Title: CROWD-BASED SENTIMENT INDICES

Abstract: Systems and methods are provided for generating a numerical index characterizing a socially observable area of interest. Content that is associated with an entity is received via one or more participating sources. The content received from the one or more participating sources is evaluated to identify qualitative and/or quantitative input providing an evaluation of an entity in a plurality of categories. The one or more participating sources of the qualitative and/or quantitative input are associated with a social sentiment. An overall entity value score is calculated, with aid of a programmable processor, based on the qualitative and/or quantitative input regarding the plurality of categories, thereby assessing social sentiment for the entity. Information relating to the qualitative and/or quantitative input or the overall entity score is displayed on the one or more devices.
before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
CROWD-BASED SENTIMENT INDICES

CROSS-REFERENCE

[0001] This application claims the benefit of U.S. Provisional Application No. 62/164,458, filed May 20, 2015, which is incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

[0002] Conventional methods for assessing and summarizing social sentiment over a selected area of interest typically involve specialized polling, or editorial summarization of news articles, or compendia of individual qualitative commentary, or similar approaches more loosely associated with source information regarding the area of interest. While these techniques capture some degree of social sentiment regarding an area of interest, they are often overly specialized, too imprecise, too indirect, inadvertently amplify input of statistical outliers, or are too infrequent.

[0003] Complementarily, conventional methods for ascribing numerical indices characterizing particular areas of interest, such as the financial performance of a publicly traded company, are usually self-generated by the area of interest and reflect only a narrow, standardized set of internal metrics often not capturing the true value of an entity within an area of interest, such as a company, as regarded by the set of all stakeholders or interested parties at large, usually external to the area of interest.

[0004] Thus, a need exists for improved systems and methods for providing a true value of an entity in the area of interest.

SUMMARY OF THE INVENTION

[0005] It is apparent that a need exists for a technique whereby a numerical index, or plurality of indices, are generated to precisely reflect the aggregate sentiment of interested parties, stakeholders, experts and the like in regard to a particular area of interest and observation, however so specific or general. Aggregate sentiment that is assessed using analysts has a number of drawbacks, including no standard methodology; time-consuming methods; outdated methods; subjective reports from analysts; difficult-to-understand reports; and high cost. It is further apparent that a need exists to present informative items, related to an area of interest, in ways providing the most expedient information flow and most expedient gathering of sentiment feedback from observers. The invention is directed toward providing such techniques.
This invention relates to a method and system for the generation of a numerical index, or plurality of indices, characterizing a socially observable area of interest. The numerical index may be indicative of a value of an entity in the area of interest. Particularly, this invention relates to novel techniques for gathering quantitative and/or qualitative input from observers of an area of interest, attributed by observable informative items characterizing said area of interest, and transforming said input into a numerical index, or plurality of indices, reflecting the aggregate sentiment of the collection of participating observers of varying degrees of expertise and level of influence in said area of interest.

This invention is applicable in areas of interest such as evaluating the characteristics of corporate behavior and performance as traditionally and conventionally only characterized heretofore by standardized financial data and metrics. Furthermore, this invention is applicable in areas of interest that can be attributed by news articles consumable by an observant public, and where members of that public have varying degrees of expertise. The invention can be applicable to other areas of interest for polling audiences on certain characteristics, such as (but not limited to), of a product, sports team, individual athlete, celebrity, company, news, or other areas.

It is an object of the invention to provide a method and a system for gathering significant volumes of sentiment input from observant social participants. It is also an object of the invention to provide a method and a system for reducing the plurality of such sentiment input to a numerical index, or plurality of indices, that accurately and precisely characterize the sentiment in an area of interest or some facet therein. Another object of this invention is to provide a method to produce quantitative correlations between the sentiment indices it generates and the conventional or traditional metrics associated with a particular area of interest. A further object of this invention is to provide updates to the product numerical sentiment indices in real time and with high frequency. A specific object of this invention is to provide a method and a system for producing social sentiment indices, or "comprehensive crowd sentiment scores", that characterize corporate behavior and performance based upon observations, upon known, related information sources, made by interested stakeholders of varying levels of expertise and influence. These and other objects of the invention will be apparent to those skilled in the art from the description that follows.

The methods and the systems described herein provide informative entities, in large quantity, such as news articles, expert opinions that had not been published before or attributed to a certain area of interest, or distillations or derivatives thereof, that yield current information about an area of interest to an observing public and enabling the observers to
register feedback, over a continuum of time, upon one, many, or all the informative entities in a manner from which a quantitative characterization can be derived. An example of such manner is a moveable meter on a computer display, with the meter being associated with a single informative entity. This capability can be replicated for all informative entities for all areas of interest for all observers, and the feedback from each possible instance comprised of an informative entity in a particular area of interest being reviewed by a particular observer at a particular instant in time. In addition, the observers can be classified corresponding to their level of expertise or influence in the area of interest, and the quantitative characterization of their feedback can be weighted appropriately relative to such a classification scheme. All quantitative input then emanating from each of these instances may then be formulaically processed to yield an index, or a plurality of indices, that characterize the summary sentiment of the group of observers of each particular area of interest. Furthermore, the gathering of all observer feedback can be performed with the highest update frequency enabled by the information technology apparatus employed, an example being multiple digital computers on a high speed digital network, such as the Internet. In addition, the sentiment indices produced in this manner can be mathematically correlated with any conventional independent metrics possibly also existing in the area of interest to articulate the relationship between sentiment and conventional metrics.

[0010] When operated in the manner prescribed by the method stipulated herein, the method and system of this invention can enable the rapid and real-time gathering and summary feedback of observer sentiment information in a quantitative manner, and additionally enables observer interrogation of such summary sentiment information.

[0011] The method of this invention is particularly suited for areas of interest comprised of corporations with publicly observed qualitative behavior, including financial performance and metrics, such as share prices on a stock exchange.

[0012] The invention advances the art of providing capabilities to gather, summarize, and feed back observer sentiment information, over a given area of interest, or over a plurality of areas of interest, in a quantitative and concurrent, real time manner.

[0013] An aspect of the invention is directed to a method of providing a crowd sentiment-based index for an entity, comprising: displaying, on a visual display of a device, information about the entity; receiving, via the device, feedback from a user of the device providing an evaluation of the entity in a plurality of categories, wherein the categories can include, yet may not be limited to, two or more of the following: leadership, employee responsibility, anti-competitive behavior, business model, data security, data privacy, environment,
corporate governance, human capital, marketing practices, political influence, product integrity, product innovation, social impact, supply chain, sustainable energy use, and sustainable energy production; and calculating, with aid of a programmable processor, an overall entity value score based on the feedback from the user regarding the plurality of categories, thereby assessing social sentiment for the entity.

[0014] In some embodiments, the categories may include three or more of the following: leadership, employee responsibility, anti-competitive behavior, business model, data security, data privacy, environment, corporate governance, human capital, marketing practices, political influence, product integrity, product innovation, social impact, supply chain, sustainable energy use, and sustainable energy production. The method may further comprise displaying, on the visual display of the device, the overall entity value score with information about the entity. The information about the entity may include a news article about the entity. The feedback from the user may be provided via a user input region for each of the plurality of categories shown on the visual display with the information about the entity. The user input region may include a sliding scale, and the user may select a position along the sliding scale indicative of a numeral score for a respective category from the plurality of categories. The sliding scale may have a substantially circular shape.

[0015] The overall entity score may be calculated with aid of the programmable processor, further based on feedback from other users regarding the plurality of categories. A trend confidence in the overall entity score may be displayed with the overall entity score on the visual display of the device. The trend confidence may be displayed as a numerical confidence value calculated using a root mean square error technique. A crowd strength data quality may be displayed with the overall entity score on the visual display of the device. The crowd strength data quality may be displayed as a numerical quality value calculated with aid of the programmable processor, based on a start time and a stop time for consideration of feedback from the user and the other users between the start time and the stop time, and a freshness decay calculation of the feedback from the user and the other users used to calculate the overall entity score. The overall entity score may include a numerical value and a double gradient indicator having a first portion and a second portion, wherein the first portion shows a visual indication of an overall entity score based on the feedback from the user without considering feedback from the other users and the second portion shows a visual indication of an overall entity score based on feedback from the user and the other users.
Further aspects of the invention are directed to a method of providing a crowd sentiment-based index for an entity, comprising: displaying, on a visual display of a device, an overall entity value score for the entity calculated based on feedback from a plurality of users, each user providing an evaluation of the entity in a plurality of categories, wherein the categories can include, yet may not be limited to, two or more of the following: leadership, employee responsibility, anti-competitive behavior, business model, data security, data privacy, environment, corporate governance, human capital, marketing practices, political influence, product integrity, product innovation, social impact, supply chain, sustainable energy use, and sustainable energy production; and displaying information identifying the entity on the visual display with the overall entity value score.

In some embodiments, the visual display of the device may show a plurality of entity identifiers and associated overall entity value scores for each of the entity identifiers. The visual display may further show a numerical amount of change in the value of the overall entity score for each of the entity identifiers. The visual display may show a ticker display that shows the plurality entity identifiers scrolling in a linear fashion along with the associated overall entity value scores and the numerical amount of change. The visual display of the device may show a news article about the entity including the information identifying the entity. The visual display may show a percentage change in the value of the overall entity score. The visual display may show category evaluations for the entity in the plurality of categories, wherein the category evaluations are based on feedback from the plurality of users.

Additional aspects and advantages of the present disclosure will become readily apparent to those skilled in this art from the following detailed description, wherein only exemplary embodiments of the present disclosure are shown and described, simply by way of illustration of the best mode contemplated for carrying out the present disclosure. As will be realized, the present disclosure is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

INCORPORATION BY REFERENCE

All publications, patents, and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication, patent,
or patent application was specifically and individually indicated to be incorporated by reference.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The novel features of the invention are set forth with particularity in the appended claims. A better understanding of the features and advantages of the invention will be obtained by reference to the following detailed description that sets forth illustrative embodiments, in which the principles of the invention are utilized, and the accompanying drawings of which:

[0021] FIG. 1 is a schematic illustration of an embodiment of a method and system allowing a sentiment analytics engine to operate upon flows from a plurality of informative item source, a plurality of areas of interest, and a plurality of observers and contributors.

[0022] FIG. 2 is a flow diagram depicting the computation of temporally contiguous sentiment indices exhaustively over all areas of interest. In a preferable embodiment, the computation is carried out on standard computing devices known in the art.

[0023] FIG. 3a and FIG. 3b show examples of user interfaces through which an observer may select an option to provide sentiment feedback relating to an entity.

[0024] FIG. 4a and FIG. 4b show examples of user interfaces through which an observer may provide feedback in response to one or more questions.

[0025] FIG. 5a and FIG. 5b show examples of user interfaces showing a score indicative of the value of the entity.

[0026] FIG. 6 shows a display providing information about an entity's overall value score as well as scores for specific categories.

[0027] FIG. 7 shows a system for providing crowd-based sentiment indices in accordance with an embodiment of the invention.

[0028] FIG. 8 shows an example of a computing device in accordance with an embodiment of the invention.

[0029] FIG. 9 shows an example of a browser extension tool that may be used to collect user feedback about a web site.

[0030] FIG. 10 shows an example of a feedback region implemented using a browser extension tool.

[0031] FIG. 11 shows an example of a browser extension tool providing a link to a website of a system for providing crowd-based sentiment indices.

[0032] FIG. 12 shows an example of a user interface that displays live updates.
FIG. 13 shows an example of a voting widget.

FIG. 14 shows another view of a voting widget in accordance with an embodiment of the invention.

FIG. 15 provides an example of a ticker figure.

FIG. 16 provides a technical architecture overview in accordance with embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

While preferable embodiments of the invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the invention. It should be understood that various alternatives to the embodiments of the invention described herein may be employed in practicing the invention.

The invention provides systems and methods for providing crowd-based sentiment indices. Various aspects of the invention described herein may be applied to any of the particular applications set forth below or for any other types of feedback. The invention may be applied as a standalone device, or as part of an integrated online valuation system. It shall be understood that different aspects of the invention can be appreciated individually, collectively, or in combination with each other.

Overview

The invention includes methods and systems for generating a numerical sentiment index, or a plurality of sentiment indices, representing the aggregate sentiment of a collection of contributing observers. The contributing observers may retain a range of expertise or influence in an area of interest, and may review informative items relating to said area of interest arising from a source, or plurality of sources. Examples of sources may include newsfeeds, company filings, agency studies, government data, and analyst reports.

In various embodiments, these methods and systems of the invention provide observers with feedback of the values of the sentiment index or indices associated with the area of interest, enabling further sentiment input by additional observers. The feedback provided to an observer may incorporate or aggregate values of the sentiment index or indices from other observers. This feedback looping process can then continue indefinitely and with updates at high temporal frequency.
Furthermore, in various embodiments, these methods and systems of the invention provide observers with a flow of the latest informative items, most recently available from their sources, which can be contemplated for additional sentiment input. Methods and systems of the invention are preferably designed to provide observers with precise numerical representations of the most current possible sentiment associated with an area of interest, in addition to a temporal history of such a numerical representation over arbitrary, selectable ranges of time.

The various functions and methods described herein are preferably embodied within software modules executed by one or more devices possessing general purpose computing capabilities, including, but not limited to, general purpose computers, mobile "smart" phones, tablet computers, or any device possessing a Von Neumann computer architecture. A preferable embodiment also includes computing devices presenting output on visual display units, with a further preference being those with input touch capabilities. In certain preferable cases, some of the various functions and methods described herein can be embodied within hardware, firmware, or a combination or sub-combination of software, hardware, and firmware. Further examples of device or hardware characteristics are described elsewhere herein.

FIG. 1 illustrates a preferable embodiment of the invention comprising a sentiment analytic engine 1, which comprises a sentiment score interpreter 2 that gathers, quantifies, and measures sentiment feedback information corresponding to an informative item in an area of interest 5. The sentiment analytic engine 1 may further comprise a sentiment index aggregator 3 that distributes, for each area of interest, a sentiment index, or plurality of sentiment indices 4. The sentiment index or indices may be mathematically or algorithmically derived from sentiment score information quantified and measured by the sentiment score interpreter 2 for each area of interest. The sentiment score information may be associated with an informative item, being within a plurality of such informative items 5, each associated with sentiment input contributed by an observer, or plurality of observers 8. In some embodiments, the areas of interest may relate to different categories or metrics relating to an entity. The areas of interest may relate to different ways of measuring value, finances, performance, image, publicity, responsibility, or activity of an entity. The areas of interest may be of interest to an investor who may want to invest in an entity, purchase or acquire products and services from the entity, or provide products and services to the entity. The areas of interest may be known as an ESG framework and may typically measure Environmental, Social and Corporate Governance aspects of a company.
FIG. 1 further illustrates a preferable embodiment of the invention additionally comprising an interpreter of informative items 6, which collects, through search techniques known in the art, informative items from available sources 7 relating to a given area of interest. Examples of sources 7 may include structured data. Examples of sources 7 may include unstructured data. Examples of sources 7 may include dynamic web feeds; external structured datasets (e.g., Trucost, EDGAR), NGO sources (e.g., CDP, Echo), and/or company data (e.g., NYSE, NASD, MSCI ACWI). In a preferable embodiment of the invention, the interpreter of informative items algorithmically summarizes the informative items, using summarization algorithms known in the art, to produce compact representations of the original informative items sufficient for ease of consumption by observers and contributors 8. The interpreter of informative items 6 preferably has an additional capability to generate a conventional sentiment score using sentiment computation algorithms known in the art. An available source of informative items 7 may be, for example, a standard known news or analysis source available to the public as a service, providing information items as digital data through the Internet 9 to consumers of such informative items.

In addition to employing summarization algorithms known in the art, to produce compact representations of the original informative items sufficient for ease of consumption by observers and contributors, an algorithm carrying out any or all the steps below can be alternatively employed to produce a compact representation:

- Content parsing. In particular, the algorithm may obtain source text and parse into separate collections of words and sentences.

- Construct an additional separate collection of "commonly used" words to not be included as substantively significant. This collection can include parts of speech such as direct and indirect articles, non-nouns, and other preset words identified as not significant to the area of interest.

- Construct an additional separation collection of words pertinent to the area of interest. (As an example, if the area of interest is a company, the name of the company would be included in the collection.) For each word in the collection, assign a relative numerical weight.

- Traverse the source text and count the occurrences of all words not in the "commonly used" collection.

- Traverse the collection of sentences and ascribe a weight to each as an increasing function of:
The sum of the counts of occurrences of non "common use" words in the sentence within the overall source text.

The sum of the weights of words pertinent to the area of interest.

- Sort the weighted sentences by weight, highest to lowest.
- Display to consumers the sentences from the sorted list do any desirable depth (For example, first five sentences), and interpret this result as a summarization of the source material.

[0046] The method of providing compact representations of the original information may be used by way of example only and is not limiting.

**Sentiment Acquisition Methods**

[0047] A preferable embodiment of the invention provides capabilities for each observer or contributor to efficiently inspect multiple informative items in an area of interest. A preferable mode of presenting a plurality of information items may include augmenting conventional methods of presenting multiple information items simultaneously known in the art, such as computer display "windows", "tiles", and the like, with movement and content selection algorithms enabling rapid consumption and feedback acquisition. The multiple informational items simultaneously displayed may relate to a single entity or multiple entities.

[0048] A preferable embodiment of such algorithms driving the presentation of information items include controlling the duration of time an item is presented proportional to the amount of sentiment feedback upon it, relative to that of other information items being presented.

[0049] Similarly, a preferable embodiment of algorithms driving the presentation of information items include controlling the proportion of display area occupied by the information items with a positively correlated proportion of sentiment feedback relative to that of other information items being presented.

[0050] Another preferable embodiment of a display control algorithm enables information item display duration and display proportion to be controlled by the incident reference counts upon each information item by other information items.

[0051] A further preferable embodiment of the information item display control algorithm displays information items in visual clusters as they relate to particular areas of interest.

[0052] An additional preferable embodiment of a display control algorithm combines the above techniques with preset weights of influence.
An additional preferable embodiment of the invention to acquire sentiment measurements may utilize sentiment values published and/or updated periodically with applicability over known durations of time. These values may then be mapped and scaled to be made mathematically comparable with the observer-driven sentiment metric ranges and further associated with timestamps distributed in a density over the same duration of time proportionate to the significance or relevance of the values in determining sentiment. The resulting sentiment output of this process can then be likened to equivalent observer-driven sentiment input metrics, suitable for processing identical to that for observer-driven sentiment input metrics. The timestamps may be reflective of when data is received (e.g., feedback from one or more users) or when data is calculated (e.g., calculation of a sentiment score or index). The timestamps may be collected with aid of a clock of a device or system.

In some examples, humans may but used to evaluate sentiment of content received from sources. In some examples, machines and/or processors may be used to evaluate sentiment of content received from sources. In some examples, machines and/or processors may be used to evaluate sentiment of content and humans may also be used to evaluate sentiment of content.

An additional preferable embodiment of the invention to acquire sentiment measurements employs natural language processing (NLP) algorithms known presently in the art which detect superlative (positive or negative) sentiment related to attributes of entities described in natural language, textual or audio. The algorithm may be steered, as known in the art, with keywords relating to the particular areas of interest. Ontological connections for different terms may be made. The sentiment output is then made mathematically comparable with the observer-driven sentiment metrics through known mathematical normalization and scaling techniques.

In examples, training the artificial intelligence (AI), associated with NLP, to detect sentiment in programmable categories may be an iterative process of successive refinement based upon setting inputs, observing results, and repeating until a satisfactory level of accuracy is accomplished. In some examples, the scope of a category may be defined, identifying subtopics it covers. Additionally, a calibration test set of article text may be built up. Text relevant to each subtopic that are representative of the target universe of text may be included in the calibration set. Each subtopic may have a few straightforward examples along with more oblique references. A reference might be oblique if it is only a brief mention or it uses less common vocabulary. Additionally, examples for edge cases may be collected, where the subtopic may be distinguished from similar but irrelevant subtopics.
Lexicons, collections of pertinent terms related to, or describing, topics or subtopics, may be defined that correspond to each subtopic. Tests may be run on the text examples, comprising the observation of the accuracy in automatically extracting a topic from raw text given a trial lexicon, and the performance of each lexicon may be evaluated. If the results are acceptable, then thresholds may be set to where relevant oblique references are counted but irrelevant references do not count. When the performance is ambiguous, an evaluation may be performed as to whether the error is consistent. Then either the subtopic may be split, or a problematic edge case may become its own subtopic. The subtopics may then be redefined, more examples may be collected to address the new subtopics, and lexicons may be edited. If the subtopics are already well-defined with enough examples, then some lexicons may be used as filters for other lexicons. Filters may use lexicons to implement boolean logic operations such as "AND" or "NOT."

For example, a topic such as "worker treatment and rights" may include fair pay, occupational safety, and non-abusive treatment of employees. After an initial round of trying to detect all these topics with one signal, it may be found that the signal regularly misses slave labor and worker abuse. As a result, the signal may be split it into two signals, "worker treatment" and "worker abuse." From testing, a couple of problematic edge cases may also be identified. In some examples, events involving the employees of suppliers may not be included. Additionally, senior management may be excluded from the definition of "worker." The way that the workers are referred to may not differ much whether it's the workers of suppliers or a company's own workers. So it may not be easy to narrow the signals themselves to exclude suppliers. It may be easier to detect whether the article is primarily about the supply chain or suppliers in general, and if it is, to disregard worker signals. This is an example of a "NOT" filter on "worker treatment" and "worker abuse." The final formula on the signals in this example is as follows, ("worker treatment" OR "worker abuse") NOT "supply chain"

Score Interpretation Methods

In reference to FIG. 1, a preferable embodiment of the sentiment score interpreter 2, delivers capabilities to tabulate, in preparation for use by the sentiment index aggregator 3, numerical sentiment score values associated with a particular informative item in a particular area of interest 5, provided by a particular contributor 8.

An additional preferable embodiment of the sentiment score interpreter 2, delivers capabilities to algorithmically generate, in preparation for use by the sentiment index
aggregator 3, additional numerical sentiment scores correlated with the known sentiment of
the author of an information item being examined by any or all observers and contributors.

[0061] An additional preferable embodiment of the sentiment score interpreter 2, delivers
capabilities to algorithmically generate, in preparation for use by the sentiment index
aggregator 3, additional numerical sentiment scores generated by applying known automated
sentiment scoring algorithms to textual feedback items, such as "blog comments", associated
with each informative item being examined by any or all observers and contributors.

[0062] An additional preferable embodiment of the sentiment score interpreter 2, delivers
capabilities to algorithmically generate, in preparation for use by the sentiment index
aggregator 3, additional numerical sentiment scores generated by applying known automated
sentiment scoring algorithms to "social media" content relative to the area of interest
associated with each informative item being examined by any or all observers and
contributors. A skilled artisan can appreciate the use of "social media" to obtain sentiment
information.

Sentiment Index Generation Methods

[0063] With reference to FIG. 1, a preferable embodiment of the sentiment index aggregator
3, delivers capabilities to algorithmically generate, as described below, a sentiment index, or
plurality of sentiment indices, associated with each area of interest 4, upon gathering input
from the sentiment score interpreter 2. With reference to FIG. 2, a preferable method
generates sentiment indices for each area of interest at regular, irregular, or arbitrary time
increments 10, as desired by the consumer of the sentiment index, or plurality thereof. A
skilled artisan can appreciate that a mark of time derived by arithmetically summing a prior
mark of time with the new increment can be contemplated as an update time mark 11 for the
sentiment index, or plurality of sentiment indices to be derived.

[0064] In a preferable embodiment, all areas of interest can be represented and maintained as
a collection of computational data resident in the storage subsystems of a computing device
known in the art. A skilled artisan can then appreciate the process of computationally
examining each area of interest sequentially 13 and the capability to repeat the examination
of the sequence an arbitrary number of times 12, preferably indefinite. A preferable
embodiment further allows for the insertion or deletion of unique areas of interest into the
collection.

[0065] In a preferable embodiment, all sentiment score types related to an area of interest can
be represented and maintained as a collection of computational data resident in the storage
subsystems of a computing device known in the art. A skilled artisan can then appreciate the
process of computationally examining each sentiment score type sequentially and the capability to repeat the examination of the sequence an arbitrary number of times. In some instances, the examination may be repeated until a pre-condition is met. In some instances, the examination may be repeated indefinitely. A preferable embodiment may further allow for the insertion or deletion of unique sentiment score types into the collection, corresponding to a given area of interest.

[0066] In a preferable embodiment of the invention, for a sentiment score type under examination, as determined by the sentiment score type examination selection process, within an area of interest under examination, as determined by the area of interest examination selection process, the current numerical value for the sentiment score is acquired from the sentiment score interpreter, in reference back to FIG. 1, for a particular informative item scored by a particular contributor. Preferably, the sentiment score numerical value is associated with the current time mark determined in the time mark incrementing process. A skilled artisan can appreciate the preferable recording of the association of the numerical sentiment score value with the current time mark in the digital storage media of a computing device, as a preferable method for such recording. A preferable method for then generating the temporally contiguous sentiment index, yielding a numerical sentiment index value at an arbitrary time mark, at present or at a past time, aggregated across all informative items associated with a particular area of interest, with associated sentiment scores provided by a contributor, or plurality of contributors, carried out by the sentiment index aggregator process is as follows. In one embodiment, this step of advancing the temporally contiguous sentiment index, for current or future access by consumers of the value yielded, is generated according to the following method. However, skilled artisans will understand from the teachings herein that other methods for computing such a temporally contiguous numerical sequence of values can be used.

[0067] A particular contributing observer that provides a sentiment score can be labeled for this preferable method description. Similarly, a particular informative item in an area of interest can be labeled for this preferable method description. Additionally, the time mark generated in step can be labeled for this preferable method description. For this preferable method description, the sentiment score value provided by the contributor through the sentiment score interpreter, associated with a particular informative item, at a particular time can be labeled . For the purposes of this preferable method description, it will apply to a particular sentiment score type in a particular area of interest, as the skilled artisan can appreciate that it can be applied to each sentiment score type within
each area of interest with no change to the method itself. \( R(t)(u)(i) \) can be considered as a function of three variables, contiguous in time \( t \), and discrete in both \( u \) and \( i \). \( R \) may be a sentiment score given by an observer (e.g., may be one of a plurality of dimension values). A skilled artisan can appreciate these mathematical interpretations. The value of the function at any time \( t \) is the sentiment score, provided by observer \( u \) on informative item \( i \) is defined, in the mathematical terminology know in the art as a "step" function, and with the value of the sentiment score set at the most recently updated time \( t_{ui} \). This value persists until the next update time \( t_{ui} \). For all time prior to the first update time \( t_{ui} \) the function is not defined mathematically. For this preferable method description, the sentiment index value can be labeled \( S(t) \), which is the objective of step 17. In this preferable embodiment, \( S(t) \) is computed by ranging over all \( u \) and all \( i \), multiplying each value of \( R(t)(u)(i) \) found by a weight associated with the particular observer \( u \) and particular information item \( i \), summing these products together and then dividing the completed sum by the sum of all the weights. The skilled artisan can appreciate that the weights can be pre-recorded in digital storage media associated with a computing device and extracted for this calculation. In a preferable embodiment of this invention, the weights can be pre-correlated with the significance of the observer and the significance of the information item.

A further preferable embodiment generates a summary sentiment index by mathematically combining a plurality of sentiment indices related to an area of interest 4 applying a mathematical function that maps multiple scalar values into a single scalar value. A preferable embodiment of such a function is an arithmetic mean. A further preferable embodiment of such a function is a weighted arithmetic mean, with weights set correlated to the significance of a particular contributing sentiment index to the overall summary thusly computed. A preferable embodiment in selecting the plurality of sentiment indices related to an area of interest for summarization would be those indices corresponding to areas of interest subordinate to a particular major area of interest. Examples of this arrangement include scenarios where the major area of interest represents a publicly traded corporation and the subordinate areas of interest represent facets of corporate governance and behavior, such as leadership, employee relations, innovation, supplier or "ecosystem" relations, environmental stewardship, and customer relations.

An alternative embodiment for generating sentiment indices that unifies and weighs the various inputs is described below:
Given:

\[ v(u_{i,g}, d_n, c_{j,k}, s, t_m) = \text{vote value from the} \ i^{th} \text{observer} \ u_g \ \text{of the} \ g^{th} \text{classification group,} \]
\[ \text{in the} \ n^{th} \text{category dimension} \ d_n, \]
\[ \text{for the} \ j^{th} \text{area of interest} c_{j,k} \ \text{of the} \ k^{th} \text{area of interest group,} \]
\[ \text{observing the} \ s^{th} \text{information source,} \]
\[ \text{at the} \ m^{th} \text{past time stamp} \ t_m \ (\text{measured in whole and fractional days}), \]
\[ V_{i,g,nj,km} \]

\( I_g \equiv \text{number of observers in the} \ g^{th} \text{observer classification group} \)

\( I_g(d_n, g, k) \equiv \text{number of observers in the} \ g^{th} \text{observer classification group} \)
\[ \text{who have ever cast a vote value} \]
\[ \text{in the} \ n^{th} \text{category dimension} \ d_n, \]
\[ \text{for the} \ j^{th} \text{area of interest} c_{j,k} \ \text{of the} \ k^{th} \text{area of interest group} \]

\( G \equiv \text{number of observer classification groups} \)

\( N \equiv \text{number of category dimensions} \)

\( J_k \equiv \text{number of areas of interest in the} \ k^{th} \text{area of interest group} \)

\( K \equiv \text{number of area of interest groups} \)

\( M \equiv \text{number of timestamp events} \)

\( v_Q \equiv \text{vote value considered neutral - below which is considered negative, above which positive} \)

\( w_g \equiv \text{weight of} \ g^{th} \text{observer classification group}, \ \forall g \)

\( y_{n,k} \equiv \text{within} \ n^{th} \text{category dimension, weight of} \ k^{th} \text{industry,} \ V_{n,k} \)

\( z_s \equiv \text{normalized weight of} \ s^{th} \text{information source,} \ \forall s \)

\( r \equiv \text{average daily rate of information decay} \)

\( D_a \equiv \text{a}^{th} \text{day within a contiguous sequence of days spanning all} \ t_m \ \text{at which any vote was} \]
\[ \text{made, measured on scale common with the} \ t_m \]
\[ T(p_a, d_n, C_{j,k}) = \text{set of all } t_m \text{ at which votes in the } n^{th} \text{ category dimension } d_n, \]
\[ \text{for the } j^{th} \text{ company } q,u \text{ of the } k^{th} \text{ industry, contained within day } D_a. \]

\[ |T(D_a, d_n, c_{j,k})| = \text{size of set } T(D_a, d_n, c_{j,k}) = \text{daily vote volume in the } n^{th} \text{ category dimension } d_n, \]
\[ \text{for the } j^{th} \text{ area of interest } q,k \text{ of the } k^{th} \text{ area of interest group,} \]

\[ D_a(t_m) = \text{day } D_a \text{ containing } t_m. \]

\[ V_n(c_{j,k}, t_m) = |T(D_a(t_m), d_n, c_{j,k})| = \text{daily vote volume in the } n^{th} \text{ category dimension } d_n, \]
\[ \text{for the } j^{th} \text{ area of interest } c_{j,k} \text{ of the } k^{th} \text{ area of interest group, on day containing } t_m. \]

\[ f(t, t_m) = (1 - r)^{t-t_m} \equiv \text{freshness factor of time } t_m \text{ relative to time } t \geq t_m. \]

\[ f(t, D_a) = (1 - r)^{t-D_a} \equiv \text{freshness factor of day } D_a \text{ relative to time } t \geq D_a. \]
Compute:

\[ \text{Compute:} \]

\[ TS_{i,g,n}(c_{j,k}, t) \equiv \text{sentiment score from the } i^{th} \text{ observer} \]

\[ u_{ig} \text{ of the } g^{th} \text{ classification group,} \]

\[ \text{in } n^{th} \text{ category dimension for the } j^{th} \text{ area of interest } q,u \text{ of the } k^{th} \text{ area of} \]

\[ \text{interest group at time } t \]

\[ = \frac{\sum_{m=1}^{M} \left[ \left( f(t, D_{a}(t_{m})V_{n}(c_{j,k}, t_{m})) f(t, t_{m}) \right) z_{a} \left( v(u_{ig}, D_{n}(t_{m}), c_{j,k}, s, t_{m}) - v_{0} \right) \right]}{\sum_{m=1}^{M} \left[ f(t, D_{a}(t_{m})V_{n}(c_{j,k}, t_{m})) f(t, t_{m}) \right]} \forall i, g, n, j, k \]

\[ = \text{average of } i^{th} \text{ observer vote values, relative to the neutrality origin } v_{0} \]

\[ \text{in } n^{th} \text{ category dimension for area of interest } q,k, \]

\[ \text{weighted by freshness, accompanying companion voting volume,} \]

\[ \text{and information source weight,} \]

\[ TS_{g,n}(c_{j,k}, t) \equiv \text{sentiment score from the } g^{th} \text{ observer classification group} \]

\[ \text{in } n^{th} \text{ category dimension for the } j^{th} \text{ area of interest } q,u \text{ of the } k^{th} \text{ area of} \]

\[ \text{interest group at time } t \]

\[ = \frac{\sum_{l=1}^{l_{g}} [TS_{i,g,n}(c_{j,k}, t)]}{l_{g}(D_{n}, c_{j,k})} \forall g, n, j, k \]

\[ = \text{average in the } g^{th} \text{ observer classification group of individual observer} \]

\[ \text{sentiment scores in } n^{th} \text{ category dimension for area of interest } q,u \]

\[ TS_{n}(c_{j,k}, t) \equiv \text{sentiment score in } n^{th} \text{ category dimension} \]

\[ \text{for the } j^{th} \text{ area of interest } q,u \text{ of the } k^{th} \text{ area of interest group at time } t \]

\[ = \frac{\sum_{g=1}^{G} w_{g} TS_{g,n}(c_{j,k}, t)}{\sum_{g=1}^{G} w_{g}} \forall n, j, k \]

\[ = \text{average sentiment scores over all observer classification groups,} \]

\[ \text{weighted per each such group} \]
**Sentiment Index Correlation Methods**

[0070] A preferable embodiment of the invention enables the consumer of sentiment indices, generated within the capabilities of the invention, to additionally consume information characterizing the correlation of the generated sentiment indices with known, published indices in the area of interest. A skilled artisan can appreciate the use of known mathematical correlation techniques for determining correlation metrics between the sentiment indices generated by embodiments of the invention and known indices characterizing the area of interest.

[0071] A further preferable embodiment of the invention teaches the correlation of sentiment indices, in areas of interest relating to corporate behavior, with rapidly changing conventional
financial indicators including, but not limited to, stock price, related derivative indicators, and other rapidly changing known financial indicators.

**Aggregate and Constituent Peer Comparative Metrics**

[0072] A preferable embodiment of the invention enables the consumer of sentiment indices, generated within the capabilities of the invention, to additionally consume information articulating the collective behavior of, and relationships among, the constituents within groups of areas of interest. Information collected to various groups may be compared and/or differentiated. In some embodiments, information may be displayed relating the comparison of data relating to sentiment indices gathered from different groups.

**Aggregate Statistics**

[0073] To indicate aggregate behavior of the indices corresponding to constituents of a collection of areas of interest, a preferable embodiment of the invention enables the consumer to view a display of, and/or obtain a report of, statistics computed across the collection, including, but not limited to, mean, median, and standard deviation. Such statistics may be individualized for different groups or areas of interest.

**Constituent Peer Comparisons**

[0074] To indicate behavior of the indices corresponding to constituents of a collection of areas of interest, relative to other constituents within the same collection, a preferable embodiment of the invention enables the consumer to view a display of, and/or obtain a report of, comparative metrics of the index corresponding to each constituent relative to those of other constituents, selected groups of constituents, or relative to aggregate statistics across the collection.

[0075] A preferable embodiment of the invention computes comparative metrics among indices of constituents of a collection of areas of interest, relative to other constituents within the same collection, by applying the technique known in the art as "Data Envelopment Analysis" or "DEA." Such techniques may be applied such that the "outputs" in the known DEA technique are the sentiment indices and the "inputs" can be any quantitative indicators known or hypothesized to have a causal relationship with the sentiment indices of the areas of interest within the collection. The consumer can then view, or obtain reports containing, the standard statistics generated by the DEA technique to assess the behavior of the indices of the peer constituents within the collection relative to one another.

[0076] In some specific applications of the invention, the areas of interest may be economic entities such as corporations and the sentiment indices may relate to measures in domains including, yet not limited to, anti-competitive behavior; business model; data security &
privacy; leadership/governance; product innovation/integrity; environmental responsibility that includes environmental atmosphere, environmental land, and environmental water; human capital topics such as employee responsibility/workplace; marketing practices; political influence; product integrity & innovation; social responsibility/impact; supply chain; sustainable energy use & production; and/or custom categories such as economic sustainability.

[0077] Anti-competitive behavior may focus on firms' use of anti-competitive practices to prevent or restrict competition. This may include, but is not limited to, predatory pricing, transfer pricing, price fixing, geographic monopolies and dividing territories, dumping, exclusive dealing, and bid rigging. Business model may focus on firms' development of strategies to create and deliver value in the short-term and/or the long-term, minimize or mitigate systemic risks and negative externalities as relevant, and avoid controversial business practices. Data security & privacy may focus on firms' data security practices and policies, as well as on its privacy policies and practices related to customer data.

[0078] Environmental atmosphere may focus on all environmental impacts on the atmosphere at the local and/or global levels, such as greenhouse gases, climate change, mercury, and/or other emissions. Environmental land may focus on environmental impacts on land, such as biodiversity, deforestation, solid waste disposal, soil pollution, land degradation, and rehabilitation. Environmental water may focus on environmental impacts of water resources, such as waste water, water pollution, aqua bio-diversity, and water efficiency.

[0079] Governance may focus on a firm's relation of top management and the board to its stockowners and key stakeholders. Considerations may include ownership structure, voting and proxy processes, board structure and tenure, ethical business practices, and executive compensation arrangements. Governance may exclude dividend reporting. Human capital may focus on the treatment of both unionized and non-union employees according to generally accepted international fair labor standards. Relevant issues may include employee retention, education and training, health and safety, compensation and benefits, as well as diversity and mentoring programs. Marketing practices may focus on information accuracy and completeness, transparent labeling, appropriate marketing channels, and the incorporation of social and environmental considerations as appropriate.

[0080] Political influence may focus on firms’ lobbying practices and attempts at regulatory capture, as well as undue influence to the degree that these activities may undermine the ability of the political structure and governmental agencies to serve the public interest.
Product integrity & innovation may focus on the quality and innovativeness of products and service, as well as the research and development of products in the pipeline. Product integrity & innovation may also include the management of packaging and disposal over the product's life cycle. Social impact may focus on recognized international human rights standards, impact on relationships with relevant communities and key stakeholders as well as philanthropy and charity.

[0081] Supply chain may focus on firms' logistical organization and coordination with its suppliers, including social and environmental conditions and impacts. Supply chain may also include adherence to supply chain labor standards, sourcing controversial raw materials, and adherence to or development of industry best practices. Sustainable energy use & production may focus on firms' use and production of sustainable energy forms, including those that minimize negative externalities, such as wind and solar power. It may also include how efficiently firms use energy inputs. Custom categories may be used to create data categories and weighting systems according to user specifications.

[0082] In such application, comparative metrics may be computed among indices of constituents of a collection of areas of interest, relative to other constituents within the same collection, by applying the DEA sets the "outputs" technique as the sentiment indices and the "inputs" can be any quantitative indicators known or hypothesized to have a causal relationship with the sentiment indices of the areas of interest within the collection, including, but not limited to, standard economic and financial metrics related to the economic entity, such as return on assets (ROA), return on investment (ROI), and EVA (economic valued added). The consumer can then view, or obtain reports containing, the standard statistics generated by the DEA technique to assess the level of "efficiency" with which economic inputs were deployed to achieve the sentiment levels corresponding to the sentiment domains described above.

Temporal Metrics and Instrumentation

[0083] A preferable embodiment of the invention enables the consumer of sentiment indices, generated within the capabilities of the invention, to additionally consume information articulating the behavior of the indices over time as described below.

Moving Averages

[0084] To depict aggregate temporal behavior of the index over selectable windows of time, a preferable embodiment of the invention enables the consumer to view a curve representing the moving average of the index over time. A skilled artisan can appreciate the use of known mathematical techniques for computing the simple moving average, the cumulative moving
average, the weighted moving average, and the exponential moving average. Any or all these are applicable in displaying moving average behavior of a sentiment index to a consumer in conjunction with the temporal behavior of the sentiment index itself.

**Aggregate Statistics and Constituent Peer Comparisons over Time**

[0085] To depict temporal behavior of collections of indices over selectable windows of time, a preferable embodiment of the invention enables the consumer to view curves representing any or all aggregate statistics and constituent peer comparisons as functions of time. Graphical representations may show peer-to-peer comparisons, peer-to-groups of peer comparisons, groups of peers-to-groups of peers comparisons, peer-to-entire aggregation comparisons, or groups of peers-to-entire aggregation comparisons.

**Trends**

[0086] To further depict aggregate temporal behavior of the index over selectable windows of time, a preferable embodiment of the invention enables the consumer to view a curve representing a mathematically fit trend. A skilled artisan can appreciate the use of known mathematical techniques for computing polynomial fit curves of selectable degree, periodic fit curves, and exponential fit curves. Any or all these are applicable in displaying trending behavior of a sentiment index to a consumer in conjunction with the temporal behavior of the sentiment index itself.

**Alerts**

[0087] To further inform temporal behavior of the index, or any derivative function of time of an index or indices, over selectable windows of time, a preferable embodiment of the invention enables the consumer to view, or receive remotely, alerts indicating index changes within fixed, moving, or dynamically expandable windows of time triggered by fixed, moving, or dynamically expandable thresholds, keyed from the start of the time window, or most recent time the threshold is exceeded, or any combination thereof. Such alerts may be delivered to the consumer by any known route (e.g. email, text message, pop-up, phone call, or through a mobile application. The consumer may define how they consumer wishes to receive the alert. The consumer may define which alerts the consumer wishes to receive, and/or thresholds for providing alerts. The consumer may define the time window, such as a start and/or end time for the time window.

**Trend Confidence Metric**

[0088] For a given trend as described above, to provide an indication that the trend will continue into the future with its current parameters, enabling predictability, an embodiment of the invention enables the consumer to obtain a figure of merit indicating the confidence that
the trend will continue. Such an indicator may make use of metrics known in the art as goodness of fit. A confidence figure can be computed as follows:

- The root mean square error (RMSE) over a time range of interest between the actual sentiment index time series data and a trend curve may be computed.
- The resultant RMSE can then be embedded within other formulae to represent it in a desired scale and amplification suitable for graphical display in conjunction with the sentiment index itself. This computation can then be computed over the entire range of interest to trace a curve of confidence to be displayed in conjunction with the sentiment index itself. An example of such a formula is as follows:
  
  - Trend Confidence = A x (B-C x RMSE/100-D)
  - where A = 10
  - where B = 1
  - where C = 10
  - where D = 0.9

In alternate implementations, other numerical values may be provided for A, B, C, and/or D.

[0089] In a further refinement of this metric, within an alternative embodiment of the invention, a predictive period of time, dt, may be selected by the consumer, in addition to a prior fit period of time T. A trend calculation can then be performed as described above for a selected fit type to generate the fit parameters that can then extend the curve beyond the fit period T by the selected predictive period dt. Error calculations may then be performed between the predicted curve and the actual data over the interval dt and the confidence figure may be computed for that range, rather than the fit range as described above.

Sentiment Index Correlation and Trend Applicability to Forecasting

[0090] To provide the ability to forecast an index characterizing the area of interest, a correlation calculation between the sentiment index and the index characterizing the area of interest can be performed and extrapolated to estimate a forecasted value of the index characterizing the area of interest. A skilled artisan can appreciate the use of known mathematical techniques for computing correlated trends that are extrapolable into the future to obtain estimates of future values, at chosen durations into the future, of one or all of the correlated variables. A preferable embodiment of conducting such a calculation is the use of neural networking algorithms, using time sequences of multiple indices to train the network and then applying the trained network to forecast future values of the indices.
A further preferable embodiment of the invention teaches the forecasting temporal correlation of sentiment indices. In some examples, real-time sustainability data may be of a comparable nature to stock price performance. Additionally, real-time sustainability data may be an ideal leading indicator of associated stock price performances or other frequent financial measures due to the high-frequency nature of the real-time sustainability data. In some examples, the forecasting temporal correlation of sentiment indices may be used in areas of interest relating to corporate behavior, with rapidly changing conventional financial indicators including, but not limited to, stock price, related derivative indicators, index volatility, company volatility, and other rapidly changing known financial indicators.

Observer Concentration Metric

To provide an assessment of the crowd strength data quality of a particular sentiment index, an embodiment of the invention enables the consumer to query a metric indicating the concentration of observers of various observer classes convolved with the recentness or "freshness" of the observer sentiment. One or more of the following steps may be implemented to compute such a metric:

- Receive the start and stop date/times for the range of interest as input from the consumer.
- Retrieve weighting factors to be applied to each class of observer from an internal database. There may be a one-to-one mapping between weights and observer classes.
- Retrieve the freshness decay rate from the database. This may be a number that will exponentially decay the shelf life of a particular observation over time using a formula below, similar to that of compounded interest (but in reverse). Thus, a more recent observation may be accorded greater weight.
- Retrieve the freshness de-compounding period from persistent data storage. In embodiments of the invention where observable informative items are news items, an exemplary decompounding period would be one day, as that is the nominal news cycle that would suggest a canonical refresh period. Any other time periods may be provided for decompounding periods, such as 1 year, 1 quarter, 1 month, several weeks, 1 week, several days, 1 day, several hours, 1 hour, 30 minutes, or 10 minutes.
- From the start date/time to the stop date/time, compute a weighted sum of all counts of observations, within each de-compounding period distributed between the start date/time and the stop date/time, over all observer classes, each with its associated weight. The result of this step may be a partial sum of weighted components for each
de-compounding period subdividing the time range between the start date/time and the stop date/time.

- Apply to each of those partial sums an additional freshness factor weight. The freshness factor is computed as \( f = (1 - r)^n \), where \( r \) may be the freshness decay rate and \( n \) may be the number of freshness de-compounding periods within the time interval between the time of the observation and the stop date/time. The result of this step will be partial sums multiplied by their appropriate freshness factor.
- Sum all such partial sums to obtain the current sum value for entity of interest.
- Retrieve the global maximum of this same sum (obtained by applying this same weighted sum method on all entities and storing the maximum value found).
- Divide the sum by the global maximum to obtain the normalized Observer Concentration Metric and express as a percentage.
- Compute this quantity for points in time between the start date/time and the stop date/time at a desired time resolution and plot as a curve accompanying the sentiment index itself.

[0093] To refine the value of the freshness decay rate, an algorithm may be employed that may sample the pool of observation data to characterize a canonical rate of change as follows:
  - At a sampling rate equal to the freshness de-compounding period, sample all observations determine the average percent change of sentiment value between each sample and the next consecutive one in the time series.
  - Set this average value as the freshness decay rate.

Long Term Sentiment Value Accumulation Metric

[0094] To reflect the cumulative effects of sentiment over time, a consumer may query a metric indicating the sustainability of the sentiment level over extended periods of time. A preferable embodiment of the invention may implement the following to compute such a metric:
  - The metric for an entity can increase its value in a period of time, \( T \), by some fixed metric maximum for that period of time, \( M \), if it maintains a constant maximum sentiment value, \( m \), for each sampling period, \( dt \), over the period of time. If the sentiment value, \( v \), varies below this maximum for intervals within the period of time, then the accumulated metric will be lower at the close of the period. In addition, if the sentiment value varies below a set minimum, \( m \), then the contribution to the metric at
that sampling point will be negative. The contribution to the metric for a sampling period \( k \) may be computed as: 
\[
c(k) = 1 + M \frac{dt}{T} \frac{v}{m - 1}.
\]
The metric \( L(k+1) \) for sample \( k+1 \) may then be computed recursively as 
\[
L(k+1) = c(k) \cdot L(k).
\]
Over time, value can accumulate in a compounded way as it would in a financial asset.

### Trend Alerts

[0095] To provide an indication that a trend may be changing, or if a trend is deviating from a trend of another index associated with an entity, a consumer may obtain alerts when these triggers are detected. A preferable embodiment of calculating the conditions for such triggers is as follows:

- **Parameters and Variables:**
  - \( T \): time window for examining possible trend change
  - \( dV \): change slope of a sentiment index linear segment fit
  - \( dS \): change slope of a comparable index linear segment fit
  - \( VdS \): \( \text{AbsoluteValue}(dV - dS) \)
  - \( adV \): threshold of \( dTV \) above which an alert will be signaled
  - \( aVdS \): threshold of \( TVdS \) above which an alert will be signaled

- For the sentiment index curve, a "tail fit" may be applied per the subfunction below to obtain \( dV \)
  - If \( (dV \geq adV) \) \( \Rightarrow \) an alert may be issued suggesting the sentiment index may be breaking into a new trend

- For the comparable index curve, a "tail fit" may be applied per the subfunction below to obtain \( dS \)
  - Compute \( VdS \)
  - If \( (VdS \geq aVdS) \) \( \Rightarrow \) an alert may be issued suggesting the sentiment index may be leading the comparable index in a new direction, up or down

**Subfunction for computing "tail fit" to a curve:**
- Given time window \( T \), collect all points on the curve from present time - \( T \) to present time
- Conduct a linear regression fit of those points (polynomial of degree 1 or just a linear fit - either one works)
- Produce the linear parameters of the fit, including the slope
Volatility Metrics

[0096] To provide an assessment of the time series volatility of a particular sentiment index, an embodiment of the invention enables the consumer to query a metric indicating a relative magnitude of index variability over time. An embodiment of the invention can include one or more of the following steps to compute a volatility metric:

- Collect a time-ordered series of nodes consisting of value pairs consisting of a time stamp measured to any precision and a corresponding value, which can be a sentiment index. The range of time can be arbitrary (e.g. within one week, one month, one year, etc.)
- Apply a fractal dimension determination algorithm known in the art to a time-ordered series of time value pair nodes.
- Scale to a preferable or predetermined magnitude range a fractal dimension value measured upon a time-ordered series of time-value pair nodes.
- Interpret a scaled fractal dimension value measured upon a time-ordered series of time-value pair nodes as a volatility index for the values in the nodes, which can be sentiment index values.

[0097] Another embodiment of the invention can include one or more of the following steps to compute a volatility metric:

- Collect a time-ordered series nodes consisting of value pairs consisting of a time stamp measured to any precision and a corresponding value, which can be a sentiment index.
- Measure a length metric of the polygon or curve traced out by a time-ordered series of time value pair nodes.
- Compute the two-dimensional bounding box, known in the art, of a time-ordered series of time value pair nodes.
- Compute the diagonal of a two-dimensional bounding box, known in the art, of a time-ordered series of time value pair nodes.
- Divide the a length metric of the polygon or curve traced out by a time-ordered series of time value pair nodes by the diagonal of a two-dimensional bounding box, of a time-ordered series of time value pair node.
- Scale to a preferable or predetermined magnitude range the quotient obtained by dividing the a length metric of the polygon or curve traced out by a time-ordered series of time value pair nodes by the diagonal of a two-dimensional bounding box,
known in the art, of a time-ordered series of time value pair nodes and interpret as a volatility index for the values in the nodes, which can be sentiment index values.

[0098] A third embodiment of the invention can include one or more of the following steps to compute a volatility metric:

- Collect a time-ordered series nodes consisting of value pairs consisting of a time stamp measured to any precision and a corresponding value, which can be a sentiment index.
- Compute the standard deviation of the value coordinates in the above collection.
- Compute the mean of the value coordinates in the above collection.
- Divide the above computed standard deviation by the above computed mean and set the result as the measurement of volatility.

Volatility Metric Correlations

[0099] To provide an assessment of the relationship of a time series volatility of a particular sentiment index and a published time series indicating volatility obtained by means outside the scope of this invention, yet of additional interest to observers, an embodiment of the invention may enable the consumer to query correlation metrics indicating a strength of relationships between the volatility metrics computed by the invention and external indices of interest. Correlations of this kind can be obtained using statistical correlation methods known in the art and providing the results of such analyses to the consumer. An embodiment of the invention can correlate stock price action beta metrics with volatility indices computed by the invention.

Machine Interfaces

[00100] A machine interface may be provided through which sentiment feedback information including indices, metrics, statistics, instrumentation, and/or alerts regarding an entity may be consumed through programmable machine interfaces through standard computer/machine communication media, connections, and/or networks. The entity may be a company, corporation, partnership, venture, individual, organization, or business. In a preferable embodiment, the machine interface can further modify the mathematical presentation of the sentiment feedback information, including, but not limited to applying filters and/or numerical weights related to entity information sources, entity categories, aggregate collections of entities.

[00101] In an additional preferred embodiment, a machine interface may be provided through which areas of interest, entities, categories, and/or entity information items and
sources can be specified from which sentiment feedback information and all derivative outputs described within this invention can be produced.

User Interface

[00102] A user interface may be provided through which observer feedback may be solicited regarding an entity. The observer may also be able to view a score indicative of the value of the entity. The entity may be a company, corporation, partnership, venture, individual, organization, or business. In one example, the entity may be a publicly traded company. Alternatively, the entity may be a private company. The score may be a numerical value representative of the value of the company. Value may refer to crowd-based sentiment, performance, financial value, or any other index.

[00103] In some implementations, entity articles may be displayed on a user interface subject to observer preferences, the significance of the article, or related entity. The entity articles may be provided by the entity, or may be about the entity.

[00104] Presentation variations on a user interface may relate to the speed/cycle of an update, size of display area dedicated to the information (e.g., tile size), highlighting, and/or other visual cues.

[00105] FIG. 3a and FIG. 3b show examples of user interfaces through which an observer may select an option to provide sentiment feedback relating to an entity, in accordance with an embodiment of the invention. In some embodiments, the user interface may show information 310, 330 about the entity. For example, the information may be an article, news, financial tracker, tweet, posting, blog, or any other information relating to the entity.

[00106] In some embodiments, the user interface may also include a region 320, 340 through which the observer may select the option to provide feedback. The feedback region may be implemented as a widget, may be displayed on a browser or application, or may be implemented in any other fashion. In some instances, the feedback region may be presented as a button, pop-up, drop-down menu, pane, or any other user interactive region.

[00107] Information about the entity 310, 330 and the region through which the observer may provide feedback 320, 340 may be simultaneously displayed. The user may provide feedback about the displayed entity via the region.

[00108] FIG. 4a and FIG 4b shows examples of user interfaces through which an observer may provide feedback in response to one or more questions. Information 410, 450 about the entity may be displayed. A feedback region 420, 460 may be displayed through which the observer may provide feedback.
The feedback region 420, 460 may include a general query 430, 470. The general query may relate to the value of the entity. For example, the general query may ask how the entity is performing overall. Entity performance can be determined according to different categories or metrics. One or more specific queries 440, 480 may also be displayed. The specific queries may relate to one or more different categories or metrics relating to the general query. For example, if the general query asks how an entity is performing, the specific queries may relate to different areas or categories of how the entity is doing. For example, the specific categories may include, yet may not be limited to, leadership/governance, product innovation/integrity, environmental responsibility, employee responsibility/workplace, social responsibility/impact, and/or economic sustainability. In some instances, five distinct categories may be provided. In alternative embodiments, one, two, three, four, five, six, seven, eight, nine, ten, or more categories may be provided in order to assess entity value or performance.

In some instances, the feedback region 420, 460 may include a visual representation 442 of each category for the specific queries 440, 480. For example, the visual representation may be an icon or picture (or tool tip or helper text) representative of categories, such as leadership, innovation, environmental responsibility, employee responsibility, social responsibility and/or economic sustainability. Such visual representation may create a broader idea of specific category.

One or more interactive tool may be provided through which the observer may provide feedback. For example, as shown in FIG. 4a, a linear slider bar 444 may be provided through which the observer may select where the entity falls in the spectrum from each category. For example, the observer may select where along the spectrum of leadership, innovation, environment, employee responsibility, and/or social responsibility the entity falls, and may adjust the placement of the slider bar accordingly. In another example, as shown in FIG. 4b a circular slider bar 484 may be provided that may function in a similar manner to the linear slider bar. The circular loop may permit an observer to select where the entity falls in the spectrum from each category. The observer may select a position along the circumference of the loop correlating to where the entity falls within each category. The selected position may slide about the circumference of the loop. The slider bar (e.g., the linear slider bar, the circular slider bar) may be an example of a gradient feedback tool.

The interactive tool may permit the observer to easily and simply provide feedback. For example, the observer may provide feedback without having to type in any letters, words, or numbers. The observer may drag a visual indicator into a desired position,
or click or touch a desired option. In an alternative to a slider bar, one or more options may be provided that the user may select. Such tools may make it easier to quickly allow an individual to express his or her opinion. An individual may express an opinion with a single click, touch, or drag.

In some instances, category values 446, 486 may be displayed in the feedback region. For example, each category may have a category value reflecting a numerical value for each category. The numeral value may correspond to the placement of the slider on the slider bar 444 or circular bar 484. For example, moving a slider along a linear slider bar 444 to the right may increase the numerical value, and moving the slider to the left may decrease the numerical value. The category value 446 may be provided in the same row or column as the linear slider bar and may be adjacent to the slider bar. In another example, moving a slider about a loop in a clockwise direction relative to a top position or other starting position in a circular bar 484 may increase the numerical value, and moving the slider value closer to the starting position may decrease the numerical value. The category value 486 may be positioned within the loop and/or may be circumscribed by the circular bar.

In one example, the numerical value for each category may fall between 0 and 100. The numerical value may be adjacent to the slider bar or within a circular bar. In one example, an entity, such as a company, may receive numerical scores for categories such as leadership, employee responsibility, anti-competitive behavior, business model, data security, data privacy, environment, corporate governance, human capital, marketing practices, political influence, product innovation, social impact, supply chain, sustainable energy use, and sustainable energy production.

In some instances, the placement of the slider on the slider bar may also be associated with a color scheme, representing emotional attachment to the related category. For example, the color scheme may reach from red representing disagreement to green representing agreement. In some instances, red (or another selected color) may correspond to a lower numerical value while green (or another selected color) may correspond to a higher numerical value. A gradient of colors between the selected colors may be provided corresponding to slider position along the slider bar and/or numerical value scale.

In some instances, a default value may be provided on the gradient feedback tool 444, 484. For example, if the user does not provide any feedback, the value may default to midway on a slider bar or circular bar. The numerical category scores 446, 486 may correspondingly have a default value. For example, the numerical category score may default to 50 out of 100, or 5 out of 10, or any other value.
In some embodiments a feedback region 420, 460 may have an expanded form and a contracted form. For example, when the observer selects an option to provide feedback for the entity, the region may expand to display the various categories for which the observer may provide feedback. The feedback region may remain in the same user interface that simultaneously displays the information about the entity 410, 450.

FIG. 5a and FIG. 5b show examples of user interfaces showing a score indicative of the value of the entity. The user interface may show information about the entity 510, 540 and a feedback region 520, 550. The feedback region may show the score, which may be a numerical score 530, 560 indicative of the overall value of the entity. As previously described, the value may relate to crowd-based sentiment, performance, financial value, or any other index. The score may be a crowd-based sentiment index for the entity overall. The score may reflect a 'true value' of the entity.

In some embodiments, the entity value score may be calculated using any of the systems and methods described elsewhere herein. In one example, the entity value score may incorporate category scores from one, two or more categories. For example, the entity value score may be calculated based on scores for: leadership, employee responsibility, anti-competitive behavior, business model, data security, data privacy, environment, corporate governance, human capital, marketing practices, political influence, product integrity, product innovation, social impact, supply chain, sustainable energy use, and sustainable energy production. The categories may be ESG categories. In some instances six or fewer, or five or fewer categories may be provided. In other instances, higher counts of categories may be provided. The overall entity value score may be an average of the various category scores.

In some implementations, the overall entity value score may be a weighted average of the various category scores. For example, category score A may have a weight of 5, category score B may have a weight of 2, category score C may have a weight of 2, and category score D may have a weight of 1. The overall entity value score may be 5 x (average category score A) + 2 x (average category score B) + 2 x (average category score C) + (average category score D). The weights may be selected based on one or more different characteristics (e.g., sector, company focus, industry, current buzz, or other areas). For example, category A may be deemed to be more relevant in certain industries, and may receive a higher weight. In another example, category A may be deemed to relate to a topic that has been receiving a large amount of press attention recently, and may receive a higher weight. The weights may be determined by an observer, administrator, or may be
automatically generated with aid of a processor. The weights may be established in accordance with an algorithm with aid of the processor.

[00121] The various category scores may include scores inputted by the observer that is viewing the overall entity value score. The various category scores may incorporate scores inputted by other observers than the observer viewing the entity value score. The category scores may be updated in real-time, or with a high level of frequency. The overall entity value score may also be updated in real-time or with a high level of frequency. For example, the various scores may be updated every millisecond, every few milliseconds, every second, every few seconds, every half minute, every minute, every few minutes, every half hour, or every hour. The scores may be reflective of crowd-based sentiment and may be gathered from multiple observers. Multiple observers may provide feedback via a feedback region of their respective user interfaces. In some instances, the feedback from each of the observers may be weighted equally. Alternatively, observers with different backgrounds or qualifications may have their feedback weighted differently. For example, observers who are experts in a particular field may have their feedback relating to that field weighted higher than observers who are not experts.

[00122] In some embodiments, in addition to the numerical score 530, 560, the feedback region may have additional visual indicators of the entity true value. For example, if the entity score is in the higher range, a particular color may be displayed. If the entity is in a lower range, a different color may be displayed. Such visual indicators may make it easy for an observer to determine with a glance the overall determined value for the entity.

[00123] In some embodiments, a confidence 570 and/or quality 580 of for the numerical score 560 may be provided. The confidence and/or quality may be calculated using any of the techniques described elsewhere herein. Factors, such as moving averages, trends, trend confidence, observer concentration, freshness, long term sentiment, and/or other factors may be considered. Temporal aspects may be considered in determining the confidence and/or quality of the numerical score. For example, changes over time, or the recentness of data may be considered. A confidence value 570 may be indicative of a confidence that a trend will continue. A higher numerical confidence value may correlate to a greater confidence that the trend will continue. A quality value 580 may be indicative of a concentration and/or freshness of observer input. A higher numerical quality value may correlate to greater concentration and/or freshness of observer input.

[00124] FIG. 6 shows a display providing information about an entity's overall value score as well as scores for specific categories. In some instances, information about an
entity's value may be displayed in a user interface. The user interface may show an entity summary page.

[00125] The entity name 610 may be presented on the user interface. The entity's overall value score 620 may be displayed as a numerical value. In some instances, a stock market index value 630 for the entity may be displayed.

[00126] Information about the entity may be displayed over a window of time. A time selection option 640 may be provided through which an observer may be able to select a window of time from a plurality of options. For example, the windows of time may include 1 day, five days, 1 month, 6 months, or a year. The value and/or index information may be updated to reflect the selected time window.

[00127] The displays may accommodate differing scales of heterogeneous quantities, which may enable an observer to visually correlate relationships. For example, a stock price may be displayed simultaneously with a total and/or category score.

[00128] The user interface may also display various category scores 650 for the entity. For example, numerical values for different categories, such as leadership, employee responsibility, anti-competitive behavior, business model, data security, data privacy, environment, corporate governance, human capital, marketing practices, political influence, product integrity, product innovation, social impact, supply chain, sustainable energy use, and sustainable energy production may be displayed. The various category scores may be used in calculating the entity's overall value score 620. In some instances, an observer may be able to select a category score to receive additional information about the category or the entity's performance within the category.

[00129] In some embodiments, an observer, administrator, or other user may be able to specify which categories to use to specify the overall value score. The overall value score may be personalized to an individual user's needs or desires. For example, if a user does not believe that an innovation score should be a factor of the overall value score, then the user can have the overall value score calculated without factoring in innovation. The user may select one or more categories from a predetermined list of categories. Alternatively, a user may be able to submit a category of the user's own. The categories may be dynamically updated or customized. The user may or may not specify any weighting of the categories in generating the overall value score.

[00130] Additional information 660 about the entity may be displayed on the user interface. The additional information may include a summary of the entity, milestones, or information about management of the entity.
In some instances, articles 670 about the entity or comments relating to the entity may be displayed. The articles may include visual information, a title of the article, the source of the article, and various feedback information.

Browser Extension Tool

FIG. 9 shows an example of a browser extension tool that may be used to collect user feedback about a website. The browser extension tool may provide feedback from any website. For instance, the website may be the website of an entity that provides crowd-based sentiment indices or may be a website of a different entity. The browser plug-in can be directly installed in the browser bar (e.g., Safari, Firefox, Explorer, Chrome) and can pull up a voting widget on a button press. This may permit a user to provide feedback anywhere on the Internet. The score, along with the content source of the website, may be submitted to an entity (and/or server thereof) that provides crowd-based sentiment indices. The feedback may be incorporated into an overall index for the source and/or content.

A website 900 may be displayed on a user interface with aid of a browser. A visual representation of the browser extension tool 910 may be provided on the browser environment. Selecting the browser extension tool may provide an option for a user to log in. An authentication interface 920 may be provided for a user to provide the user's identifier (e.g., email, username) and/or password. Alternatively, a user may be pre-logged in, or may not need to be authenticated to access to the browser extension tool.

FIG. 10 shows an example of a feedback region implemented using a browser extension tool. Selecting a browser extension tool 1010 may result in a feedback region 1020 being displayed. The feedback region may have one or more characteristics described elsewhere herein. The feedback region may include a general query 1030 and/or one or more specific queries 1040. A user may be able to provide a feedback about the specific queries via the user interface.

In some instances, the feedback region 1020 may overlie a website 1000. In some instances, the website may provide content about an entity. The feedback region may include queries about the entity and/or entity performance. The queries in the feedback region may relate to the content of the website, which may be about the entity, or any other types of content as described elsewhere herein.

FIG. 11 shows an example of a browser extension tool providing a link to a website of a system for providing crowd-based sentiment indices. For example a website 1100 may be displayed in a browser. A browser extension tool 1110 may be provided through which a user may provide feedback relating to content of the website. In some
instances, the browser extension tool may provide a link 1120 to another website through which a user may get more information relating to the content of the website. The other website may be a website of a party that calculates and/or provides crowd-based sentiment indices. If the content of the website 1100 relates to an entity, the other website may provide additional information about the entity, such as an overall value score of the entity, category scores for the entity, financial information relating to the entity, articles relating to the entity, or any other information, including information described elsewhere herein.

Tools and widgets

FIG. 12 shows an example of a user interface that displays live updates. General information and/or articles may be displayed 1200. In some instances, the articles may be about one or more companies 1202. The overall value score 1205 for the company may be displayed. In some instances, whenever an article names a company in its headline, an overall value score for the named company may be displayed. The overall value score may be reflective of scores given by multiple users. For example, the overall value score may be a crowd-based sentiment index. In other examples, the overall value score displayed may be reflective of a score provided by a user that is viewing the article.

A live update region 1210 may be displayed. The live update region may be on the left hand side, right hand side, top portion, or bottom portion of the user interface. The live update region may be updated periodically or in real time. The live updates may include information about various companies. For example, the overall value score 1220 of the company may be displayed. Changes to the overall value score of the company may be displayed. The changes may be displayed as numerical score changes 1222 and/or relative percent changes 1224. A visual indicator may be provided whether the changes are positive or negative. The information may scroll through and may be indicative of changes within a given period of time, such as those described elsewhere herein. The changes may reflect real-time changes and/or values.

Other information relating to the companies may be displayed. For example, the appearance of new articles 1230 may be provided. Comments 1240 by other users or individuals to the articles or relating to the company may also be provided. The appearance of the new information may be updated in real time.

The live update region 1210 may be provided so that newer information provided on top or in the front, and older information would scroll downwards or toward the back. As new information is provided, the new information may displace the older information, which may move further down or backwards.
FIG. 13 shows an example of a voting widget. A selected article about a company 1300 or any other type of information relating to a company may be provided. Selecting a company (e.g., by selecting an article about the company) may cause a voting widget 1310 to be displayed. The voting widget may be displayed in any region of the user interface (e.g., left side, right side, top side, bottom side).

The voting widget 1310 may show the company name 1320. One or more categories 1330a, 1330b, 1330c for evaluation may be provided. Examples of such categories may include, but are not limited to, leadership, employee responsibility, anti-competitive behavior, business model, data security, data privacy, environment, corporate governance, human capital, marketing practices, political influence, product integrity, product innovation, social impact, supply chain, sustainable energy use, and sustainable energy production. When a user has already rated a company in a particular category 1330a the user's category score 1340a for the company may be displayed. When a user is in the process of rating a company in a particular category 1330b, the user's category score 1340b may be displayed once the user has entered a value. Optionally a default value may be provided. An expanded view may be provided which may include information or criteria for the user to consider when rating the company. When a user has not yet rated a company in a particular category 1330c, no category score 1340c may be presented. In some instances, a question mark or similar information indicating the category has not yet been rated may be provided.

When a user is rating a company category, a gradient tool, such as a circular bar 1340b may be provided. The user may slide a slider along the circular bar, or any other type of gradient tool. The numerical value may be updated to reflect the position of the slider along the gradient tool. In some examples, arrows 1342 or similar tools may be provided through which the user may manipulate the numerical value directly.

When the user has entered the user's feedback for the various categories, the overall score for the company provided by the user may be shown or displayed. This overall score may be considered in conjunction with overall scores provided by other users to provide a crowd-based sentiment index.

FIG. 14 shows another view of a voting widget 1410 in accordance with an embodiment of the invention. The voting widget may be tied to a company for which information may be displayed 1400. In some instances, the information may be an article about the company.
The voting widget may show the company name 1420. The voting widget may show an overall score for the company 1430. In some embodiments, a confidence 1440 and/or quality value 1450 may also be provided. The overall score may include a double gradient indicator. For example, a double ring voting circle may be shown. An outer ring 1432 may show a current score provided by the user and an inner ring 1434 may show an existing value (e.g., overall value from the combined feedback of other users), or vice versa. The numerical value 1460 displayed for the overall score may be reflective of the current score provided by the outer ring, or the existing value provided by the inner ring. Optionally, comparison value 1465, such as a percent change may be displayed. The percent change may be for the current score relative to the existing value.

The voting widget may show one or more categories 1470. Each of the categories may be representative of a dimension along which the company may be evaluated in determining the overall score. The dimensions may be ESG categories. The overall score may be an ESG rating for the company. The categories may show a score for each of the categories. In some embodiments, each of the category scores may be a double gradient indicator. For example, a double ring may be provided showing the current score for each category as compared to the existing score for the category. Numerical values may also be displayed, which may be reflective of the current category score or the existing category score. A user may be able to manipulate the ring that shows the current score without being able to manipulate the existing score. In some instances, a user may be able to manipulate a slider an on outer ring without being able to manipulate data on an inner ring. The double ring, or double gradient indicator may advantageously provide a simple visual interface through which a user may view how the user's scoring of the company compares to existing scores for the company.

Ticker

FIG. 15 shows an example of a ticker display1500 in accordance with an embodiment of the invention. The ticker display may have a format similar to that as applied to stock and other financial data, and may be utilized for displaying real-time changes in sentiment indices.

In some embodiments, the ticker display may show a company name 1510, as well as an overall value score 1520 for the company. The overall value score may be a numerical value. In some instances, the numerical value may fall between 0 and 100 or between any other two numbers. Optionally, changes 1530 in the overall value score may be displayed. The changes in the overall value score may be a numerical change over a period
of time. In some examples, the period of time may be since the previous day. Other examples of time periods may include years, 1 year, quarters, months, 1 month, weeks, 1 week, days, 1 day, hours, 1 hour, 30 minutes, 10 minutes, or 1 minute. The relative changes 1540 in the overall value score may also be displayed. The relative change may be displayed as a percentage value. The percentage change may be the difference between the current overall value and the previous overall value divided by the previous overall value (or alternatively divided by the current overall value). The previous overall value may be the overall value score at the previous period of time.

[00150] The changes 1530 and/or relative changes 1540 in the overall score may show whether a positive or negative value change has occurred.

[00151] The ticker display may be shown as part of a website or other environment. The ticker may include the company names and related information scrolling. The information may scroll across horizontally or vertically. For instance, an entity name and overall value score for multiple entities may scroll in a linear fashion.

Technical Architecture Overview

[00152] FIG. 16 provides a technical architecture overview in accordance with embodiments of the invention. As seen in FIG. 16, Sources are provided to a Data Server, which then provides information to an Analytics Server. The Analytics Server then interacts with a client through an API. The technical architecture overview as seen in FIG. 16 may be used to implement embodiments of the invention that augment human decision-making by enabling the extraction of meaningful sustainability signals from data sources and generating analytics in real-time.

[00153] In some examples, data is aggregated from one or more sources, such as Sources illustrated in FIG. 16. Examples of sources may include web-based sources (such as web pages), static sources, third-party sources, social media sources, organizationally (company) self-reported sources, auditor sources, insurance policy/payout sources, and legal settlement sources, among others. In examples, a wide variety of data sources may be aggregated to bring together a real-time stream of data. In some embodiments, the data may be particularly related to Environmental, Social, and Governance (ESG) topics. In some examples, the number of data sources may be scalable. In some examples, data sources may include both semantic and quantitative content. In some examples, the data may comprise news content, company-issued data, government agency data, and/or reports from industry associations, NGOs, and watchdog organizations.
Data may be provided to a Data Server, such as the Data Server seen in FIG. 16. The Data Store may include a Data Store. A Data Store may be used to store dynamic and/or static data. Additionally, the Data Server may include a Data Processing component. A Data Processing component may include parsing, tagging, natural language processing, categorization, and/or sentiment processes. Additionally, the Data Server may include a Meta Data component. The Meta Data component may include score series, company profiles, and/or content details, such as the definition of fields, timeframes covered, description of the source, potentially funders of the source, and the like.

Incoming data content may be identified and/or categorized based on data type. Additionally, each data point may be contextualized so as to identify, extract, and categorize relevant sustainability content. In examples, content may be classified according to one of a set number of categories. In some examples, data may overlap between two or more categories. In examples, analytics may be provided on particular topics identified as relevant to a particular user by creating custom categories.

Additionally, both structured and unstructured data points may be normalized within each category. In some examples, each data point may be naturally weighted within the system according to its timeliness, frequency, and intensity through a running sum-based average. In some examples, custom materiality lenses can be developed to weight data points to varying degrees according to sustainability topic, sector, and/or data source.

The Analytics Server of the technical architecture overview may include a Calculations component, an Aggregation component, and an Event Detection component. In some examples, sustainability performance analytics may be generated. In particular, a dynamic scorecard may be generated for each monitored company. The analytics may be updated in real-time so as to display sustainability trends. In examples, each data point may be scored independently. Additionally, each data point may provide the basis for trends that can be displayed either as an aggregated "overall" performance view and/or by a particular category chosen by a user. In some examples, data behind the analytics may be transparent. In some examples, users may have access to the underlying content used to inform a score in the generated analytics.

Once analytics have been performed, data may be augmented with additional platform tools. This is seen in FIG. 16 as data from the Analytics Server passes through an API to a Client. The data may be provided to the Client through a mobile application, a web-based application, and/or another external interface. Platform tools may include financial performance overlays, a research mode to provided quick access to underlying data, the
ability to quickly compare the performance of different companies sectors, and benchmarks, and other tools. In some examples, company pages may be generated that provide quick access to relevant information. In further examples, a customizable alerts system may be provided to draw attention to particular sustainability performance changes. Additionally, a report creation tool may be used to create custom sustainability reports. In some examples, a direct data feed API may be available to quickly integrate data within existing systems.

**System**

**[00159]** FIG. 7 shows a system for providing crowd-based sentiment indices in accordance with an embodiment of the invention.

**[00160]** One or more devices 710a, 710b, 710c may be in communication with one or more servers 720 of the system over a network 730.

**[00161]** One or more user may be capable of interacting with the system via a device 710a, 710b, 710c. In some embodiments, the user may be an observer or contributor that may provide feedback relating to an entity, such as a company. The user may be an individual viewing information about the entity, such as a value for the company. In some instances, the user may be an investor or broker.

**[00162]** The device may be a computer 710a, server, laptop, or mobile device (e.g., tablet 710c, smartphone 710b, cell phone, personal digital assistant) or any other type of device. The device may be desktop device, laptop device, or a handheld device. The device may be a networked device. Any combination of devices may communicate within the system. The device may have a memory, processor, and/or display. The memory may be capable of storing persistent and/or transient data. One or more databases may be employed. Persistent and/or transient data may be stored in the cloud. Non-transitory computer readable media containing code, logic, or instructions for one or more steps described herein may be stored in memory. The processor may be capable of carrying out one or more steps described herein. For example, the processor may be capable of carrying out one or more steps in accordance with the non-transitory computer readable media.

**[00163]** A display may show data and/or permit user interaction. For example, the display may include a screen, such as a touchscreen, through which the user may be able to view content, such as a user interface for providing information about an entity or soliciting feedback about the entity. The user may be able to view a browser or application on the display. The browser or application may provide access to information relating to an entity. The user may be able to view entity information via the display. The display may be capable of displaying images (e.g., still or video), or text. The display may be a visual display that
shows the user interfaces as described elsewhere herein. The display may emit or reflect light. The device may be capable of providing audio content.

[00164] The device may receive user input via any user input device. Examples of user input devices may include, but are not limited to, mouse, keyboard, joystick, trackball, touchpad, touchscreen, microphone, camera, motion sensor, optical sensor, or infrared sensor. A user may provide an input via a tactile interface. For instance, the user may touch or move an object in order to provide input. In other instances, the user may provide input verbally (e.g., speaking or humming) or via gesture or facial recognition.

[00165] The device may include a clock or other time-keeping device on-board. The time-keeping device may be capable of detecting times at which user inputs are made. In some instances, the device may generate a timestamp associated with the user inputs that may be useful for calculating one or more score as described elsewhere herein. The timestamps may be associated with user feedback and useful for determining feedback to include in specified timeframes.

[00166] The device 710a, 710b, 710c may be capable of communicating with a server 720. The device may have a communication unit that may permit communications with external devices. Any description of a server may apply to one or more servers and/or databases which may store and/or access content and/or analysis of content. The server may be able to store and/or access crowd-based sentiment relating to one or more entities. The one or more servers may include a memory and/or programmable processor.

[00167] A plurality of devices may communicate with the one or more servers. Such communications may be serial and/or simultaneous. For examples, many individuals may participate in viewing information about an entity and/or providing feedback relating to an entity. The individuals may be able to interact with one another or may be isolated from one another. In some embodiments, a first individual on a first device 710a may provide feedback relating to an entity, which may affect the entity scores which may be viewed by the first individual and a second individual on a second device 710b. In some embodiments, both the first individual and the second individual may provide feedback about an entity which may be used as at least part of the basis of the entity score calculations which may be viewed by the first individual and/or second individual.

[00168] The server may store information about entities. For example, feedback received relating to various entities may be stored. Entity scores relating to various categories/metrics or overall entity scores may be stored in memory accessible by the server. Information about users may also be stored. For example, information such as the user's
name, contact information (e.g., physical address, email address, telephone number, instant messaging handle), educational information, work information, experience or expertise in one or more category or areas of interest, or other information may be stored.

[00169] The programmable processor of the server may execute one or more steps as provided therein. Any actions or steps described herein may be performed with the aid of a programmable processor. Human intervention may not be required in automated steps. The programmable processor may be useful for calculating and/or updating entity scores. The server may also include memory comprising non-transitory computer readable media with code, logic, instructions for executing one or more of the steps provided herein. For example, the server(s) may be utilized to calculate scores for entities based on feedback provided by users. The server may permit a user to provide feedback via a user interface, such as a widget.

[00170] The device 710a, 710b, 710c may communicate with the server 720 via a network 730, such as a wide area network (e.g., the Internet), a local area network, or telecommunications network (e.g., cellular phone network or data network). Communication may also be intermediated by a third party.

[00171] In one example, a user may be interacting with the server via an application or website. For example, a browser may be displayed on the user's device. For example, the user may be viewing a user interface for entity information via the user's device.

[00172] Aspects of the systems and methods provided herein, such as the devices 710a, 710b, 1710c or the server 720, can be embodied in programming. Various aspects of the technology may be thought of as "products" or "articles of manufacture" typically in the form of machine (or processor) executable code and/or associated data that is carried on or embodied in a type of machine readable medium. Machine-executable code can be stored on an electronic storage unit, such memory (e.g., read-only memory, random-access memory, flash memory) or a hard disk. "Storage" type media can include any or all of the tangible memory of the computers, processors or the like, or associated modules thereof, such as various semiconductor memories, tape drives, disk drives and the like, which may provide non-transitory storage at any time for the software programming. All or portions of the software may at times be communicated through the Internet or various other telecommunication networks. Such communications, for example, may enable loading of the software from one computer or processor into another, for example, from a management server or host computer into the computer platform of an application server. Thus, another type of media that may bear the software elements includes optical, electrical and
electromagnetic waves, such as used across physical interfaces between local devices, through wired and optical landline networks and over various air-links. The physical elements that carry such waves, such as wired or wireless links, optical links or the like, also may be considered as media bearing the software. As used herein, unless restricted to non-transitory, tangible "storage" media, terms such as computer or machine "readable medium" refer to any medium that participates in providing instructions to a processor for execution.

Hence, a machine readable medium, such as computer-executable code, may take many forms, including but not limited to, a tangible storage medium, a carrier wave medium or physical transmission medium. Non-volatile storage media include, for example, optical or magnetic disks, such as any of the storage devices in any computer(s) or the like, such as may be used to implement the databases, etc. shown in the drawings. Volatile storage media include dynamic memory, such as main memory of such a computer platform. Tangible transmission media include coaxial cables; copper wire and fiber optics, including the wires that comprise a bus within a computer system. Carrier-wave transmission media may take the form of electric or electromagnetic signals, or acoustic or light waves such as those generated during radio frequency (RF) and infrared (IR) data communications. Common forms of computer-readable media therefore include for example: a floppy disk, a flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, DVD or DVD-ROM, any other optical medium, punch cards paper tape, any other physical storage medium with patterns of holes, a RAM, a ROM, a PROM and EPROM, a FLASH-EPROM, any other memory chip or cartridge, a carrier wave transporting data or instructions, cables or links transporting such a carrier wave, or any other medium from which a computer may read programming code and/or data. Many of these forms of computer readable media may be involved in carrying one or more sequences of one or more instructions to a processor for execution.

FIG. 8 shows an example of a computing device 800 in accordance with an embodiment of the invention. The device may have one or more processing unit 810 capable of executing one or more step described herein. The processing unit may be a programmable processor. The processor may execute computer readable instructions. A system memory 820 may also be provided. A storage device 850 may also be provided. The system memory and/or storage device may store data. In some instances the system memory and/or storage device may store non-transitory computer readable media. A storage device may include removable and/or non-removable memory.
An input/output device 830 may be provided. In one example, a user interactive device, such as those described elsewhere herein may be provided. A user may interact with the device via the input/output device. A user may be able to provide feedback about an entity using the user interactive device.

In some embodiments, the computing device may include a display 840. The display may include a screen. The screen may or may not be a touch-sensitive screen. In some instances, the display may be a capacitive or resistive touch display, or a head-mountable display. The display may show a user interface, such as a graphical user interface (GUI), such as those described elsewhere herein. A user may be able to view information about an entity, such as overall value score for the entity or category scores for the entity through the user interface. In some instances the user interface may be a web-based user interface. In some instances, the user interface may be implemented as a mobile application.

A communication interface 860 may also be provided for a device. For example, a device may communicate with another device. The device may communicate directly with another device or over a network. In some instances, the device may communicate with a server over a network. The communication device may permit the device to communicate with external devices.

It should be understood from the foregoing that, while particular implementations have been illustrated and described, various modifications can be made thereto and are contemplated herein. It is also not intended that the invention be limited by the specific examples provided within the specification. While the invention has been described with reference to the aforementioned specification, the descriptions and illustrations of the preferable embodiments herein are not meant to be construed in a limiting sense. Furthermore, it shall be understood that all aspects of the invention are not limited to the specific depictions, configurations or relative proportions set forth herein which depend upon a variety of conditions and variables. Various modifications in form and detail of the embodiments of the invention will be apparent to a person skilled in the art. It is therefore contemplated that the invention shall also cover any such modifications, variations and equivalents.
CLAIMS

WHAT IS CLAIMED IS:

1. A method of displaying a crowd sentiment-based index for an entity, comprising:
   receiving, via one or more devices, feedback from a user of the one or more
devices providing an evaluation of the entity in a plurality of categories, wherein the
categories include two or more of the following: leadership, employee responsibility, anti-
competitive behavior, business model, data security, data privacy, environment, corporate
governance, human capital, marketing practices, political influence, product integrity, product
innovation, social impact, supply chain, sustainable energy use, and sustainable energy
production;
   associating the feedback from the user with one or more timestamps reflective
of the time the feedback is provided;
   calculating, with aid of a programmable processor, an overall entity value
score based on the feedback from the user regarding the plurality of categories, thereby
assessing social sentiment for the entity; and
   displaying, on the one or more devices, information relating to the feedback
from the user or the overall entity score collected over a selectable window of time.

2. The method of claim 1 wherein the information displayed includes a comparison
of information relating to the entity with a peer entity, a selected group of peer entities, or a
total aggregated set of entities.

3. A method of generating a numerical index characterizing a socially observable
area of interest, comprising:
   receiving, via one or more participating sources, qualitative and/or quantitative
input providing an evaluation of an entity in a plurality of categories, wherein the categories
include two or more of the following: leadership, employee responsibility, anti-competitive
behavior, business model, data security, data privacy, environment, corporate governance,
human capital, marketing practices, political influence, product integrity, product innovation,
social impact, supply chain, sustainable energy use, and sustainable energy production;
   associating the one or more participating sources of the qualitative and/or
quantitative input with a degree of expertise with respect to the entity and a degree of interest
with respect to the entity;
   calculating, with aid of a programmable processor, an overall entity value
score based on the qualitative and/or quantitative input regarding the plurality of categories,
thereby assessing social sentiment for the entity; and
displaying, on the one or more devices, information relating to the qualitative and/or quantitative input from the user or the overall entity score.

4. The method of claim 3, wherein said calculating further comprises generating an index that characterizes the social sentiment for the entity.

5. A method of providing a crowd sentiment-based index for an entity, comprising:
   displaying, on a visual display of a device, information about the entity;
   receiving, via the device, feedback from a user of the device providing an evaluation of the entity in a plurality of categories, wherein the categories include two or more of the following: leadership, innovation, environment, employee responsibility, and social responsibility; and
   calculating, with aid of a programmable processor, an overall entity value score based on the feedback from the user regarding the plurality of categories, thereby assessing social sentiment for the entity.

6. A method of providing a crowd sentiment-based index for an entity, comprising:
   displaying, on a visual display of a device, an overall entity value score for the entity calculated based on feedback from a plurality of users, each user providing an evaluation of the entity in a plurality of categories, wherein the categories include two or more of the following: leadership, innovation, environment, employee responsibility, and social responsibility; and
   displaying information identifying the entity on the visual display with the overall entity value score.
   receiving, via the device, feedback from a user of the device providing an evaluation of the entity in a plurality of categories, wherein the categories include two or more of the following: leadership, innovation, environment, employee responsibility, and social responsibility; and
   calculating, with aid of a programmable processor, an overall entity value score based on the feedback from the user regarding the plurality of categories, thereby assessing social sentiment for the entity.

7. The method of any of the previous claims, wherein an overall entity value score is updated based on additional quantitative and/or qualitative input received from the one or more participating sources.

8. The method of any of the previous claims, further comprising:
   displaying, on a visual display of the device, the overall entity value score with information about the entity.
9. The method of any of the previous claims, wherein the feedback from the user may be provided via a user input region for each of the plurality of categories shown on the visual display with the information about the entity.

10. The method of any of the previous claims, wherein the user input region is a sliding scale.

11. The method of any claim 10, wherein the sliding scale is configured to accept a selection of a position along the sliding scale to be indicative of a numeral score for a respective category from the plurality of categories.

12. The method of any of claims 10 and 11, wherein the sliding scale has a substantially circular shape.

13. The method of any of the previous claims, wherein a trend confidence in the overall entity score is displayed with the overall entity score on the visual display of the device.

14. The method of any of the previous claims, wherein the trend confidence is displayed as a numerical confidence value calculated using a root mean square error technique.

15. The method of any of the previous claims, wherein crowd strength data is displayed with the overall entity score on the visual display of the device.

16. The method of claim 15, wherein crowd strength data is displayed as a numerical quality value calculated with aid of the programmable processor based on a start time and a stop time for consideration of feedback from the user and other users between the start time and the stop time.

17. The method of any of the previous claims, wherein a freshness decay calculation is performed on input from one or more participating sources.

18. The method of any of the previous claims, wherein the overall entity score includes a numerical value and a double gradient indicator having a first portion and a second portion, wherein the first portion shows a visual indication of an overall entity score based on the feedback from the user without considering feedback from the other users and the second portion shows a visual indication of an overall entity score based on feedback from the user and the other users.

19. The method of any of the previous claims, wherein the visual display of the device shows a plurality of entity identifiers and associated overall entity value scores for each of the entity identifiers.
20. The method of any of the previous claims, wherein the visual display shows a ticker display that shows the plurality entity identifiers scrolling in a linear fashion along with the associated overall entity value scores and the numerical amount of change.

21. The method of any of the previous claims, wherein the visual display of the device shows a news article about the entity including the information identifying the entity.

22. The method of any of the previous claims, wherein the visual display shows a percentage change in the value of the overall entity score.

23. The method of any of the previous claims, wherein the visual display shows category evaluations for the entity in the plurality of categories, wherein the category evaluations are based on feedback from the plurality of users.

24. A method of generating a numerical index characterizing a socially observable area of interest, comprising:

   receiving, via one or more participating sources, content that is associated with an entity;
   
   evaluating the content received from the one or more participating sources to identify qualitative and/or quantitative input providing an evaluation of an entity in a plurality of categories;
   
   associating the one or more participating sources of the qualitative and/or quantitative input with a social sentiment;
   
   calculating, with aid of a programmable processor, an overall entity value score based on the qualitative and/or quantitative input regarding the plurality of categories, thereby assessing social sentiment for the entity; and
   
   displaying, on the one or more devices, information relating to the qualitative and/or quantitative input or the overall entity score.

25. The method of claim 24, wherein each of the plurality of categories are fixed.

26. The method of claim 24, wherein each of the plurality of categories are programmable.

27. The method of claim 24, wherein a portion of the plurality of categories are fixed and wherein a portion of the plurality of categories are programmable.

28. The method of claim 24, wherein the social sentiment comprises a degree of expertise with respect to the entity and a degree of interest with respect to the entity.

29. The method of claim 24, wherein the social sentiment is based on simulated crowd ratings.
30. The method of claim 24, wherein the social sentiment is based on natural language processing.
31. The method of claim 24, wherein the social sentiment is based on artificial intelligence training.
32. The method of claim 24, wherein the social sentiment is based on cognitive computing.
33. The method of claim 24, wherein the social sentiment is based on human crowd ratings.
34. The method of claim 24, wherein calculating an overall entity value score comprises temporal mapping.
35. The method of claim 24, wherein calculating an overall entity value score comprises assessing social sentiment measurements.
36. The method of claim 24, wherein calculating an overall entity value score comprises at least one of averaging, aging, and aggregating social sentiment measurements.
37. The method of claim 24, wherein the information displayed is in a form of at least one of a chart, graph, and table.
38. The method of claim 24, wherein the information displayed is interactive.
39. The method of claim 24, wherein the information displayed is queryable.
40. The method of claim 24, wherein sentiment indices are generated, and wherein the sentiment indices are correlated to other known indices.
41. The method of claim 40, wherein at least one of the other known indices is a financial indicator.
42. The method of claim 41, wherein the financial indicator is selected from the group consisting of stock prices and derivatives of stock prices.
43. The method of claim 24, wherein sentiment indices may be generated, and wherein the sentiment indices may be used in forecasting temporal behavior of known indices.
44. The method of claim 43, wherein at least one of the other known indices is a financial indicator.
45. The method of claim 44, wherein the financial indicator is selected from the group consisting of stock prices and derivatives of stock prices.
46. A non-transitory computer readable medium comprising machine executable code that, upon execution by one or more computer processors, implements a method of any of the previous claims.
47. A system comprising one or more computer processors that are individually or collectively programmed to perform steps of a method of any of the previous claims.
FIG. 2
Q: Why do B and C buy a run for A?

A: To give A money.
FIG. 4a
Pandora redesigns iPad app as iTunes Radio rolls out

The top-selling radio company gives its iPad app users the full major label library plus the entire digital library, offering the same day as Apple is set to launch its competing radio service.
Pandora redesigns iPad app as iTunes Radio rolls out

The long-anticipated radio feature gives its iOS users the first major refresh since the service was rolled out, offering the same capabilities as Apple is now showing in competing radio services.
Box No. II  Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. X Claims Nos.: 11,16
   because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
   Claims 11 and 16 are unclear, because they refer to multiple dependent claims 10 and 15 which do not comply with PCT Rule 6.4(a).

3. X Claims Nos.: 8-10,12-15,17-23,46-47
   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III  Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.
A. CLASSIFICATION OF SUBJECT MATTER
G06Q 30/02(2012.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06Q 30/02; G06F 17/30; G06Q 50/00; G06F 7/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: feedback, input, overall, entity, value, score, assess, social, sentiment

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>A</td>
<td>See paragraphs [0030], [0038], [0045, H0046], claims 1,6-7,10-13,18 and figure 3.</td>
<td>24-28, 30-32, 34-45</td>
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<td>See abstract, paragraphs [0038], [0049]-[0050], [0056] and claims 1,7.</td>
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<td>A</td>
<td>See paragraphs [0027], [0040], [0042], [0118], [0124], [0150], [0162], [0215], [0217], claims 1-2, 4-5, 11-12 and figures 19-20.</td>
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<td>US 2015-0012331 A1 (FIRST CALL CONSULTING, PTE LTD.) 08 January 2015</td>
<td>1-7, 24-45</td>
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<td>See abstract, claim 1 and figures 1-2.</td>
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Further documents are listed in the continuation of Box C.

* See patent family annex.

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
09 September 2016 (09.09.2016)

Date of mailing of the international search report
09 September 2016 (09.09.2016)

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Form PCT/ISA/210 (second sheet) (January 2015)
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