Introducing the Industry Graph
Extending Searching & Discovery Intelligence

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By James J. Andrus & Alan S. Michaels

Abstract

Useful context is the latest frontier of Internet information. Google is pioneering the next stage of Internet search with its Knowledge Graph, which aims to understand the searcher's intent and the contextual meaning of his/her search terms[1]. Facebook has been developing its Social Graph for people to people context by learning the personal relationships of its users[2]. Yahoo has been developing the Interest Graph which builds a context of personal identity that can be used as indicators of such things as what people might want to do or buy, where they might want to go, or who they might want to meet, vote for or follow.[3]

Now the Industry Graph, created by Industry Building Blocks (IBB) and Discovery Patterns, is another source of useful decision making context. The Industry Graph is being developed to serve competitive strategy and financial decision making. The Industry Graph first creates useful competitive context around the companies competing in 16,000 granular industries[4]. This high degree of granularity enables useful intra-industry and inter-industry financial and strategy analyses. The Industry Graph creates a real time situational awareness by prioritizing unstructured information like news and social media that might indicate interesting industry trends or changes within the industry composition and broader inter-industry ecosystem. This Industry Graph context is the foundation for superior searching, discovery, competitive analysis, situational awareness, market anticipations, financial tracking and investing strategies.

The Fundamental Nature of Competitive Context

Competitive context defines the environment where companies and investments either succeed or fail. The Industry Graph starts with a fundamental definition of competitive industries first promoted by Michael Porter of the Harvard Business School. In the Porter competitive force model[5], the forces of competitors, buyers, suppliers, new entrants and substitutes interact to determine industry attractiveness, market trends, winners and losers. These forces are so fundamental that nearly every competitive situation can be assessed and planned for by defining and tracking these forces. To effectively track a target industry, a business strategist or financial analyst should track direct competitors, as well as the additional companies defined by the Porter forces.
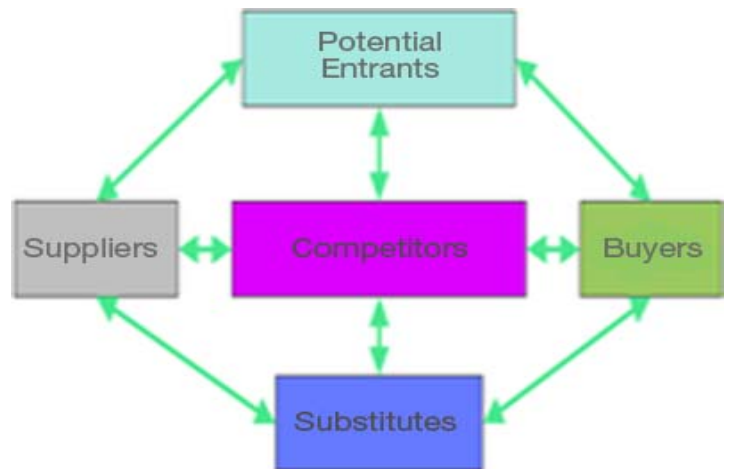

Figure 1: Porter's Competitive Forces are archetypes of almost any competitive environment for business, investing and political decision making.

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[1] Google, Knowledge Graph, http://www.google.com/insidesearch/features/search/knowledge.html, October 9, 2013

[2] Wikipedia, Social Graph, http://en.wikipedia.org/wiki/Social_graph, October, 9, 2013

[3] Wikipedia, Interest Graph, http://en.wikipedia.org/wiki/Interest_Graph, October 9, 2013

[4] Similar contextual build-out efforts are also under way for political campaigns.

[5] Michael E. Porter, "Competitive Strategy: Techniques for Analyzing Industries and Competitors" 1980. Also, see: Porter's, HBR article, 'The Five Competitive Forces That Shape Strategy' 2008

Sixteen Thousand IBB Industries Enable the Industry Graph

Granularity of industry definitions is a key starting point of the Industry Graph. As of this date, the Industry Graph starts with 16,000 IBB industry definitions that include competing companies and other fundamental competitive forces. This level of granularity enables the required level of context for business and financial analysis. The NAICS classification system (which is used by the U.S. government, banks providing SBA loans, and most of today's industry information vendors) defines the economy using fewer than 1,100 industries which is almost always at too high a level to appreciate head-to-head competition at the Porter five forces level. (Most other industry classification systems are even less granular than NAICS.)

Extending Search Insights with the Industry Graph

The Internet has created the illusion that knowledge is immediately available through a search input box. Alerts extend this illusion with continuous and automatically delivered search results. Yet the problem with this approach to search is that the useful context of the search query is often lacking. For example, today one can search for "pizza" on Google, but if Google does not add the useful context of the searcher's location, then almost all search results will be useless. The same is true for industry searches. Without the Industry Graph context, one can search for Toyota and get results from all industries where Toyota competes as well as accident and crime reports that involve Toyota vehicles. Perhaps the searcher was interested in all of Toyota. Yet, in most instances, a business searcher of Toyota is typically interested in assessing a competitive strength or weakness of Toyota, which would require results in the refined context of the Industry Graph. The Industry Graph solves this lack of focus by defining Toyota as the sum of all the granular industries in which it competes. By leveraging this industry context, the searcher can better assess Toyota in the useful context of its competitors, buyers, suppliers, and other competitive forces.
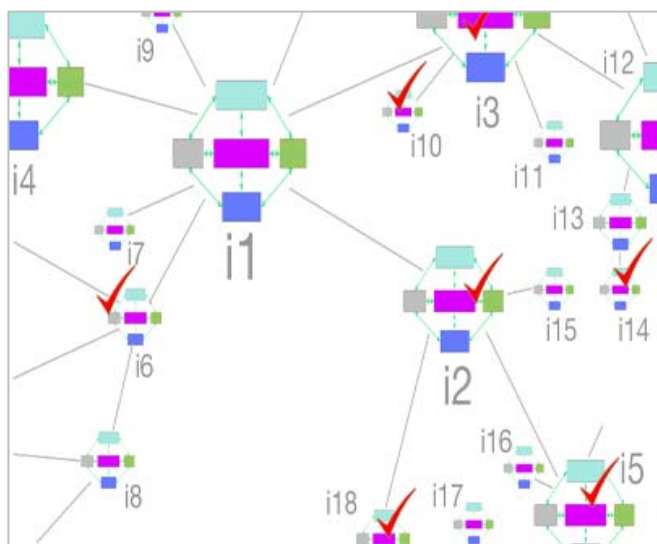

Figure 2: A Typical Search without Industry Graph context will produce summary (at best) results for a company (red check marks) across all the industries where it competes - in this figure, industries 2, 3, 5, 6 8, 10 and 18.
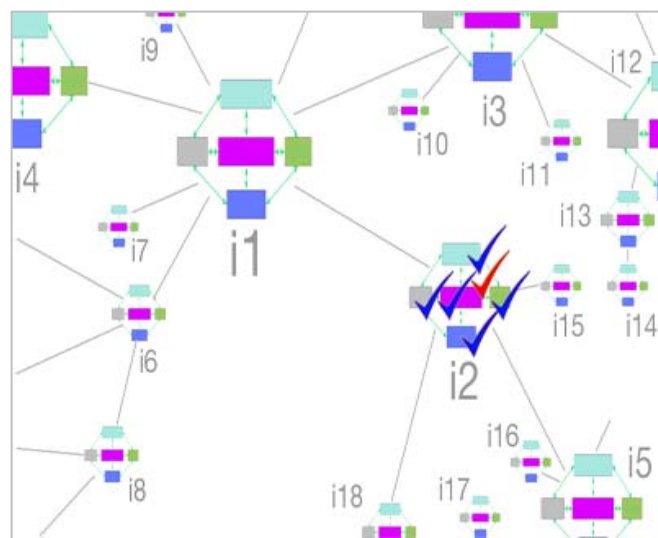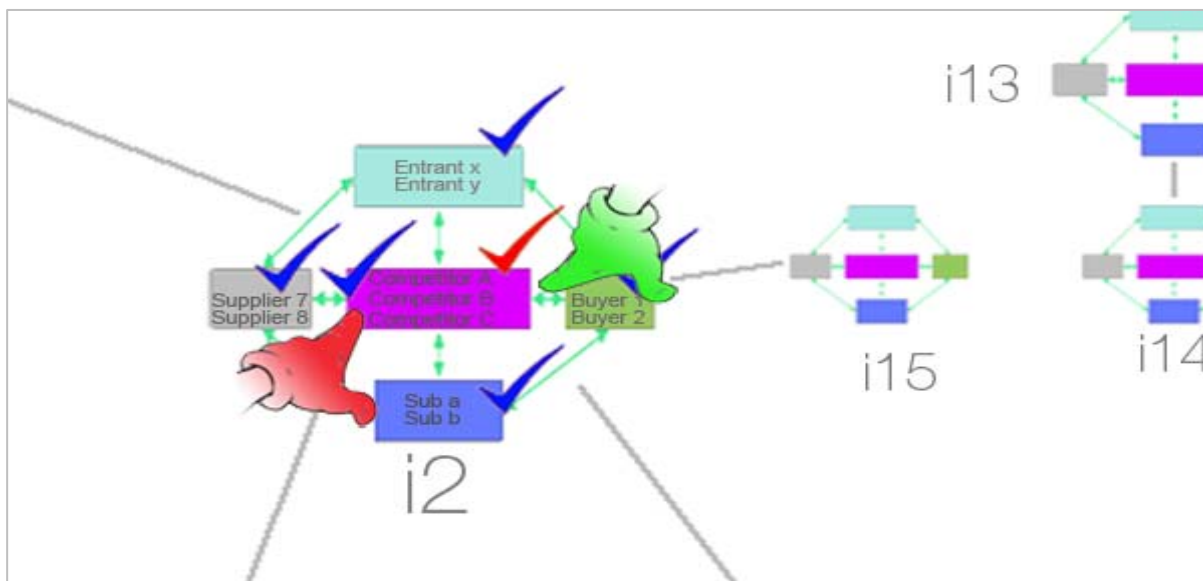

Figure 3: Industry Graph Enhanced Search enables company searches to deliver summary and granular results about the company (red check mark) in a specific industry (i2) with contextually relevant information about company competitors, buyers, suppliers, substitutes, and potential entrants (blue check marks).

Enabling Real-Time Discovery with the Industry Graph

Discovery is the key reason that Google, Facebook and Yahoo are undertaking the development of their respective Knowledge, Social and Interest graphs. Discovery is that utility that anticipates user interests without the user needing to specifically search for or request the interesting or needed information. All these graphs apply the needed context of the searching situation. So too is the goal of the Industry Graph to anticipate user interests. In business and financial situations, the Industry Graph anticipates competitive survival interests, while discovering potential threats, opportunities and emerging trends.

Leveraging the granular industry context for news search and discovery is one application of the Industry Graph. Unstructured data like news and social media are key flows of public information about changes within competitive industries. Discovery Patterns applies its pattern seeking algorithms to these unstructured big data flows to discover interesting events and changes to industries that compose the Industry Graph. The Discovery Patterns algorithms are unique in that they evaluate the aggregate of many articles associated within specific industries to discover changing relationships and connections among the industry players over time. For example, if Competitor A adopts a new technology that is needed by Buyer 1, then pattern seeking algorithms would discover the interesting change between Competitor A and Buyer 1, and highlight that connection as potentially interesting. Competitor A would interpret this new connection as an opportunity, while Competitors B and C would discover it and interpret it as a potential threat.

This function of Discovery prioritization is important because many industries contain thousands of weekly unstructured data articles. Discovery Patterns algorithms prioritize those articles that describe the most interesting information, thereby creating an efficient, real-time information source for its users that does not require them to wade through overwhelming volumes of unstructured articles.

Figure 4: Industry Graph Discovery starts with granular industry definitions – in this figure industry i2. Real time news and social media are continuously gathered relative to a specific company (red check mark) and the specific contextual lens of industry 2 with associated competitors, suppliers, buyers, substitutes and new entrants (blue check marks). Competitive pattern seeking algorithms discover the priority articles and trends that might deserve attention within and between industry forces.

Example of Enhanced News Search and Discovery with the Industry Graph

To start an Industry Graph news search, a user might simply request information about Toyota. Such an inquiry about Toyota could either return all unstructured articles about Toyota, or a second decision step could be considered by the searcher for more focused Industry Graph information. Table 1 is a partial list and serves as an example of the level of industry granularity possible within Industry Graph about industries where Toyota competes.

Table 1: Partial Industry List for Toyota	(via Industry Building Blocks data base)
Motor Vehicle / Transportation Energy (see detail in Table 2)	Motor Vehicles / Vans - Standard Vans
Motor Vehicle / Auto Air Conditioning Manufacturing	Trucks / Flatbed Truck Manufacturing
Motor Vehicle / Auto Airbag Manufacturing	Leasing / Truck Leasing & Trailer Leasing
Motor Vehicle / Auto Compressors Manufacturing	Aisle Truck Manufacturing
Motor Vehicle / Auto Doors & Door Panel Manufacturing	Automatic Guided Vehicle Systems Manufacturing
Motor Vehicle / Auto Electronics - Body Electronics	Order Picking Truck Manufacturing
Motor Vehicle / Auto Entertainment & Infotainment Products	Rail Guided Vehicle Systems Manufacturing
Motor Vehicle / Auto Filters - Oil Filters & Transmission Fluid	Pallet Trucks / Automatic Guided Pallet Truck Manufacturing
Motor Vehicle / Auto Instrument Panels & Auto Cockpit	Tractors / Tow Tractor Manufacturing
Motor Vehicle / Auto Lighting & Auto Illumination	Forklifts / Automatic Guided Forklift Truck Manufacturing
Motor Vehicle / Auto Seat Fabric & Seat Foam Manufacturing	Forklifts / Battery & Electric Lift Truck Manufacturing
Motor Vehicle / Auto Seating Manufacturing	Loaders / Skid Loaders & Skid Steer Loader Manufacturing
Motor Vehicles / Autos - Hybrid Gas-Electric Cars	Robots / Palletizing Robot Manufacturing
Motor Vehicles / Autos - Regular Full Size & Premium Cars	Automated Storage and Retrieval System Manufacturing
Motor Vehicles / Autos - Super Luxury Cars	Reach Trucks / Reach Truck Manufacturing
Motor Vehicles / Autos - SUVs & Minivans	
Motor Vehicles / Light Trucks & Pickup Trucks	

Transportation Energy in Table 1 is a composite of several IBB industries, created for the purpose of discovering relevant news, trends, and emerging competitive participants as transportation transitions from gasoline to alternative energy sources. If the searcher next requests the Transportation Energy Industry Group, the following Table 2 extends Toyota with the competitive context of Competitors, Suppliers, Substitutes, Potential Entrants and Buyers:

Table 2:
Example Detail of Composite Transportation Energy Industry Group – Key Company Participants

Competitors	Suppliers	Substitutes	Entrants	Buyers
GM	Exxon	Hybrids	Tesla	Note 1
Ford	BP	Electric Vehicles	Google	
Honda	Shell	Ethanol	Driverless	
Toyota	Chevron	Diesel		
VW/Audi		Butanol		
BMW		Biodiesel		
Mercedes		Fuel Cells		
		Hydrogen		
		Natural Gas		
		Algae Biofuel		
		Dimethyl Ether		

Note 1: Buyer companies are not detailed as individual consumers are the purchasers of most vehicles

Table 2 Industry Graph context is invaluable for business and financial planning and analysis. In this specific example for Toyota, one can now better understand Toyota's competitive threats and opportunities as it competes with other auto manufacturers in the pivotal Transportation Energy industry. Searches can be specific to Toyota within the Transportation Energy Industry, or searches can select the entire industry and

include all relevant articles about Toyota and the associated Transportation Energy Group competitors, suppliers, buyers, substitutes and potential entrants. In searches of an entire industry, the searcher does not need to know the Industry Graph context as detailed in Table 2 for the Transportation Energy industry group. Searches of Toyota in this specific industry context will likewise eliminate results from Toyota's robotic and seat manufacturing operations. Table 3 provides Industry Graph specific news search results for Toyota in the Transportation Energy group.

Table 3: Example Toyota News Search Results for Transportation Energy Industry Group for the Week of October 6, 2013		
* Honda Fit Designed as Prius Killer in Challenge to Toyota (Bloomberg)		
* Toyota cuts price for Prius Plug-in hybrid (Reuters)		
* Toyota, Honda Unveil New Electric Cars (Wall Street Journal)		
* The High-Tech Car Of The Future Is Around The Corner (Investor's Business Daily)		
* Toyota says slashes fuel cell costs by nearly $1 million for new ...(Chicago Tribune)		
* Toyota navigates popular paths with redesigned RAV4 (Video) (Phoenix Business Journal)		

Table 4 gives examples of discovered trends within the Transportation Energy industry group. This table highlights eight industry topics worthy of attention over the course of a week, out of five hundred or more topics or connections between topics. The typical user experience would enable him/her to immediately drill down to the driving news and social media of the highlighted topics. In the spirit of Industry Graph utility, the user has the superior context of industry detail, completeness, prioritization and real-time situational awareness.

Table 4: Discovered Transportation Energy Industry Group Topics for Week of October 6, 2013			
Industry Topic Name	*Interesting Characteristic*	*Type of Topic(s)*	
Hybrids	Central to all transformation trends	Substitute	
Diesel	Central to all transformation trends	Substitute	
Toyota	Current connection to Hybrids	Competitor - Substitute	
Methanol	Growing in industry relevance	Substitute	
Exxon	Decreasing in industry relevance	Supplier	
Mercedes	Decreasing in industry relevance	Competitor	
Electric Vehicles	New connection to Driverless	Substitute - Entrant	
Tata	New connection to Natural Gas	Competitor - Substitute	

Color Legend				
Competitor	Supplier	Buyer	Substitute	Entrant

Table 5 gives examples of discovered articles within the Transportation Energy industry. The source of these articles could be any unstructured digital source, including subscription feeds. Table 5 highlights articles worthy of attention over the course of a week, out of thousands of potentially relevant Transportation Energy articles. The results of Table 5 were discovered based on their overall industry relevancy by pattern seeking algorithms. Notice that there is a mixture of competitor, supplier, buyer, substitute and new entrant articles. A user could certainly focus his/her search on any individual topic within the industry, with the immediate benefit that results would be in the context of the Transportation Energy ecosystem. Also notice that the Industry Graph topic of Buyer was discovered in the "Tesla Fire" and "easy to adopt" articles even though there was no explicit topic categorizing Buyers as seen in Table 1.

Table 5: Discovered Transportation Energy Industry Group Articles for Week of October 6, 2013		
* Honda Fit Designed as Prius Killer in Challenge to Toyota (Bloomberg)	magenta	magenta
* Warren Brown: Audi's luxurious diesel Q5 TDI Quattro is powerful ... (Washington Post)	blue	magenta
* Owner of Battery Fire Tesla Vehicle: Car 'Performed Very Well, Will Buy Again' (Slashdot) (Buyer example)	light blue	green
* Battery Maker Shifts to Hybrid Car Focus (Wall Street Journal)	blue	blue
* Toyota cuts price for Prius Plug-in hybrid (Reuters)	magenta	magenta
* Neste Pro Diesel is the first fuel to comply with the WWFC 5 ... (MarketWatch)	gray	blue
* Tata Nano CNG Emax: India's Most Fuel-Efficient... (Green Car Reports)	magenta	blue
* New Fleet of Natural Gas Powered Trucks Arrives in Twin Cities (Wall Street Journal)	blue	blue
* When California had 15,000 methanol cars	Fuel Freedom (Fuel Freedom)	blue	blue
* VIDEO: Electric vehicles 'easy' to adopt (BBC News) (Buyer example)	blue	green

Key Advantages of Industry Graph Search and Discovery

- Granular Industry Graph context enables superior searching, discovery, competitive analysis and financial tracking.
- Searcher does not need to define the details of his/her competitive environment: competitors, suppliers, buyers, new entrants and substitute relationships.
- Search engines and unstructured data feed services can enable superior business and financial search results for users without their laborious and tedious effort of refining or maintaining search queries.
- Discovery enables a real-time analytic process for prioritized situational awareness of unstructured big data.
- Once personalized discovery is activated, decision makers do not need to dedicate daily effort to searching or scanning for relevant unstructured data, or waiting for others to pass information along.

Conclusion

Google and all the major knowledge engines are embracing the next generation of searching and discovery technologies with their various Knowledge, Social and Interest Graphs. Industry Graph as created by Discovery Patterns and Industry Building Blocks is the knowledge graph for business and financial decision making.

Managers know that discovering and learning about global information is vital for making good market decisions. Today, these strategic and financial decisions are made in torrents of world-wide unstructured data, written by thousands of conventional and nonconventional content creators, exemplified by individuals tweeting about company products. It is increasingly clear that there are patterns among these unstructured flows; and the impact is best understood at the (Porter) five forces level where true competition takes place. Discovery Patterns provides the technology and services to leverage the intelligence often hidden in these flows.

In the experience of Discovery Patterns, effective pattern discovery technology can be based on swarm intelligence, or the intelligence of colony animals like bees. Discovery Patterns has created trend discovery networks that aim at specific companies and granular industries, that are constantly changing based on near real time unstructured data flows. By applying sophisticated pattern seeking algorithms that are based on archetypes of competitive interactions, Discovery Patterns is able to reveal long term patterns that might be key components of creating superior business and investment strategies. By proactively accessing, analyzing, and leveraging strategically relevant global information – in context - companies have a better chance of beating the competition and investors have better odds because they will know what they need to know sooner.

About James J. Andrus

James J. Andrus is President and technical founder of Discovery Patterns, incorporated as Netro City Design & Information Systems Inc. at http://www.DiscoveryPatterns.com. Jim and Discovery Patterns have been data science development leaders of unstructured big data analytics, accompanied by dynamic visualizations of discovered patterns. Jim has spent the past decade working with Fortune 50 corporations, individuals and national political campaigns to deliver real-time situational awareness and early warnings of competitive threats and opportunities. Recently, Jim is a co-developer of the Industry Graph. Jim is an engineering graduate of the University of Cincinnati and master's degree graduate from the Kellogg School of Management of Northwestern University. james.andrus@discoverypatterns.com

About Alan S. Michaels

Alan S. Michaels is the owner of Industry Building Blocks at http://IndustryBuildingBlocks.com which provides industry information for the top 16,000 global industries. The Industry Building Blocks Classification System [TM] is 14x more granular than the commonly used NAICS taxonomy. The IBBCS also enables companies to be compared, side by side, at the line-of-business level where true competition takes place. Alan also manages the LinkedIn group, "Corporate Planning, Strategy & Strategic Market Segmentation" with over 20,000 members at: http://www.linkedin.com/groups?about=&gid=1846141. Recently, Alan is a co-developer of the Industry Graph. He attended SUNY Binghamton where he graduated from: Harpur College, the Graduate School of Business, and the Watson School of Engineering. amichaels@IndustryBuildingBlocks.com