end, or the client workstation may be configured to send the records as such to the server, or the records may be partly processed in either ends. As a result of processing, a trace comprising the assessed factors and values given is produced.

During the processing phase, grades related to a group of attributes are processed into a grade of a lowest subgroup and grades of each of the lower subgroups are processed into grades of a higher subgroup, and the procedure is continued hierarchically upwards until a grade is available for each attribute and group in the layers of the trace. In its simplest form processing in the embodied information system comprises averaging of the values to a consensus value of the lowest subgroup and averaging the consensus values of each lower subgroup into the grade of the higher subgroup. In the embodied system, the grade values are multiplied with the weight and information values, and this figure is stored as a personal consensus value of the factor. For a person skilled in the art it is clear that other processing methods are applicable without deviating form the scope of protection. A computation is performed with

the total consensus values of the factor matrix and the personal consensus values of each of the factors in the trace and the updated consensus values for the factors are stored into the database.

As discussed above, the key motivator and incentive for participators to engage in this type of information sharing is that they are offered valuable information in return. In the invented solution this valuable information is called as reciprocal consensus information (RCI), which refers to the mechanism that, reciprocally, the participator will be provided with information only on factors for which that he or she has submitted values for. In Figure 7, the white triangles and the figures in parenthesis represent, as an example, the current consensus values that have been become available to the participator after he or she has first provided his or her view on the topic. For a person skilled in the art that the format of displaying the reciprocal consensus information is not relevant for the current invention. RCI thus relates to a concept where, when a participator provides an opinion on a factor, collective information on the other participators opinions on that same factor is made available to him. In order to be able to define the RCI for the participator, cumulative information on participator's submitted traces are maintained in the database of the server, and maintained by means of a polyadaptive attribute matrix. The polyadaptive attribute matrix refers here to the dynamically changing matrix for the consensus values of the factors, continuously computed on the basis of the input records received from individual users, and made accessible to each user in a controlled reciprocity according to the traces submitted by him.

Figure 8 shows a hypothetical two-dimensional example of the extent of user's traces in consecutive assessment inputs to a polyadaptive attribute matrix PAM. Each item of the polyadaptive attribute matrix comprises a consensus value R_i computed for the factor from the values received in the plurality of traces from all users as described above. Additionally, for each consensus value of a factor, a consensus number N_i is calculated, based on the cumulative number of traces where a value for this particular factor is given.

The basic principle of the RCI of an individual participator is that it corresponds directly with his or her personal inputs, a cumulative trace generated on the basis of traces in consecutive assessment inputs of the participator. This means that the more factors the traces of the participator cover, the broader view to the consensus values will be available to the participator. This

is illustrated in Figure 8 by means of two separate assessment inputs of one participator. In time T1, for example on a busy day, the participator feeds in a new trace AI1, merely reflecting some recent news he or she has recently learned. In time T2, the participator has more time and chooses to go through a number of factors, including his earlier inputs, and check whether his views have, in the course of time, altered. In this session, a broader trace AI2 is generated. The traces AI1, AI2 of these partly overlapping assessment inputs are combined into a collective trace TR= AI1∪AI2, and the RCI is implemented by allowing to the party access to view all consensus values (dashed in Figure 8) of the polyadaptive attribute matrix that correspond to the cumulative trace of the user.

It is clear that the total number of assessments from all users on an item corresponds directly with the relevance of the consensus, and therefore the consensus number is advantageously utilized in providing consensus values for the users. Advantageously, the operator may generate one or more consensus rules that further define a valid consensus. For example, it may be defined that as long as $N_i < TL_i$, where TL_i is a defined trigger level, a true consensus is not recognized. In such case, the consensus value is either not included in the RCI accessible to the user or is, for example, arranged to be displayed differently than the recognized consensus results. Separate consensus rules may be defined for each group or layer of the polyadaptive attribute matrix.

In the conventional questionnaires the responses are processed at the same time, and the lifetime of the information begins to run right after the end of the term for responding. The information will not be updated before the release of new questionnaire, and in the course of time the accuracy (in the sense of topicality) of the collected consensus information deteriorates. In such conventional systems, the only way to control the rate of updating the information in such conventional systems is by the frequency of sending out the updates. Since answering a questionnaire is a laborious task, the rate of consecutive questionnaires must, on the other hand, be kept on a moderate level. In the following embodiment of the invention, the performance of the system is enhanced by means of a reciprocity expiration mechanism, through which the timely validity of the information may be controllably improved.

In the following, the mechanism is illustrated by referring to Figure 8. For each participator the server is configured with a functionality for defining

and maintaining a RCI-window. This RCI-window may be used to control whether a value in the polyadaptive attribute matrix is accessible to the user or not. The elements of the RCI window each correspond to a combination of elements of the polyadaptive attribute matrix, and have two possible states: OPEN and CLOSE, (marked correspondingly as o and c in Figure 8). When the element of the RCI-window is OPEN the consensus value corresponding to that element is accessible to the user, and when the element of the RCI-window is CLOSED the consensus value corresponding to that element is not accessible to the user.

The state of the elements in the RCI-window is determined on the basis of a reciprocity expiration factor (REF). Initially all the elements in the RCI-window of the polyadaptive attribute matrix for the participator are CLOSED. Each time a participator provides a trace comprising a particular factor, an element of the RCI-window that corresponds to the factor is updated to OPEN state. Through this transition, the participator gets access to the consensus values of the factors in the trace, as described above. Each time a participator inputs a new trace, the REFs of the elements that correspond to the combinations of attributes in the trace, are also reset. After reset the REF is being updated, either continuously based on one or more update rules, or by the operator, in response to some sudden changes in the operative environment. The state of an element in the RCI-window is determined based on the current value of its REF, whereby at updating a REF of an element may reach a predefined threshold value. In this case the state of the element changes to CLOSED, and the user is no longer able to access the corresponding consensus value in the polyadaptive attribute matrix.

Updates on the value of REF of a factor may be based on, for example:

- The period since the last assessment input
- The number of times the consensus value of the factor has been presented to the participator
- The number of times the consensus value of the factor has been assessed by other participators since the last assessment from the participator
- Dramatic, statistically relevant change in the consensus value of the factor in the polyadaptive attribute matrix
- Dramatic, statistically relevant change in the contractor side
- Relevant new information released by a contractor

- Other unspecified external event or change that, by the service provider, is deemed relevant in this respect.

The update rules may be mutually interconnected or independent. One rule may be arranged to drive the REF beyond the threshold, or alternatively, a combined effect of several rules may be required to trigger the transition of an RCI-window element to the CLOSED state.

With reference to the example of Figure 8, at time T2 the RCI-window element of factor 81 is updated to OPEN state and the REF of the element is reset to an initial value of 100 points. After time T2, the REF is being updated by deducting points P1, P2, P3, P4, P5 derived from calculations according to the following rules. When the updated value of REF goes negative (threshold=0), the RCI-window element for factor 81 is closed.

- P1=N *M

where N corresponds to a predefined number of points per day, and M corresponds to a number of days since the last trace that comprised a record related to factor 81,

- P2=O * R

where O corresponds to a predefined number of points to be deducted per a time the consensus value for this factor is accessed by the participator, and M corresponds to a number of times the participator has accessed the consensus value of factor 81,

- P3= S * T

where S corresponds to a predefined number of points per update to this factor by another participator, and T corresponds to a number of times the factor 81 has been included in a trace of another participator since the last update by the participator,

- .P4= U

where U corresponds to a number of points estimated appropriate by the operator to reflect the dramatic change in the operating environment.

For a person skilled in the art it is clear that other equations and mechanisms for determining the REF and defining the triggering of the state transition are possible. Furthermore, the number of rules and/or parameters may be varied freely without deviating from the scope of the present invention. The parameters may be employed separately or in conjunction of each other.

Through the reciprocity expiration factor, the operator may control the rate of updates on the polyadaptive matrix. For example, the operator may

choose to expedite the expiration of the elements in the RCI-windows of the participators, in response to fresh news on a contractor. The expiration of the information induces the participators to update their assessments sooner than otherwise anticipated, and thus decreases the probability of obscure information in the polyadaptive attribute matrix. This directly enhances the timely validity of the information in the database.

The service implemented through the information system is valuable to the contractor side already as such, i.e. from the perspective of the contractor acting as a participator. On the other hand, the performance of the system may be further enhanced with additional means for serving the needs of the contractors. Firstly, the system may be equipped with additional filtering means in order to eliminate, for example, deliberate attempts to bias the consensus. Such means may comprise, for example, a filter unit arranged to disqualify input values that deviate from the consensus value with a percentage greater than a predefined threshold.

The information system allows the operator to actively follow the information sources related to the assessable entities, and act whenever deemed appropriate. On the other hand, the methodology of reciprocity may be optimally utilized to enhance the operation of the information system in the contractor side as well. The operator may configure the server with secondary reciprocity means configured to operate so that a contractor, who actively submits press releases comprising information relevant in view of one or more factors of the polyadaptive attribute matrix, is in response to his or her voluntary inputs, allowed access to consensus values of those factors for a defined period. The definition on the extent of reciprocity may be implemented by means of rule processor that correlates a voluntary submission of a contractor to a specific RCI-window. For example, a listed company may, through its own user account, submit information on its new revolutionary product. In response to this piece of information, the rule processor sets elements in the contractor's RCI-window to OPEN access to consensus information on factor 543 Product selection (Figure 5). At the same time the rule processor resets the REF, that will thereafter expire within a limited time interval. This secondary reciprocity mechanism in the contractor side, will induce increased activity in assessments, accelerate the update rate of the information input, and therefore improve the overall performance of the information system.

Referring to the embodiments above, the flow chart of Figure 9 illustrates an embodiment of a method according to the present invention. Figure 9 shows a procedure followed in consecutive sessions of one participator. Step 910 begins in the initial state of the information system where a database comprises a polyadaptive attribute matrix of N elements. Initially, the RCI-window RCIW of the participator for each of the N elements is in the CLOSED state. In step 915 the procedure is initiated by initializing the trace counter *i* for counting the number of traces submitted by the participator. In step 920 the participator sends in a trace TR_i as described in connection of Figure 6. The trace TR_i comprises a number of records, each corresponding to a factor identified by a combination of attributes in the record. In step 925 the reciprocity expiration factor of the elements in the RCI-window RCIW corresponding to these factors is reset. Correspondingly, in step 930 the elements of the RCI-window of all these factors is set to OPEN. New consensus values are computed based on the earlier stored values in the polyadaptive attribute matrix and on the values in the trace TR_i and updated to the polyadaptive attribute matrix according to the computations (step 935). After this the updated consensus values with whose RCI-window elements are OPEN are available to be accessed by the participator.

The updating of REF values will start right after their reset (step 940) according to the predefined rules and/or parameters, as described in connection of Figure 8. The system checks (step 945) whether the participator has input another trace, and if yes, increments the trace counter *i* (step 950), and returns to step 920. If no new trace is received, the system will continue by monitoring the expiry of the reciprocity information. This is initiated by first determining the cumulative number *n* of elements currently OPEN (step 955) in the RCI-window. After this the element counter *j* is initialized (step 960). By means of *j* the system will go through all *n* elements and check (step 965) whether the expiration rule for the RCI-window element is met. If yes, the RCI-window element of the factor is closed (step 970). If not, the procedure will move to step 975 where it is checked whether all *n* elements have been checked. If not, the element counter *j* is incremented (step 980) and the procedure returns back to step 965. If yes, the procedure returns back to step 935.

It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above

but may vary within the scope of the claims.

CLAIMS

1. An information system for providing results computed on the basis of values derived from a plurality of independent information sources, the information system comprising

one or more terminals;

a database;

connection means for providing access to the database from the one or more terminals, wherein

the database comprises a plurality of records that correspond to a plurality of predefined interrelated factors, each record comprising an identity field for identifying the factor, and a result value computed from the input values related to the factor received from the one or more terminals, the identity field of the factor comprising a position indicator for indicating the subordinate relationship of the factor to at least one of the other factors;

the terminal comprises a receiving unit for receiving from a user one or more input records, an input record comprising identification of a factor and at least one input value related to the factor;

the connection means comprise a computing unit for computing a new result value on the basis of the current result value of the factor and the value of the factor received in the input record;

the connection means comprise a control unit for, in response to the received input records, opening to the user the result values of the factors identified in the input record, and the result values of the factors in superordinate relationship with the factor, and closing from the user the result values of the factors not identified in the input record.

2. An information system according to claim 1, **characterized** in that the connection means comprise a server and an IP network.

3. An information system according to claim 1, **characterized** in that the control means comprise a two-valued variable associated with each factor, the first value of the variable opening the result value to the user and the second value closing the result value from the user.

4. An information system according to claim 3, **characterized** in that the control means further comprise an expiration factor associated with each two-valued variable for controlling the state of the two valued variable, and a rule processor for updating each expiration factor according to

one or more expiration rules, and resetting the expiration factor every time a new value for the factor associated with the two-valued variable is received from the user.

5. An information system according to claim 4, **characterized** in that the rule processor is arranged to progress expiry with time.

6. An information system according to claim 4, **characterized** in that the rule processor is arranged to progress expiry every time the consensus value is accessed by the user.

7. An information system according to claim 6, **characterized** in that the rule processor is arranged to progress expiry in response to an input signal from the operator.

8. An information system according to claim 1, **characterized** by the connection means comprising a threshold value corresponding to a predefined minimum number of received input records required for establishing a consensus.

9. An information system according to claim 8, **characterized** by the connection means being arranged to indicate separately result values for which the threshold value is not exceeded.

10. An information system according to claim 1, **characterized** in that for each factor there is arranged three different input values, and the result value corresponds to a consensus value calculated as a sum of all the three input values.

11. An information system according to claim 10, **characterized** in that for each factor there is arranged three different input value types, and the connection means further comprise secondary reciprocity means for calculating, from the group of all values of one type, a secondary consensus value for the factor, on the basis of input values of the one type for the factor.

12. A server system comprising a server and a database for providing results computed on the basis of values received from a plurality of independent information sources connected to the server system, wherein

the database comprises a plurality of records that correspond to a plurality of predefined interrelated factors, each record comprising an identity field for identifying the factor, and a result value computed from the input values related to the factor received from the one or more terminals, the identity field of the factor comprising a position indicator for indicating the subordinate relationship of the factor to at least one of the other factors;

the server comprises a receiving unit for receiving from a terminal one or more input records, an input record comprising identification of a factor and at least one input value related to the factor;

the server comprises a computing unit for computing a new result value on the basis of the current result value of the factor and the value of the factor received in the input record;

the server comprises a control unit for, in response to the received input records, opening to the user the result values of the factors identified in the input record, and the result values of the factors in superordinate relationship with the factor, and closing from the user the result values of the factors not identified in the input record.

13. A server system according to claim 12, **characterized** in that the server is connected to the plurality of terminals via an IP network.

14. A server system according to claim 12, **characterized** in that the control means comprise a two-valued variable associated with each factor, the first value of the variable opening the result value to the user and the second value closing the result value from the user.

15. A server system according to claim 14, **characterized** in that the control means further comprise an expiration factor associated with each two-valued variable for controlling the state of the two valued variable, and a rule processor for updating each expiration factor according to one or more expiration rules, and resetting the expiration factor every time a new value for the factor associated with the two-valued variable is received from the user.

16. A server system according to claim 15, **characterized** in that the rule processor is arranged to progress expiry with time.

17. A server system according to claim 15, **characterized** in that the rule processor is arranged to progress expiry every time the consensus value is accessed by the user.

18. A server system according to claim 15, **characterized** in that the rule processor is arranged to progress expiry in response to an input signal from the operator.

19. A server system according to claim 12, **characterized** in that the server comprises a threshold value corresponding to a predefined minimum number of received input records required for establishing a consensus.

20. A server system according to claim 12, **characterized** by the connection means being arranged to indicate separately result values for which the threshold value is not exceeded.

21. A server system according to claim 12, **characterized** in that for each factor there is arranged three different input values, and the result value corresponds to a consensus value calculated as a sum of all the three input values.

22. A method for providing results computed on the basis of values derived from a plurality of independent information sources, the method comprising:

providing access to a database from one or more terminals, the database comprising a plurality of records that correspond to a plurality of predefined interrelated factors, each record comprising an identity field for identifying the factor, and a result value computed from the input values related to the factor received from the one or more terminals, the identity field of the factor comprising a position indicator for indicating the subordinate relationship of the factor to at least one of the other factors;

receiving from a user one or more input records, an input record comprising identification of a factor and at least one input value related to the factor;

computing a new result value on the basis of the current result value of the factor and the value of the factor received in the input record;

in response to the received input records, opening to the user the result values of the factors identified in the input record, and the result values of the factors in superordinate relationship with the factor, and closing from the user the result values of the factors not identified in the input record.

23. A method according to claim 22, **characterized** by associating with each factor a two-valued variable, the first value of the variable opening the result value to the user and the second value closing the result value from the user.

24. A method according to claim 23, **characterized** by associating with each two-valued variable an expiration factor for controlling the state of the two valued variable, and updating each expiration factor according to one or more expiration rules, and resetting the expiration factor every time a new value for the factor associated with the two-valued variable is received from the user.

25. A method according to claim 24, **characterized** by progressing expiry with time.

26. A method according to claim 24, **characterized** by progressing expiry every time the consensus value is accessed by the user.

27. A method according to claim 24, **characterized** by progressing expiry in response to an input signal from the operator.

28. A method according to claim 22, **characterized** by comparing the number of received input records for a factor to a threshold value, said threshold value corresponding to a predefined minimum number of received input records required for establishing a consensus for a factor.

29. A method according to claim 28, **characterized** by the connection means being arranged to indicate separately result values for which the threshold value is not exceeded.

30. A method according to claim 22, **characterized** by inputting for each factor three different input values, and computing the result value as a sum of all the three input values.

31. A computer program product, executable in a server connected to a database that comprises a plurality of records that correspond to a plurality of predefined interrelated factors, each record comprising an identity field for identifying the factor, and a result value computed from the input values related to the factor received from the one or more terminals, the identity field of the factor comprising a position indicator for indicating the subordinate relationship of the factor to at least one of the other factors, **characterized** in that execution of the computer program product in a server computer causes the server to

receive from a terminal one or more input records, an input record comprising identification of a factor and at least one input value related to the factor;

compute a new result value on the basis of the current result value of the factor and the value of the factor received in the input record;

in response to the received input records, open to the user the result values of the factors identified in the input record, and the result values of the factors in superordinate relationship with the factor, and close from the user the result values of the factors not identified in the input record.