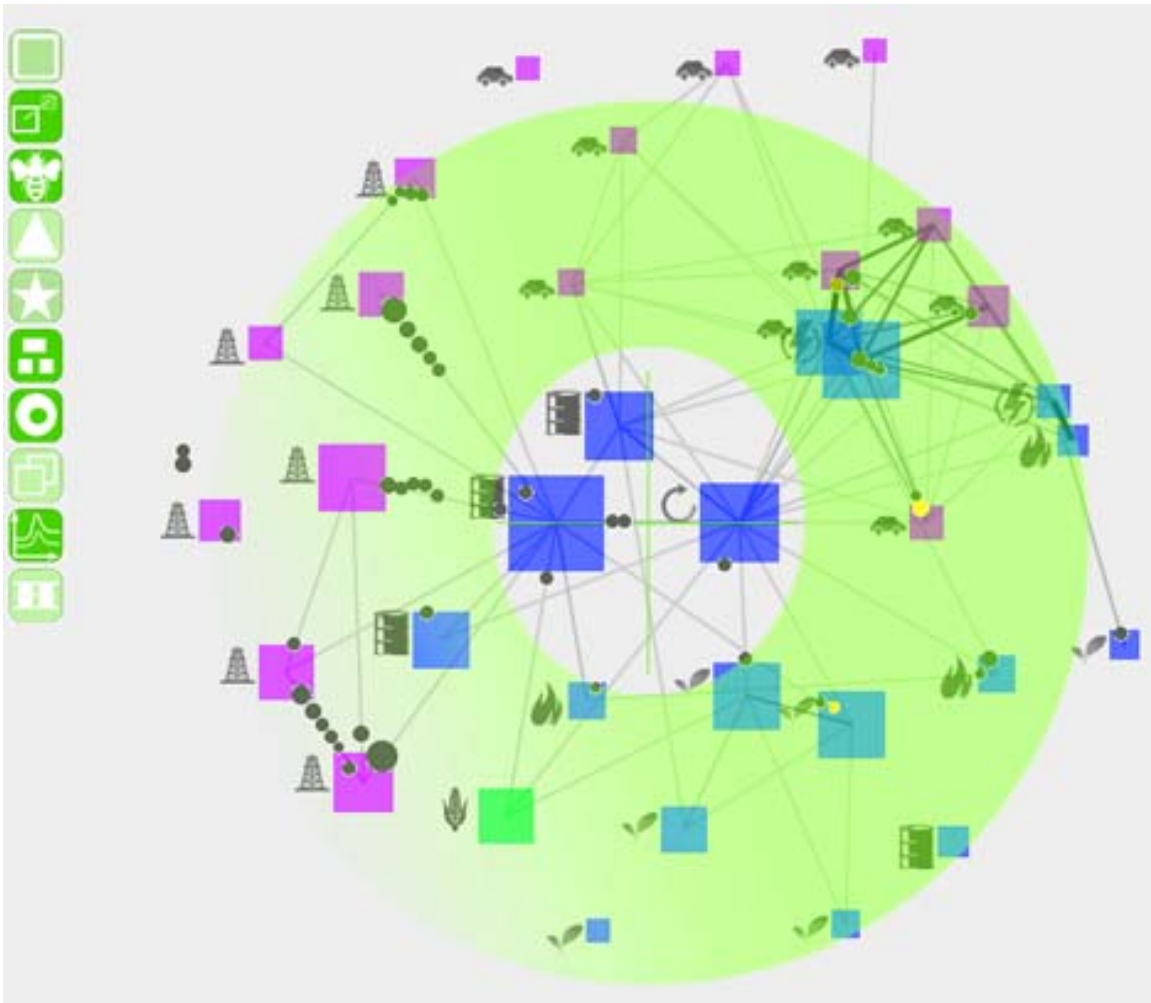


# Using Dynamic Graphical Images of News Articles to Increase Market Awareness Bandwidth



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## Overview

Visual patterns are used by humans and most mammals as part of a fundamental survival mechanism. Our eyes perceive basic shapes<sup>1</sup> and movements that our brains use for threat and opportunity assessment. The information that we take in is measured in millions of bits per second. In split seconds, we react to patterns and their movements that have been ingrained in our brains through experience and learning without “thinking” or decoding the message sent from our eyes to our brain. Potential threats and opportunities are automatically cast in the context from which they originated. This image-to-eye-to-brain reaction process is the result of eons of natural evolution based on natural selection and survival.



In contrast to our natural power to see and perceive threats through shapes and movements, most potential threats today are conveyed by written words as in news items. The ever present list of news items is generally how a competitive environment is presented to one hoping to survive in it. In this mode of

information delivery, we force our eyes to slowly decode news items into meanings, word by word. This mode of information collection and processing is measured at the slow speed of tens of bits per second. Compare this relatively slow text reading bandwidth to the estimated power of the human eye in concert with our brain to process visual images at the rates of megabits per second<sup>2</sup>. The ability to perceive a complex market at the megabits bandwidth level could yield a significant advantage to managers and analysts in discovering and tracking market trends.

News Radars leverage the natural power of our eyes to capture and process visual patterns at megabit bandwidth rates. The existing focus of News Radar technology is market and situational awareness about overwhelming and chaotic news environments. News can include any digital information package like traditional news, blogs, email messages, social media and research reports. News Radars display graphical patterns synthesized from hundreds to tens of thousands of news items, giving analysts and executives the ability to literally see overarching patterns of potential threats and opportunities. Each News Radar has hundreds of embedded patterns that the eye sees as threat/opportunity priorities. The end result is a superior market awareness bandwidth that can be used to discover and track potential and targeted market trends.

<sup>1</sup> Donald Hoffman, *Visual Intelligence: How We create What We See* (Norton & Company, 2000): pages 1-16

<sup>2</sup> Dietrich Trincker, “Aufnahme, Speicherung und Verarbeitung von information durch den menschen,” Veröffentlichungen der Schleswig-Holsteinischen Universitätsgesellschaft, Neue Folge, nr. 44 (Kiel: Verlag Ferdinand Hirt, 1966, As quoted in Tor Nørretrander's 'The User Illusion'.



## A Short History of Information Bandwidth

Our modern life is the result of ever increasing information bandwidth. A single photographic image can be larger than a megabit, and a short video can be large than 100 million megabits. Computer processors once had clock speeds measured in the megahertz range. Computer CPUs now achieve many gigahertz of computations, or a thousand (1000) fold increase in performance. Early dial-up modems achieved data transfer rates in kilobits per second. Today's fiber optic broadband communications can transfer information at speeds measured in terabits per second, or a billion (1,000,000,000) fold increase in data transfer power. Cell phones have seen data rates grow from the kilobit range to the megabit range or a thousand (1,000) fold increase in less than ten years. The need for speed is a basic motive force in our information society.

Surprisingly, humans have actually evolved to sense and process information at incredibly fast bandwidths. The eye in combination with the brain can sense and process visual data at an approximate rate of ten megabits per second<sup>3</sup>. This powerful bandwidth is due to the hundreds of millions of photoreceptors in the retinas of our eyes. The optic nerve carries the impulses of the photoreceptors to the brain where automatic pattern matching is affected. The brain itself possesses amazing computation powers. 100 billion brain cells<sup>4</sup> (neurons), each with thousands of potential connections, yield an estimated computing power in the range of a petabit per second.<sup>5</sup>

<sup>3</sup> Kristin Koch, Judith McLean, Ronen Segev, Michael A. Freed, Michael J. Berry, II, Vijay Balasubramanian, and Peter Sterling, *How Much the Eye Tells the Brain*, National Institute of Health Public Access, July 26, 2006.

<sup>4</sup> Eric H. Chudler, Ph.D, *Brain Facts and Figures*, A reference compilation as part of Department of Bioengineering, University of Washington, Seattle.

<sup>5</sup> Ralph C. Merkle, *Energy Limits to the Computational Power of the Human Brain*, Foresight Update No. 6, August 1989.

## Information Glossary

**Bandwidth:** a rate of data transfer, throughput or bit rate, measured in bits per second.

**Bit:** A bit is a binary digit, taking a value of either 0 or 1. Binary digits are a basic unit of information storage and communication in digital computing and digital information theory.

**Kilobit:** a thousand bits or 1,000.

**Megabit:** a million bits or 1,000,000.

**Gigabit:** a billion bits or 1,000,000,000.

**Terabit:** a thousand billion bits or 1,000,000,000,000.

**Petabit:** a million billion bits or 1,000,000,000,000,000.

In spite of these huge potential bandwidths of information creation, transfer and understanding, the input and processing of news into useful context and market patterns is typically limited to text reading. Text reading is a rather unnatural process in regard to the natural power of our brains and eyes to see and recognize patterns in our environment. If an average adult can read at the rate of 240 words per minute, then he or she inputs information into his/her brain at the approximate rate of 200 bits per second. As another reference point, studies have shown that dedicated human consciousness operates at the relatively slow bandwidth of approximately 40 bits per second.<sup>6</sup>

From an evolutionary perspective, the slow speed of 200 bits per second for human data input through reading is understandable.

<sup>6</sup> Zimmermann, M. (1989 second edition) *The Nervous System in the Context of Information Theory* in *Human Physiology* edited by Schmidt R. F. and Thews, G. Springer-Verlag. As quoted in Tor Nørretrander's 'The User Illusion'.



Humans have been evolving for over a million years. As part of survival and natural selection, man developed sophisticated eye and brain systems for sensing potential predators or prey. If man could see targeted movements, changes or other patterns in his environment, then he could increase his chances of survival. To keep up with the large power of human eyes to input bits of visual information, the human brain needed to develop the ability to automatically match visual inputs with patterns remembered in the brain.

In contrast with the million years of eye/brain pattern sensing evolution, man's evolution of reading is relatively young, only 6,000 years<sup>7</sup>. Humans have only had general access to written materials for the last several centuries. Therefore, in the long arc of human information processing, the "primitive brain" that uses pattern recognition dominates man's ability to perceive his environment.



Here is a useful visualization that illustrates the disparity of our ability to input and comprehend reading news versus our ability to perceive information with our eyes in concert with our brains. Imagine a pin prick in the center of an 8.5" by 11" sheet of white paper. The pin area represents the bandwidth of our consciousness as we read news. This consciousness

<sup>7</sup> Alberto Manguel, A History of Reading, 1997 Penguin Books.

bandwidth is estimated at 200 bits per second. This low bandwidth compares with the estimated actual information that our eyes collect and our brains automatically pattern at 10,000,000 bits per second. In our paper example, the remaining white space represents the megabit bandwidth that our brain inputs and processes through pattern recognition. By limiting our comprehension of our world to text alone, we fail to utilize the natural power of our brains and eyes to perceive and interpret information through graphical patterns. A huge gulf separates actual bandwidth from potential.

### The Current Information Problem

Significant markets are complex, often defined by thousands of weekly news and blog articles. Because no typical human has the ability to read such a volume of articles, let alone create relevant context about the articles, he or she typically limits reading to a few trusted sources of the news or narrowly targeted topics displayed in news-ticker lists. This limitation of scope not only increases the possibility of missing important news, but it can also reinforce biases that are shared between the analyst and the publisher.

As part of a news environment, an analyst must be aware of many interacting elements.<sup>8</sup>

- Industry competitors
- Suppliers
- Potential entrants
- Substitutes
- Buyers

In addition to these standard news elements, market awareness also includes the following:

- Government regulation
- Macro-economic forces
- Global political forces
- Impingements by associated industry sectors.

<sup>8</sup> Michael Porter, Competitive Strategy – Techniques for Analyzing Industries and Competitors, 1980 The Free Press.



On the other hand, these competitive forces can reflect competitive forces in a political campaign where competitors are rival candidates, buyers are voters and issues are the suppliers.

The resulting volume of news articles that combines these market forces can be measured in thousands of articles per week. Example article volumes of significant markets have yielded these weekly figures:

- General Wireless – 6,000 articles
- Transportation Energy – 5,000 articles
- US Politics – 38,000 articles
- World Financial Crisis – 18,000 articles

These large news volumes are the result of the thousands of news sources enabled by Internet publishing, advanced searching, and syndication technologies. Blogs, RSS feeds and video publishing compete with traditional news sources. Where there were once several trusted sources for particular market topics, there are now innumerable sources. All this news has created the need for better collection, filtering, relevancy highlighting, trending and delivery technologies.

### **“Connecting the Dots” of News Events Into Market Trends**

The overwhelming volume of news from innumerable sources gives market analysts a unique opportunity to discover and track market trends. The chaotic characteristics of the news can be filtered and potential unseen patterns can be identified by “connecting the dots” amongst related news articles over time. In the early twentieth century, Friedrich Hayek foretold the need for the News Patterns. Hayek was a Nobel Prize winner in economics and the champion of open markets. Hayek made this significant observation and prediction: “Almost all information that matters is decentralized, that it exists in the minds of millions of participants in an economy. Therefore, the

challenge is how to best maximize the benefits of decentralized information that exists as millions of single data points in humans spread across the globe.”<sup>9</sup>



At the time of Hayek’s observation, he was referring to innumerable market transactions as part of determining the prices of freely exchanged goods and services. He believed that prices cannot be set by some centralized authority. Rather, prices needed to evolve from “millions of single data points in humans spread across the globe.” With the advent of Internet news publishing, insight into market trends, like prices, can be gleaned from a global community of individual news contributors. An individual news story may not accurately reflect a market trend, but the synthesis of patterns out of innumerable articles has the potential to deliver valuable new market insights.

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<sup>9</sup> F. A. Hayek , [The Road to Serfdom](#), University of Chicago Press, 1944.



## The News Radar Solution

News Radars were invented to solve the problem of news overflow by synthesizing graphical simulations of markets out of thousands of individual news articles. The produced graphics represent high level patterns as calculated by the relationships of words among the news elements. News elements are typically composed of participants who compete, interact and convert various resources into products and services, and respond to changes in market conditions. The graphical patterns provide instant drill-downs to articles composing the graphical representations. The power of News Radars to represent graphical simulations of news as interacting and changing graphical patterns enables users to access the natural human capacity to acquire information and process patterns with our eyes.



Specific information bandwidth enhancements of News Radars include the following:

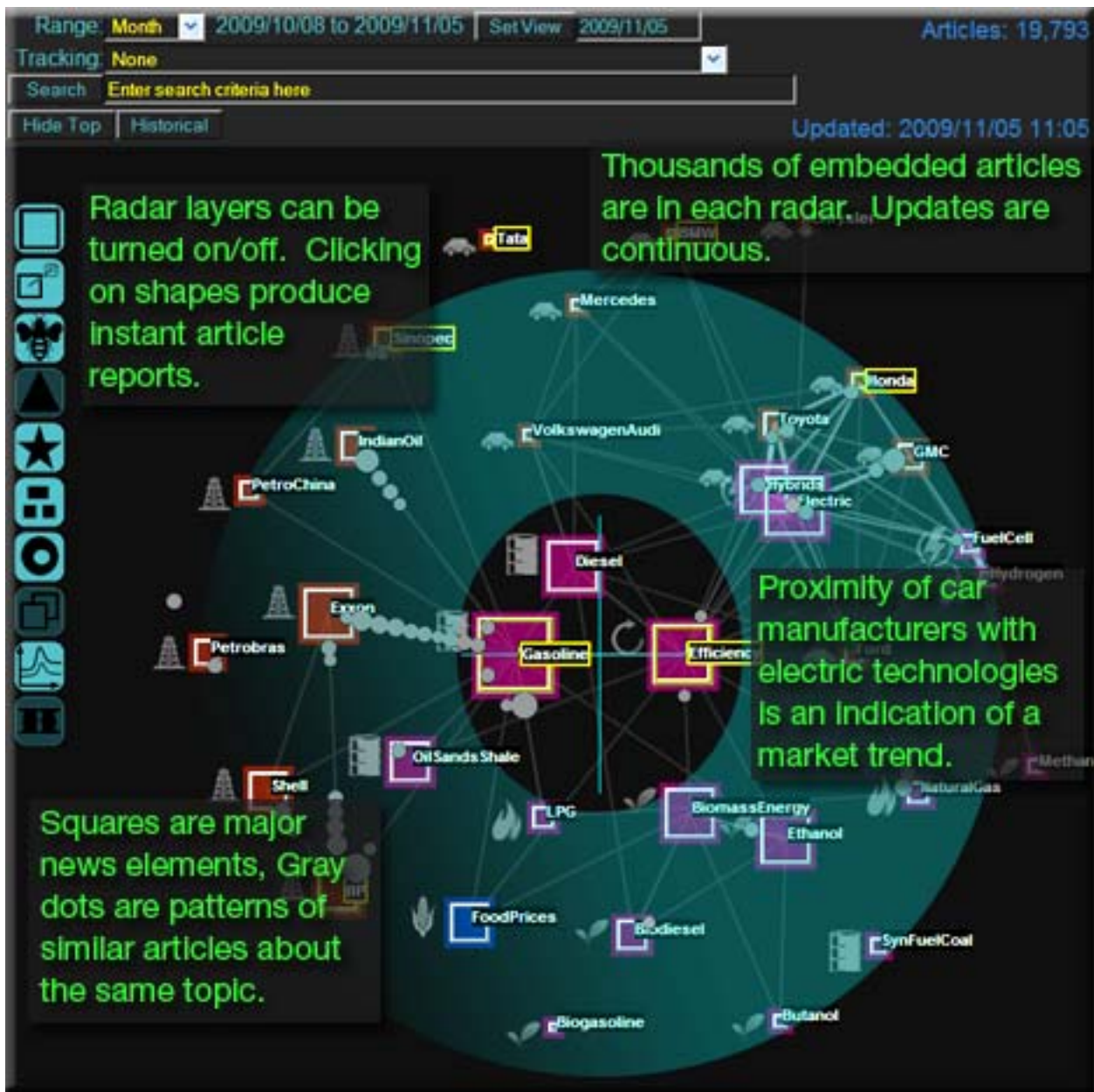
- ❑ Thousands of news articles are embedded in each News Radar interface.
- ❑ Simple user interaction with graphical interface (clicking on a location) will produce specific article lists that are pre-filtered and prioritized, thereby saving the time of searching and sorting through various sources.
- ❑ News Radars highlight potential and emerging market trends as the result of billions of pattern matching calculations, in ways that stimulate natural pattern recognition in the human brain.
- ❑ Continuous updates of news articles produce current top buzz articles as defined by many sources writing on essentially the same topic and the publications of key sources for market sectors.
- ❑ Historical archives allow users to interact and watch market trends evolve over many months as part of animated movies. Some News Radar animations are composed of hundreds of thousands of articles.
- ❑ Targeted or predicted news tracking layers can be tracked and plotted, creating a superior context of the trend with supporting or challenging news article references.

By leveraging the ability to see huge volumes of information using graphical images, News Radars empower users to quickly scan complex markets while alerting them to potential or emerging trends. Billions of pattern matching calculations enhance the News Radars. Connections to specific news items are not lost in “black box” processes. Graphical patterns like movements, associations, and changes naturally draw attention to specific articles out of populations of thousands that might portend expected or surprising market trends.



### Transportation Energy News Radar Example

Here is a snapshot of a News Radar dedicated to the Transportation Energy sector. The time period of the radar is October 8<sup>th</sup> through November 4<sup>th</sup> 2009. The monthly article count that composes this radar example is 19,793. The weekly article count was 5,208. The displayed layers (left) can be added or removed as desired.



The following layers are present in regard to enabled news patterns with simple access to corresponding news articles:

- The News Element layer shows plots or individual squares representing hundreds or thousands of news articles about the news element. Size of square is proportional to number of articles. Proximity of squares to others represents a similarity in market news signals.
- The Top Buzz layer shows clusters of commonly published articles as larger and smaller circles.
- The News Connections layer shows lines connecting news elements that share common words or articles.



## The News Radar Process

News Radars are continually updated with news articles. Here are our noteworthy process steps:



News & blog articles are automatically collected from worldwide sources for filtering and patterning. Users can input their own articles.



News is continually collected and patterned, enabling users to watch news patterns evolve over each day.



Many sources are integrated, creating one simple and transparent radar input process that can be controlled by the user.



Sophisticated filters remove “noise” articles from top list reports and pattern calculations.



Billions of pattern seeking calculations are conducted on input articles. Discovered patterns are displayed in News Radars as graphical images and “top article” lists.

## Transportation Energy: Example of High Information Bandwidth in Spite of 5,000 Weekly News Articles

The transportation energy market has become a key area of interest for many market analysts and portfolio managers. Sky high oil prices in the summer of 2008, a call for energy independence in the US, and greater demand for cleaner energy have all resulted in a very complex industry. 5,000 weekly published articles make it difficult to discover and track market trends. News of oil and gas prices, scientific breakthroughs, government subsidies, competitive actions and other topics contribute to the complexity of the transportation energy sector.

A News Radar is composed of major news elements that impact the market trends of various transportation fuel alternatives, traditional oil companies, and automotive manufacturers. The goal of this News Radar is to deliver a high bandwidth source of market news and trends. Scanned and plotted news elements for the Transportation Energy News Radar include the following:

### *Traditional Oil Companies*

- Exxon
- BP
- Shell
- Sinopec
- Petro China
- Indian Oil
- Petrobras

### *Traditional Hydrocarbon Fuels*

- Gasoline
- Diesel
- LPG, Liquefied Petroleum Gas
- Synthetic Coal Fuel
- Oil & Tar Sands Oil
- Natural Gas



### ***Automotive Manufacturers***

- ❑ Toyota
- ❑ Ford
- ❑ General Motors
- ❑ Volkswagen/Audi
- ❑ Mercedes
- ❑ BMW
- ❑ Honda
- ❑ Chrysler
- ❑ Tata

### ***Bio Fuels***

- ❑ Ethanol
- ❑ Biodiesel
- ❑ Butanol
- ❑ Methanol
- ❑ BioGasoline
- ❑ Biomass Energy
- ❑ Food Prices (effect on biofuels)

### ***Engine Innovations***

- ❑ Hybrids
- ❑ Electric Cars
- ❑ Efficiency Innovations
- ❑ Fuel Cells
- ❑ Hydrogen

As stated before, the sum of the articles for the above transportation energy market elements totaled approximately 5,000 articles per week – far too many to read or analyze for market trends, especially at the human text comprehension rate of 200 bits per second. News Radars convert these articles into graphical representations and enable a much higher bandwidth of human awareness. Examples of this higher market awareness bandwidth include the following:

### ***High Bandwidth Market News Information***



**Plotted News Elements:** The thirty-four plotted news elements produce instantaneous lists of corresponding top articles, based on simple user interaction. These lists of articles can be selected by “today,” “this week” and “this month”, thereby producing instant references for current and historical market news. For example, a top article for “Electric Cars” for the week of April 6<sup>th</sup> through April 13<sup>th</sup>, 2009 was “*A123 to Make Batteries for Chrysler Electric Cars.*”



**Points of Interest:** Pattern seeking algorithms conduct billions of calculations to highlight the news elements that have high probabilities of being part of important market patterns or trends. These news elements are then highlighted on News Radars for simple user awareness and interaction. (See yellow squares on Radar image.) “Efficiency” and “Electric Cars” were two market elements that were part of important overall sector market patterns.



**News Element Connections:** Hundreds of connections between plotted news elements are highlighted, with the strongest connections being thicker. Users can interact with these connections to instantly activate complex searches of the top articles connecting news elements. For example a top article connecting “VW/Audi” and “Diesel” for the week of April 6<sup>th</sup> through April 13<sup>th</sup>, 2009 was “*Audi Sets Prices on the 2009 Q7 TDI, the World's Cleanest Diesel SUV.*”



**Top Buzz Articles:** Special filters continually seek similar articles that are published by numerous sources. The name given to these clusters or articles are “top buzz.” The logic of these articles is that they are likely to address an important market sector topic, since many different sources



published a similar article during the same time period. For example, a Top Buzz article for the month of March 16<sup>th</sup> through April 13<sup>th</sup>, 2009 was “*Brazil Petrobras oil workers begin strike*”.



**News Element Layer:** News elements tend to follow macro patterns. These patterns give an instant overview that certain companies or technologies are rather similar in their description by market news. Nevertheless, interesting trends can be seen by exceptions or evolutions of the element patterns. For example, during this Transportation Energy Event Radar period, one can see that most auto manufacturers are clustered about “Electric Cars” and “Hybrids” with the interesting exception that “VW/Audi” is strongly connected to “Diesel.” which is connected to “Efficiency<sup>10</sup>.” An observer of this radar might question the lack of connections amongst auto manufacturers with alternative fuels like “Ethanol.”



**Top Sector Articles:** Special filters also continually seek the top articles for each selected time period. This instantly accessible list is a good overall summary of the most important news events across the entire Transportation Energy sector. For example, for the days of April 12<sup>th</sup>-13<sup>th</sup>, 2009, a top sector articles was “*Ethanol Industry Burning Through Equity.*”



**News Tracking Layers:** Articles corresponding to specific market trends can be captured and tagged over long periods of time. Article tagging is controlled directly by a client or News Patterns analyst. Green tagging correspond to articles corresponding to supporting or positive market trends. Red tagging corresponds to

<sup>10</sup> Note: In the early months of 2009, VW made very public product positions that its vehicles were fuel efficient due to advanced diesel engine technology.

contradicting or negative market trends. For example, the news tracking layer of “A significant North American car battery manufacturer will emerge in 2009” was tracked and plotted for the week of April 7<sup>th</sup> – 14<sup>th</sup>, 2009. During this week, there were 11 supporting, 1 challenging and 1 ambivalent articles. Example supporting articles for this news tracking layer were “*A123 Systems to Build US Lithium-ion Battery Plant*”, and “*Kentucky, Argonne Partner to help Build Domestic Battery Industry*”.



**Market Trace Layer:** this layer shows the movement of news elements over a four week period. This trace layer is useful because news elements can create surprising associations with other news elements, or movements can indicate the growing or dissipating importance of a news element in the greater market sector. For example, the news element of “Food Prices” shifted toward the “Ethanol” news element during the month of March 15<sup>th</sup> – April 11<sup>th</sup>, 2009. This movement indicates continued public concern over using food crops for fuel. An example article was “*The Impact of Ethanol Use on Food Prices and Greenhouse-Gas*”



**Article Statistics Layer:** Article Statistics provides a tabular display of article counts for the selected search range.



**Historical News Patterns:** News Radars also display animated movies of changing market trends. Each movie can capture the collective impact of hundreds of thousands of articles over many months. Market trends that may be too gradual to see in the daily or weekly time period might be more obvious over many months.



**Conclusion: Bandwidth at 10,000,000 versus 200**

News Patterns were invented to overcome the problem people face in attempting to discover and track market trends in complex markets that are defined by thousands of weekly news articles. Reading lists of text articles limits awareness of market environments because humans can only comprehend text reading at the slow rate of approximately 200 bits per second.

In contrast to this slow information bandwidth, humans have evolved for eons with the ability to automatically see and process visual patterns at the rate of 10 megabits per second. News Radars convert innumerable news articles into high level patterns that simulate movements and evolution in a competitive market. Through interaction with our dynamic graphical imagery supported by billions of background calculations, analysts and managers can quickly analyze thousands of news articles in minutes. News Radars can direct user attention to likely or targeted market trends. Users can also explore their own market topics to discover relevant articles. The end result is a significant increase in market awareness speed and insight. This increase in insight speed corresponds to similar enhancements in information technology that inexorably demand greater bandwidth. It is indeed true that “a picture is worth a thousand words” - in fact, much more than a thousand.

