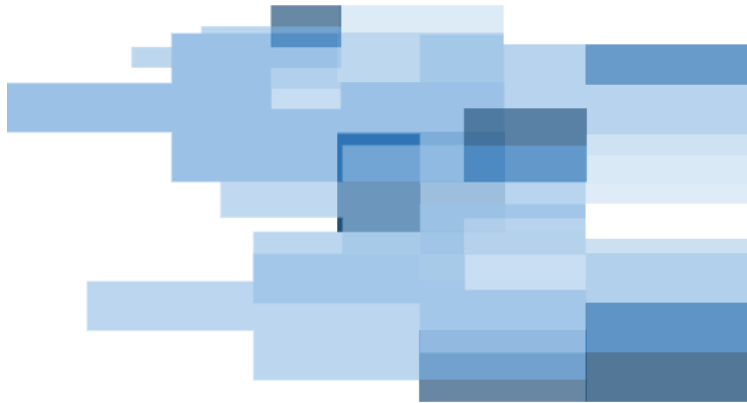


Client application white paper



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Ultra-Granular Industry Classifications: Simplifying investing decisions with Industry Building Blocks

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Executive Summary

Oliver Wendell Holmes, Jr.¹ once said “I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity.” All classification systems are products of simplicity based on complexity. The overarching trend of the basic sciences like chemistry, biology and genetics are ever granular investigations at the, atomic, species and genetic levels. These complex and granular investigations reveal the fundamental and simple patterns of nature. And once these fundamental patterns are discovered, it is possible to predict missing pieces and predict future outcomes under innovation, evolution, interaction or stress.

So too with recent advancements in business data. Through the application of IBB, an ultra-granular industrial classification system, it is now possible to distill great complexity into simplicity and make early market discoveries of companies and industries as they evolve and morph under competitive innovation, evolution, interaction and stress. This paper will first define the ultra-granular industrial classification system IBB, in the context of existing scientific and industry classification systems. Then this paper will demonstrate simplified investment decision making on the other side of ultra-granular industry complexity.

¹ Oliver Wendell Holmes, Jr., (<http://www.famousquote.com/>, March 2016)



Important Terms Used in This Paper

Industry

The aggregate of manufacturing or technically productive enterprises (companies) in a particular field, often named after its principal product such as the automobile industry or the steel industry.²

Industry Classification

Collections and names of common industries in hierarchical structures where each point of definition is unique. Industry Classification systems are exemplified by Standard Industry Classifications³ (SIC), North American Industrial Classification System⁴ (NAICS), Global Industry Classification Standard⁵ (GICS), Thomson Reuters Business Classification⁶ (TRBC), Industry Classification Benchmark⁷ (ICB) and Industry Building Blocks Classification System⁸ (IBB).

Market Theme - A general definition of a theme is a “unifying or dominant idea, motif, etc., as in a work of art.”⁹ McKinsey further defines a theme as opportunities created by long term structural trends.¹⁰ In regard to markets, a theme is a unifying idea about a market premise that needs to be maintained or proved to be relevant over time. Themes are rich grounds for early trend discoveries and market sentiment mismatch opportunities.¹¹

The Genesis of IBB

Industry Building Blocks [IBB] is the world’s most granular industry classification system, created by Alan S. Michaels who was a strategic planner for technology, banking and insurance companies. It was Alan’s goal to focus on granular market competitiveness to create a superior classification, different from correlated stock classifications. At present, there are over 17,000 IBB industries in the IBB database, which is more than ten times the number of industries in SIC and NAICS industrial classification codes.

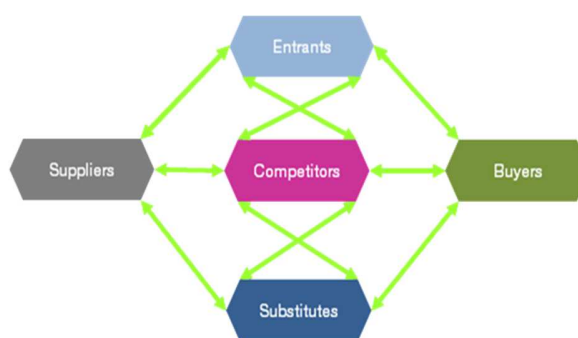


Figure 1: The Five Porter Forces Defining IBB Industries

² [Industry definition](#), (dictionary.com, March 2016)

³ [Standard Industry Classifications](#) (SIC, March 2016))

⁴ [North American Industrial Classification System](#) (NAICS, March 2016)

⁵ [Global Industry Classification Standard](#) (GICS, March 2016)

⁶ [Thomson Reuters Business Classification](#) (TRBC, March 2016)

⁷ [Industry Classification Benchmark](#) (ICB, March 2016)

⁸ [Industry Building Blocks Classification System](#) (IBB, March 2106)

⁹ [Theme definition](#), (Dictionary.Reference.com, March 2016)

¹⁰ V. Berube, S. Ghai and J. Tetrault, *From Indexing to insights: The rise of thematic investing*, (McKinsey, Dec. 2014)

¹¹ J J Andrus, *Unstructured Big Data: Investing advantages with expanded market sentiments*, (Discovery Patterns, March 2016)



IBB classifications are based on Michael Porter's five archetypical competitive forces¹²: competitors, buyers, suppliers, substitutes, potential market entrants and all the relationships among these forces. The controlling Porter and IBB rationale is that each industry has a unique competitive dynamic among these archetypical industry forces. If one or more of these five forces is significantly different from a related industry, then IBB will define them as different industries in its classification system¹³. Winning and losing companies and products are better understood in this basic competitive context. Market trends and evolving industries can be better identified and projected into the future once these complex competitive interactions are identified and tracked. Unrecognized industries can also be identified early within IBB. Stock and asset values are coupled with these changing archetypical forces and industry classifications.

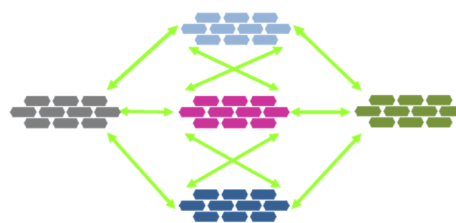


Figure 2: Force Complexity within Industries

IBB arose out of the needs of corporate planning for multinationals. Granular IBB industries or business units are resourced and planned based on their competitive standings and likely financial performances. Within a company all these financial measures are visible and therefore a truer measure of market performance. Even though a company may not use IBB classifications for its corporate planning, these companies are nonetheless using classifications that approach IBB in granularity versus standard industrial classifications. Public financial markets crave this level of detail for market evaluation.

For example, infant diapers is a different industry from adult diapers; cloud computing represents dozens of unique IBB industries; Alphabet now competes in 82 industries; and GE competes in 203 industries. IBB also delivers insight complexity among all the interactions of market forces in each industry and among multiple industries. For example, the recent merger of Dell with EMC created a portfolio of 278 combined IBB industries in which only 31 of those industries were initial overlaps, a smaller number than many might have predicted.

The sum of all a company's IBB industries, with their embedded competitive force relationships, defines the overall expected performance of a company. These forces govern shareholder returns because they influence prices, quantities sold, costs, investment, and the riskiness of firms in an industry. These force variables, in turn, are the building blocks for the value driver determinants of shareholder value. IBB categories enable granular industry comparisons between companies, where overlapping industries serve as points of comparison, and non-overlapping IBB industries serve as points of contrast.

Figure 3 charts 19 IBB Sectors, the highest level of IBB classification. Through five levels of hierarchy, IBB classifications now end with 17,613 ultra-granular industries as its endpoints. The entire world economy is captured in IBB, including "Unlawful Industries." For example, although marijuana may generally be considered unlawful today, there are emerging structural trends that it may one day join other lawful IBB industries. There are a total of five hierarchical levels in the IBB classification system. There are currently 19 Sectors at the highest level. Afterwards, in the

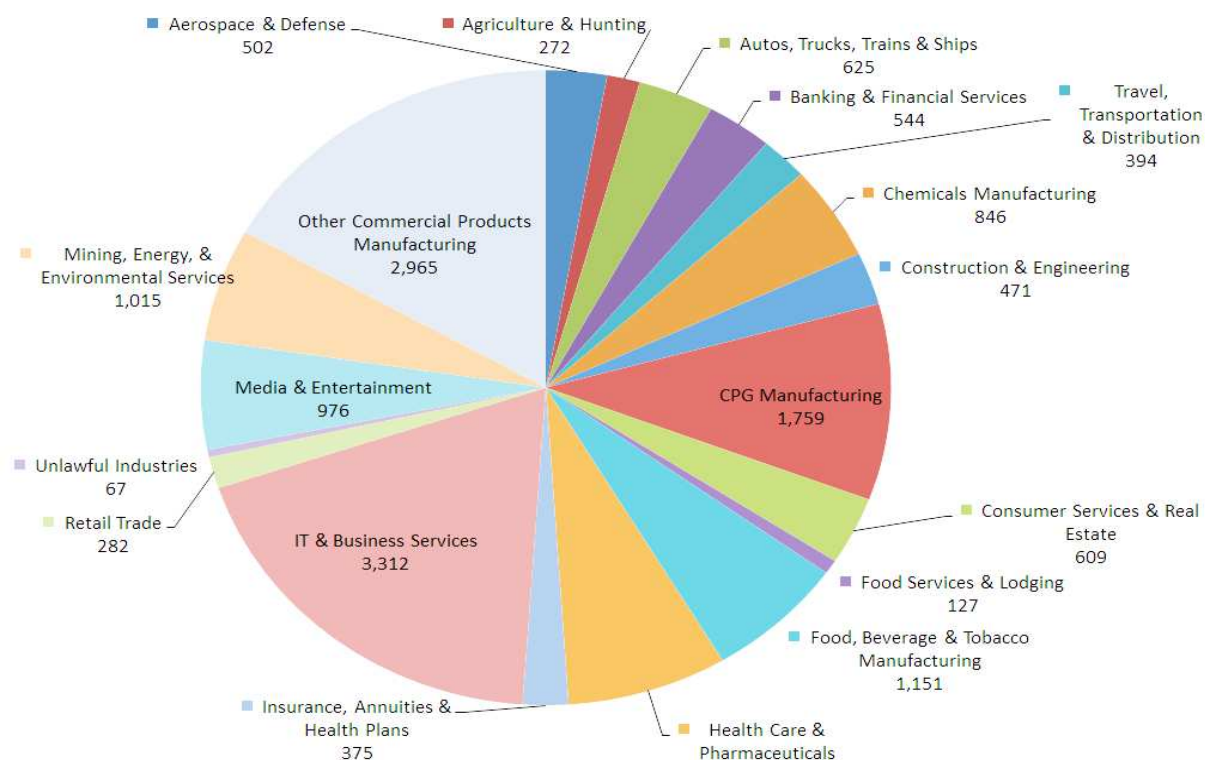
¹² Michael E. Porter, *Competitive Strategy*, (Free Press, New York, 1980)

¹³ Alan S Michaels, [IBB Overview Video](#), (February 18, 2015)



direction of greater refinement, there are: 130 Sub-Sectors; 535 Groups; 2,552 Sub-Groups; and finally 17,613 Industries at the greatest level of granularity.

Figure 3: IBB top level Sectors with associated industries that ultimately categorize 17,613 industries as of March 19, 2016



IBB Industry Definition Specification:

One or more products and/or services that are direct substitutes sold by one or more businesses to one or more external customers (and where the processes for manufacturing the product, or for providing the service, are similar).

Table 1 gives an example of Apple IBB ultra-granularity, part of “IT & Business Services” Sector of in Figure 3. Today, Apple is now composed of 50 IBB industries, 45 of which are detailed in Table 1. Each of these industries composing Apple has a unique combination of Porter market forces characteristics to make it a distinct IBB industry. Specifically, each of these industries has a unique combination of competitors, buyers, suppliers, substitutes and entrants as defined by Porter. This specification yields the most granular and unique industries in accordance with Porter’s five archetypical competitive forces. As such, each Industry is unique, without overlaps with other industries. Additionally, each IBB industry can be modular inputs for combinations like market themes and electronic traded funds (ETF’s).



The overall market performance of Apple is the sum of all Apple's market performances in each IBB industry¹⁴. iPhone® [IBB Industry = Smart Phones] may be important to Apple, yet there are 49 other Apple lines of business (industries) that also define the cumulative market performance of Apple. IBB industry context engine enables a realistic capture and reduction of true market complexity that is often unrealized in traditional market classifications.

Table 1: Sample IBB Industries Defining Apple – (45 of 50, March 2016)

#	IBB Industry Name	Report Date = March 21, 2016
1	Payments / Mobile Payment Services & Digital Wallets	
2	Cameras / 3D Embedded Camera Manufacturing	
3	Digital Music Players / Portable Media Player Manufacturing	
4	MP3 Player / Portable CD + MP3 Player Manufacturing	
5	DMPs / Digital Media Players & Digital Media Receiver Network Device Manufacturing	
6	Smartwatches / Smart Watch & Computerized Wristwatch Manufacturing	
7	Social Media / Social Gaming Services	
8	Digital Media Services	
9	Publishing / Digital Publishing Software	
10	Collaboration Software & Workgroup Team Collaboration Software & Services	
11	Email / Internet Services for Email, Contacts & Calendars	
12	Health Data Platforms	
13	Hardware Servers / Rackmount Server & Rack Server Manufacturing	
14	Routers / WLAN Routers & Wireless Local Area Network Router Manufacturing	
15	Displays / Flat Display & Flat Panel Screen Monitors	
16	Displays / HDTV - High-Definition TV Monitors & Flat Panels	
17	Displays / LCD - Liquid Crystal Display Computer LCD Monitors	
18	Cables / Lightning to USB Cable Manufacturing	
19	Notebooks / Business Laptop & Notebook Computer Manufacturing	
20	Notebooks / Consumer Laptop & Notebook Computer Manufacturing	
21	PCs / All In One PCs & All-In-One PC Manufacturing	
22	PCs / PC Desktop Stand-Alone System Units	
23	Tablets / Apple iOS iPad Tablet Manufacturing	
24	Ink / Ink-jet Printer & All-In-One Inkjet Replacement Cartridges	
25	SANs / Storage Area Networks Infrastructure Products	
26	Web Browser Software	
27	Video Conferencing & Web Conferencing Software & Services	
28	Business Intelligence: Analytics - Big Data Analytics & Social Media Analytics Software	
29	PC Databases	
30	Content Authoring Tools	
31	SDK / iOS Software Developers Kits	
32	Collaboration / Cloud File Sync & File Sharing, Storage & Collaboration Solutions	
33	Digital Media Player Application Software	
34	Music / Consumer Music Creation Software	
35	DVD Application Software	
36	Photo Editing Software / Digital Photo Application Software	
37	Video Software / Digital Video Editing Software	
38	Auto Operating System, Car OS & Commercial Vehicle Operating System Software	
39	PC OS / Personal Computer Operating Systems Software	
40	Portable Intelligent Device OS Software for Handheld Computer, Cell Phone, Tablet & Smart Phone	
41	Tablet PC Operation System Software	
42	TV & Home Entertainment Media Center Operating Systems Software	
43	Phones / Smart Phones - Smartphone Manufacturing	
44	Internet - Music Downloads Subscription Services	
45	Internet Music / Digital Music Service & Personalized Music Listening	95

¹⁴ Alfred Rappaport, *Creating Shareholder Value*, (The Free Press, 1986)



Granular Classifications: From Complexity to Simplicity & Insights

Enhanced granularity is the foundation of many scientific insights, often becoming the inputs of simple yet powerful prediction models, including probabilities of entity survival or failure in nature. For example, the Periodic Table¹⁵ of Elements is an ultra-granular classification system based on the most granular measure of elements, the individual atom. When Dmitri Mendeleev first created the Periodic Table in 1869, he predicted as-yet-unknown elements existed that would fill gaps in his classifications once those elements were discovered¹⁶. His predictions were correct. During the Middle Ages there were 13 discovered elements; and by the end of the 1800's, there were 84 total elements. At present there are 118 discovered elements.

Elements in common columns in the Periodic Table share similar properties at the atomic level. Elements in common columns also have the same propensities when combining with other elements, therefore enable chemists to predict outcomes in reactions. And when they do combine, they create more stable molecules. For example, the alkali metals in Group 1 of the Periodic Table react with water. The Group 17 elements, the halogens, all react with metals to form salts. And the members of Group 18, noble gases, do not generally react with any of the common elements.¹⁷

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	* 71 Lu	* 72 Hf	* 73 Ta	* 74 W	* 75 Re	* 76 Os	* 77 Ir	* 78 Pt	* 79 Au	* 80 Hg	* 81 Tl	* 82 Pb	* 83 Bi	* 84 Po	* 85 At	* 86 Rn
87 Fr	88 Ra	* 103 Lr	* 104 Rf	* 105 Db	* 106 Sg	* 107 Bh	* 108 Hs	* 109 Mt	* 110 Ds	* 111 Rg	* 112 Cn	* 113 Uut	* 114 Fl	* 115 Uup	* 116 Lv	* 117 Uus	* 118 Uuo
		* 57 La	* 58 Ce	* 59 Pr	* 60 Nd	* 61 Pm	* 62 Sm	* 63 Eu	* 64 Gd	* 65 Tb	* 66 Dy	* 67 Ho	* 68 Er	* 69 Tm	* 70 Yb		
		* 89 Ac	* 90 Th	* 91 Pa	* 92 U	* 93 Np	* 94 Pu	* 95 Am	* 96 Cm	* 97 Bk	* 98 Cf	* 99 Es	* 100 Fm	* 101 Md	* 102 No		

Figure 4- Periodic Table of the Elements, the Leading Chemical Classification System

Biology is another field where ultra-granular definitions have contributed to current and predictive sciences. Carl Linnaeus published his ultra-granular biological taxonomy (classification system) in 1735¹⁸ with the species as the most fundamental of classification units. Linnaean Taxonomy, further extended by Evolutionary Taxonomy or Darwinian Classification¹⁹ enables biologists to understand not only how plant, animal, fungi, chromists and protozoa species are classified, but also how they evolved, which species might yet be discovered and how these granular organisms might adapt, react and be recombined in the “survival of the fittest” of nature.

At present, it is estimated that 8.7 million species exist in earth²⁰. Nevertheless, researchers predict with current granular biological classifications that only a fraction of these species have been identified, including just 7% of fungi and 12% of animals, compared with 72% of plants. In another predictive use of granular biological classifications, researchers estimate that between

¹⁵ [Periodic Table](#), Wikipedia (March 2016)

¹⁶ Kaji, Masanori, *D.I.Mendeleev's concept of chemical elements and The Principles of Chemistry*, (Bulletin for the History of Chemistry, 2002)

¹⁷ *Periodic Table - Predicting the Structure and Properties of the Elements*, (World of Earth Science, 2003)

¹⁸ Carl Linnaeus, *Systema Naturae*, (1735)

¹⁹ Mayr, Ernst & Bock, *Classifications and other ordering systems*, (Journal of Zoological Systematics and Evolutionary Research, 2002)

²⁰ Juliet Eilperin, [8.7 million species exist on Earth, study estimates](#), (Washington Post, August 23, 2011)



15% and 37% of certain plant and animal species will be extinct by 2050²¹ due to the stresses of global warming. Other research looks at the ability of species to react to environmental stresses.²²

A third example of ever granular classifications are genetics. The Human Genome Project (HGP) maps all of the human genes - together known as the genome, thereby giving scientists the ability to read and potentially modify nature's complete genetic blueprint for building a human being.²³ The human genome is certainly an ultra-granular classification of human composition. At present it is estimated that there are 20,000-25,000 human protein-coding genes²⁴. The identification and classification of these genes, the granular building blocks of life, enable scientists to formulate more effective medicines and to predict the effects of health stresses like cancer, aging, sun exposure, hearing loss, inherited blindness and infertility.²⁵

These three scientific fields invented classification systems that are based on the most fundamental yet simple building blocks of chemistry, biology and genetics. Knowing these ultra-granular units of nature and their relationships in classifications, empowers scientists to harness the complexity that nature creates in innumerable scenarios. Specific simplified insights include:

- Realizing gaps in existing classifications
- Predicting propensities for survivability, advantage and stability
- Goals for reconfiguration and combinations

These complexity to simplicity insights are also inherent in IBB classifications. Whereas the atom, species and gene are fundamental classification units in nature, IBB utilizes the most fundamental unit of business, the ultra-granular industry defined by archetypical forces of competition. Once ultra-granular industries are defined in IBB methodologies, investors and analysts can be rewarded, like their counterparts in the sciences, with simplified insights based on great complexity.

²¹ Thomas, C.D.; Cameron, A.; Green, R.E.; Bakkenes, M.; Beaumont, L.J.; Collingham, Y.C.; Erasmus, B.F.N.; Siqueira, M.F.D.; Grainger, A.; Hannah, L., *Extinction risk from climate change*, (Nature, 2004)

²² Alba Estrada, Ignacio Morales-Castilla, Paul Caplat, Regan Early, *Usefulness of Species Traits in Predicting Range Shifts*, (Trends in Ecology & Evolution, 2016)

²³ [All About The Human Genome Project \(HGP\)](#), (National Institute of Health, National Human Genome Research Institute, March 2016)

²⁴ [The human genome is the genome of Homo sapiens](#), (Science Daily, March 2016)

²⁵ [Genome Advancements](#), (National Institute of Health, National Human Genome Research Institute, March 2016)



IBB Classifications versus Other Industry Classifications

IBB is an industrial classification system that is complementary with the leading classification systems of GICS²⁶, TRBC²⁷ and ICB²⁸. These three leading industry classification systems were created to organize public companies into groupings whose stock behaviors are generally correlated. Therefore, their most basic unit of granularity is the company itself based on past financial reporting. Each company in these classifications is assigned to only one classification at their lowest levels. Table 2 compares IBB with the leading industry classification systems.

Table 2- Industry Classification Comparisons

	Most Granular Unit	Level 1	Level 2	Level 3	Level 4	Level 5
GICS	the company	Sectors	Industry Groups	Industries	Sub-Industries	
		11	24	68	156	
ICB	the company	Industries	Super Sectors	Sectors	Sub Sectors	
		10	19	41	114	
TRBC	the company	Economic Sectors	Business Sectors	Industry Groups	Industries	Activities
		10	28	54	136	837
IBB	the industry	Industry Sectors	Industry Subsectors	Industry Groups	Industry Subgroups	Industries
		19	130	535	2,552	17,613

Table 3 illustrates example public companies and their corresponding IBB industry ultra-granularity, remembering that GICS, TRBC and ICB would define each company in only one classification.

Table 3 – Example IBB Industry Classification Granularity as of March 1, 2016

Company	IBB Industries	Company	IBB Industries	Company	IBB Industries
Accenture	95	McDonald's	1	Nestle	54
Amazon.com	84	Haier Group	83	News Corp.	46
Apple	50	HP Enterprise	289	Oracle	234
BASF	184	Marriott	3	Oshkosh	22
Caterpillar	227	HP Inc	80	Royal Caribbean	1
Corning	70	IBM	675	Procter & Gamble	173
Wal-Mart	11	JPMorgan Chase	96	PepsiCo	63
Dow Chemical	90	Kraft Heinz	84	Pfizer	60
AutoZone	2	MetLife	64	Qualcomm	43
General Electric	203	Microsoft	195	Toyota Group	76

²⁶ [GICS Classification Offering](#), (MSCI, March 2016)

²⁷ Geoffrey Horrell and Richard Meraz, [Test-Driving Industry Classifications](#) - Correlation coefficients in market-based industry classifications [TRBC], (Journal of Indexes, September/October 2009)

²⁸ [A comprehensive structure for company classification](#) (ICB, March 2016)



Table 4 displays examples where a company can simultaneously compete in multiple ultra-granular IBB industries. In Table 4, Amazon competing in several example cloud industries.

Table 4 - Example IBB Cloud Related Industries + Competitors in that IBB Industry Classification

Example IBB Industry Classifications	Example Competitors at IBB Industry Classification
Cloud Computing - General Public Cloud Computing Service	Amazon ; Windstream Corporation; EMC Corporation; Teradata; NTT Group; ...
Cloud Computing Database as a Services & Data Warehouse as a Service	Microsoft; Amazon ; Teradata; Alphabet Inc; ...
Cloud Computing Development Platform as a Service / PaaS	Salesforce.com; International Business Machines; Amazon ; EMC Corporation; Magic Software Enterprises; Red Hat Inc; Engine Yard Inc; SAP; Hewlett-Packard Enterprise; Alphabet Inc; ...
Cloud Computing Mobile Workspace Suite & Workspace as a Service	Citrix Systems; EMC Corporation; Microsoft; Dell; Amazon ; Unisys; Aurelius Group; Huawei Technologies; Colt Group SA; Independence IT Corporation; MobileIron; Blackberry Limited; ...
Cloud Computing Storage & Cloud Storage Services	Amazon ; Alphabet Inc; Microsoft; Acxiom; AT&T; Amplidata; Rackspace Hosting; Windstream Corporation; Basho Technologies; Hewlett-Packard Enterprise; International Business Machines; ...

IBB complements GICS, TRBC and ICB in that IBB's lowest level is the Porter five forces defined granular industry. Therefore a company may simultaneously be classified in several or many IBB industry classifications. IBB also differs from GICS, TRBC and ICB in that IBB is forward looking, evolving weekly as granular industries with new or removed company members emerge and adapt to ever changing market competitive pressures. GICS, TRBC and ICB are logically limited to their historical correlations, thereby company assignments to a particular classification change slowly over time.

The disadvantage of IBB industry granularity is that it does not fit the single company industry assignment for stock correlation purposes. Partial company assignments to multiple IBB classifications for historical indexes are difficult. Nevertheless, the advantage of IBB's fundamental granularity is that it enables greater market visibility once the ultra-granular IBB industries are first identified then reassembled into simpler patterns, trends and themes. The following case studies follow this methodology of first identifying granular and complex IBB industry units which are archetypical competitive forces, then reassembling them into simple composite market insights.



Case Study 1: Single Company Investing (Google, Alphabet)

Google, aka GOOG, GOOGL or Alphabet, has been a key company driving many technology innovations. Over the past five years [2011-2015] Google has grown 150% in value, exceeding a market capitalization of \$500 billion and approaching yearly revenues of \$75 billion. The simple, pre-complexity story is that Google's business model of search plus advertising has been fabulously successful. Yet hidden in this simplicity is a complex proliferation of new markets and products that have been remaking Google.

Figure 5- Google IBB Granular Industries and Stock Price over Time

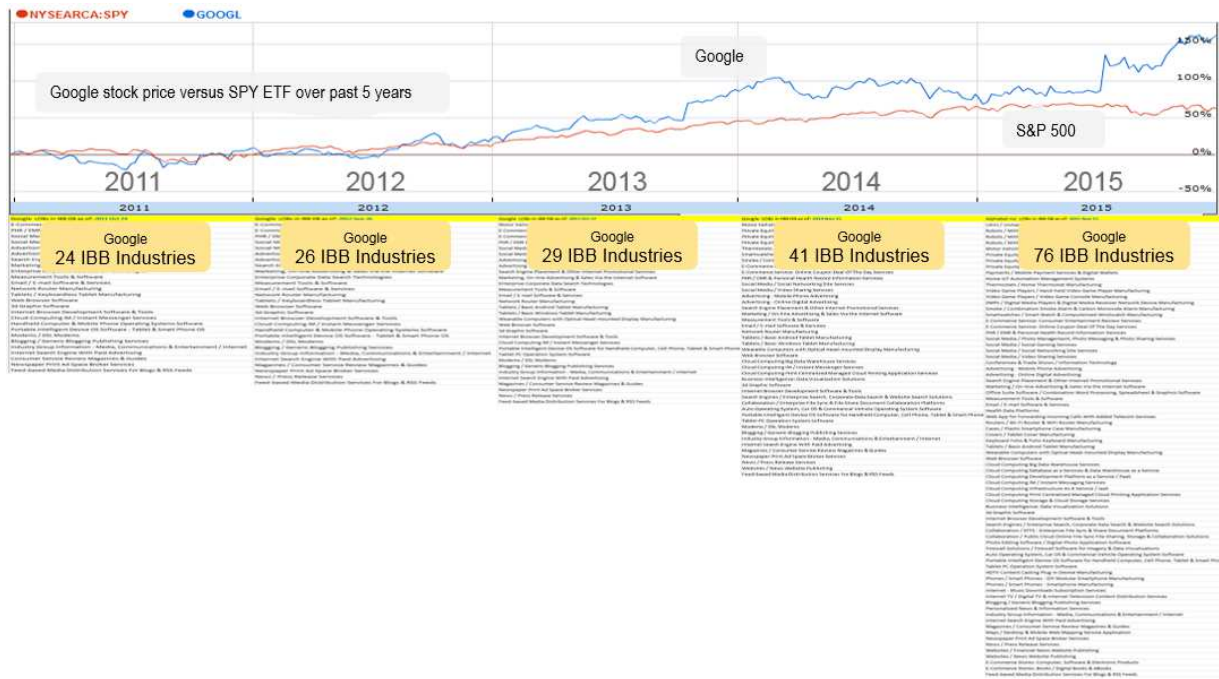


Figure 5 shows the actual complexity of Google as new ultra-granular industries are added every year between 2011 and year end 2015. In 2011, IBB identified 24 industries defining Google. By year end of 2015, Google's composite industry composition grew at an average annual rate of 26% to 76 ultra-granular industries. Interestingly, Google IBB industries grew 85% between 2014 and 2015. Table 5 reveals even more complexity about Google's definition as a multi-industry competitor, comparing specific ultra-granular industries between 2011 and 2015.



Table 5 - IBB Industry Definitions for Google (2011 versus 2015)

24 IBB Industries	76 IBB Industries
2011 IBB Industries Defining Google = 24	2015 IBB Industries defining Google = 76
Advertising - Mobile Phone Advertising	Advertising - Mobile Phone Advertising
Advertising - Online Digital Advertising	Advertising - Online Digital Advertising
Internet Search Engine With Paid Advertising	Internet Search Engine With Paid Advertising
	UAVs / Unmanned Aerial Vehicle Drone Manufacturing
	Robots / Military All Weather All Terrain Robot Manufacturing
	Robots / Military Search & Rescue Robot Manufacturing
	Robots / Military Squad Gear Transport Support Robot Manufacturing
	Smartwatches / Smart Watch & Computerized Wristwatch Manufacturing
Marketing, On-line Advertising & Sales Via the Internet Software	Marketing / On-line Advertising & Sales Via the Internet Software
	Office Suite Software / Combination Word Processing, Spreadsheet & Graphics Software
Measurement Tools & Software	Measurement Tools & Software
Email / E-mail Software & Services	Email / E-mail Software & Services
	Web App for Forwarding Incoming Calls With Added Telecom Services
	Maps / Desktop & Mobile Web Mapping Service Application
	Motor Vehicles / Autos - Driverless Cars, Autonomous Cars & Self-Driving Cars
Network Router Manufacturing	Routers / Wi-Fi Router & WiFi Router Manufacturing
	HDTV Content Casting Plug-In Device Manufacturing
	Video Game Players / Hand-held Video Game Player Manufacturing
	Video Game Players / Video Game Console Manufacturing
	DMPs / Digital Media Players & Digital Media Receiver Network Device Manufacturing
Newspaper Print Ad Space Broker Services	Newspaper Print Ad Space Broker Services
Feed-based Media Distribution Services For Blogs & RSS Feeds	Feed-based Media Distribution Services For Blogs & RSS Feeds
	Payments / Mobile Payment Services & Digital Wallets
	Conferences & Trade Shows / Information Technology
	Health Data Platforms
	Home IoT Automation Management Systems
	Thermostats / Home Thermostat Manufacturing
	Smoke / Combination Smoke Alarm & Carbon Monoxide Alarm Manufacturing
E-Commerce Stores: Computer, Software & Electronic Products	E-Commerce Stores: Computer, Software & Electronic Products
	E-Commerce Stores: Books / Digital Books & eBooks
	Cloud Computing Big Data Warehouse Services
	Cloud Computing Database as a Services & Data Warehouse as a Service
	Cloud Computing Development Platform as a Service / PaaS
Cloud Computing IM / Instant Messaging Services	Cloud Computing IM / Instant Messaging Services
	Cloud Computing Infrastructure As A Service / IaaS
	Cloud Computing Print Centralized Managed Cloud Printing Application Services
	Cloud Computing Storage & Cloud Storage Services
	Private Equity - Angel Network Investment Services & Seed Capital Funding
	Private Equity - Growth Capital Investment Services
	Private Equity - Venture Capital Funding Services



Table 5 - Continued - IBB Industry Definitions for Google (2011 versus 2015)

2011 IBB Industries Defining Google = 24 (continued)	2015 IBB Industries defining Google = 76 (continued)
	Internet - Music Downloads Subscription Services
	Internet TV / Digital TV & Internet Television Content Distribution Services
Blogging / Generic Blogging Publishing Services	Blogging / Generic Blogging Publishing Services
	Personalized News & Information Services
Industry Group Information - Media, Communications & Entertainment / Internet	Industry Group Information - Media, Communications & Entertainment / Internet
Magazines / Consumer Service Review Magazines & Guides	Magazines / Consumer Service Review Magazines & Guides
	News / Press Release Services
Predominant single industry classification for Google	Websites / Financial News Website Publishing
	Websites / News Website Publishing
Search Engine Placement & Other Internet Promotional Services	Search Engine Placement & Other Internet Promotional Services
	E-Commerce Service: Consumer Entertainment Review Services
	E-Commerce Service: Online Coupon Deal Of The Day Services
PHR / EMR & Personal Health Record Information Services	PHR / EMR & Personal Health Record Information Services
	Social Media / Photo Management, Photo Messaging & Photo Sharing Services
	Social Media / Social Gaming Services
Social Media / Social Networking Site Services	Social Media / Social Networking Site Services
Social Media / Video Sharing Services	Social Media / Video Sharing Services
Web Browser Software	Web Browser Software
	Business Intelligence: Data Visualization Solutions
3d Graphic Software	3d Graphic Software
Internet Browser Development Software & Tools	Internet Browser Development Software & Tools
Search Engines / Enterprise Search, Corporate Data Search & Website Search Solutions	Search Engines / Enterprise Search, Corporate Data Search & Website Search Solutions
	Collaboration / EDFS - Enterprise File Sync & Share Document Platforms
	Collaboration / Public Cloud Online File Sync File Sharing, Storage & Collaboration Solutions
	Photo Editing Software / Digital Photo Application Software
	Firewall Solutions / Firewall Software for Imagery & Data Visualizations
	Auto Operating System, Car OS & Commercial Vehicle Operating System Software
Portable Intelligent Device OS Software for Handheld Computer, Cell Phone, Tablet & Smart Phone	Portable Intelligent Device OS Software for Handheld Computer, Cell Phone, Tablet & Smart Phone
	Tablet PC Operation System Software
	Cases / Plastic Smartphone Case Manufacturing
	Covers / Tablet Cover Manufacturing
	Keyboard Folio & Folio Keyboard Manufacturing
	Tablets / Basic Android Tablet Manufacturing
	Wearable Computers with Optical Head-mounted Display Manufacturing
	Phones / Smart Phones - DIY Modular Smartphone Manufacturing
	Phones / Smart Phones - Smartphone Manufacturing
Modems / DSL Modems	



Although it could be the case that Google grew in stock value entirely based on its primary search/advertising market identity, it is more likely that new Google ultra-granular industries were also positively influencing overall Google revenues and market sentiments. Table 6 reveals a simplified analysis of the major business categories, as composites of many ultra-granular IBB industries, where Google grew between 2011 and 2015.

Table 6 - Simplifying Google Ultra-Granular Industry Complexity (2011-2015)

Composite Industries or Themes	Table 5 color code	2011 industry count	2015 industry count	% growth	Analysis Notes
Cloud Computing		1	8	700%	Complementary tracking information like revenue estimates and expanded market sentiments.
Consumer Content Publishing		6	16	167%	
Home Internet of Things		0	3	na	
Consumer Electronic Devices		1	14	1300%	
Consumer Purchases		2	5	150%	
Healthcare		1	8	700%	
Autonomous Cars		0	1	na	

Figure 5 with Table 5 reveals the complexity of Google in the many granular industries where it competes. Table 6 collapsed that complexity about Google by revealing major market themes where Google was investing and developing new markets. For example, many might find it surprising that Google is growing as a significant cloud services competitor, starting with one cloud computing industry in 2011 and ending 2015 with eight cloud industries.

The value of IBB ultra-granularity for individual company analysis includes the following:

- Revealing the true complexity of companies, complementing standard classification systems.
- Baseline for predicting survivability, advantage and stability in competitive markets.
 - For example, Google industries can be compared with major competitors [like Apple, Microsoft, etc.] over time, thereby anticipating strategic movements.
- Opportunities for new/divested product lines
 - IBB enables analysts and investors to see what internal company corporate planners are seeing; thereby providing some predictive insights about future strategic evolutions.
- Strategies for company reconfigurations and combinations
 - IBB industries can be mixed and matched into new combinations because they are unique without overlap with other IBB industries. Therefore IBB industries can be inputs to new strategic company organizations. [See Case Study 3]



Case Study 2: Theme Investing (Cloud Computing)

Case 1 demonstrated the evolving definition of Google as it added new ultra-granular industries to its market offerings. Case 2 complements the single company analysis of Google in Case 1 with the application of ultra-granular classifications as part of market themes. Cloud computing is a major structural trend today, enabling many related market trends like the industrial internet and connected healthcare. The importance of cloud trends is highlighted by these statistics²⁹:

- Morgan Stanley predicts Microsoft cloud products will be 30% of revenue by 2018.
- In 2015, Amazon Web Services (AWS) generated \$7.88B in revenue with Q4 2015, up 69% over last year.
- Worldwide spending on public cloud services will grow at a 19.4% compound annual growth rate (CAGR) from nearly \$70B in 2015 to more than \$141B in 2019.

Cloud computing investing themes will also benefit from the complexity of IBB ultra-granularity that can be collapsed into simple insights. There are currently 73 ultra-granular IBB industries defining the various cloud computing industries (March 2016). In 2014 there were 44. Table 7 defines the growth of cloud computing industries over time in relationship to major cloud competitors: Amazon³⁰, IBM, Cisco, Oracle, Google³¹, Dell and Microsoft.

²⁹ L. Columbus, *Roundup Of Cloud Computing Forecasts And Market Estimates, 2016*, (Forbes, March 13, 2016)

³⁰ J. Bort, *Google just scored a huge win against Amazon by landing Apple as a customer*, (Business Insider, Mar. 16, 2016)

³¹ Table 5 was based on Google IBB industries at year end 2015. Table 8 used updated count on March 15, 2016.



Table 7 - Complexity and History of Ultra-Granular IBB Cloud Industries (2014-2016)

Amazon		Cisco		Dell		Microsoft															
IBM		Oracle		Google																	
2014 (Jan)		2015 (Jan)		2016 (Mar)																	
Total IBB Cloud = 44		Total IBB Cloud = 64		Total IBB Cloud = 73																	
A	I	C	O	D	G	M	A	I	C	O	D	G	M	A	I	C	O	D	G	M	IBB Industry Name
13	5	0	0	1	0	1	13	6	0	0	3	1	1	16	17	5	4	13	8	14	<i>yearly totals - both tables together</i>
																				IT Training - Cloud Training, Web Services, Virtualization & Arch. Training	
																				Corporate Planning Cloud & Company Business Planning Cloud Service	
																				Market Intelligence Cloud & Business Intelligence Cloud Services	
																				Company Cloud / Holistic Business Cloud Services	
																				Managed Services / Marketing Cloud Managed Services	
																				Marketing Cloud / Holistic Marketing Cloud Services	
																				Social Media Analytics, Social Analytics & Cloud Insights Cloud Services	
																				IT Consulting - Cloud Consulting Services	
																				IT Consulting - Security / Cloud Security Services	
																				Web Hosting / Email Hosted Security Services & Cloud Email Mgmt. Services	
																				Managed Cloud Services / Cloud Man. Services, Man. Cloud Ops. & Admin	
																				Cloud-based Handwriting & Data Capture Solutions	
																				Home Cloud Software & Home Device Remote Access Services	
																				Cloud Services / Compliant Healthcare Cloud Platform	
																				Cloud Computing Operator Network Extension Capabilities for Telecom	
																				Internet-Focused Self-Contained Cloud Computing Data Centers	
																				Wireless Virtual Appliances for Cloud Environments	
																				Cloud Services Distribution Services	
																				Cloud Solutions Distribution Services	
																				Cloud Computing - Cloud Management & Cloud Monitoring Services	
																				Cloud Computing - General Hybrid Cloud Computing Service	
																				Cloud Computing - General Private Cloud Computing Service	
																				Cloud Computing - General Public Cloud Computing Service	
																				Cloud Computing - HPC Cloud & High Performance Computing Cloud	
																				Cloud Computing Analytics Advisor Services Using Cog. Natural-Language Q&A	
																				Cloud Computing Backup & Cloud Disaster Recovery Services	
																				Cloud Computing Big Data As A Service & Cloud Analytics As A Service	
																				Cloud Computing Big Data Spreadsheet Services	
																				Cloud Computing Big Data Warehouse Services	
																				Cloud Computing Collaborative Application Development Platform	
																				Cloud Computing Collaborative Project Information Management Platform	



Table 7 reveals the complexity of cloud computing, defined by many ultra-granular industries. Table 7 is possible because each IBB industry is unique, without overlaps with other IBB industries, therefore enabling the assembling of industry composites out of ultra-granular IBB industry units.

Table 8 - Simplifying Ultra-Granular Cloud Industry Complexity (2011-2015)

Cloud Computing Theme Insights	Table 7 color code	2014 cloud IBB count	2015 cloud IBB count	2016 cloud IBB count	% of 2016 total cloud industries	% of 2016 cloud to total company industries
Explosive overall cloud industry growth rate		44	64	73	100%	
Amazon was early and continued leadership		13	13	16	22%	15%
IBM is another early leader in cloud computing		5	6	17	23%	2%
Microsoft accelerated its cloud offerings the most		1	1	14	19%	5%
Dell + EMC created a new force in cloud		1	3	13	18%	5%
To the distress of Amazon, Google grows in cloud		0	1	8	11%	9%
Cisco plays catch-up in cloud computing		0	0	5	7%	3%
Oracle plays catch-up in cloud computing		0	0	4	5%	1%

The most contested cloud industries are these..

- .. Cloud computing databases a service & data warehousing as a service
- .. Cloud computing development platform as a service / PaaS
- .. Cloud computing storage & cloud storage services

Table 8 collapses the ultra-granular industry complexity of cloud computing from Table 7 into simple insights. For example, the number of cloud industries grew from 44 to 73 or 66% in the twenty-six months starting from January of 2014. Amazon was an early leader in cloud industries, yet Microsoft and IBM accelerated their efforts with comparable industry developments.

The value of IBB ultra-granularity for market theme analysis includes the following:

- Realization that theme and ETF³² collections of companies can be very complex, thereby defining potential noise and other influences to the investment.
- Baseline for predicting survivability, advantage and stability as companies compete with each other across many simultaneous industries.
 - For example, IBB cloud granularity is defining a road map for Cisco and Oracle to catch-up with Amazon, IBM and Dell.
- Opportunities for new/divested product lines.
 - IBB enables analysts and investors to see what internal company corporate planners are seeing; thereby providing some predictive insights about future strategic evolutions.
- Strategies for company reconfigurations and combinations
 - IBB industries can be mixed and matched into new combinations because they are unique without overlap with other IBB industries. [See Case Study 3]

³² [What Are ETFs?](#), (Nasdaq, 2016)



Case Study 3: Merger & Acquisition Investing (Dell + EMC)

One of the simple insights from the complexity of IBB ultra-granularity are merger & acquisition investing opportunities - likewise divesture opportunities. In 2015, Dell and EMC announced that they would merge. Even before this merger was announced, IBB classifications predicted the strategic benefits of the merger³³ through its process of converting great complexity/granularity into financial decision making simplicity.

Figure 6 details the complexity of 278 ultra-granular industries that will compose the new Dell + EMC at the inception of the merger. The analytic intent of Figure 6 is to show the new combination of Dell + EMC as composed of 278 IBB industries, and then to compare this combination with competitor IBM. Figure 6 furthermore illustrates example strategic advantages of Dell + EMC as colored bands across many IBB industries.

Table 9 – Grouping & Strategy Color Codes for Figure 6, Dell + EMC IBB Industries

Dell + EMC Combination Key	Figure 6 color code
Dell IBB Industries before EMC	Grey
Dell + EMC overlap, strengthening industry	Dark Grey
New Dell industry enabled by EMC	Yellow
IBM industries	Light Blue
Strategic Advantage = Single CIO Solutions	Dark Green
Strategic Advantage = Manufacturing & Marketing economies of scale	Purple
Strategic Advantage = Big Data + IOT + Cloud Platforms	Orange

IBM was chosen as a competitor comparison due to its long standing strategy of offering complete solutions to its target clients, who are the largest multinationals and government agencies. Dell + EMC enables Dell to offer total solutions to Chief Information Officers of mid-sized companies to large multinationals. The Dell and EMC combination also brings the strategic value of manufacturing and marketing economies of scale, as well as critical mass to any cloud, Internet of Things or Big Data client offerings.

³³ Trefis Team, *Dell-EMC Merger Gets FTC Approval, Remains On Track To Close*, (Forbes, Feb. 25, 2016)



Figure 6 - Complexity of Dell + EMC Ultra-Granular, 278 IBB Industries (January 2016)

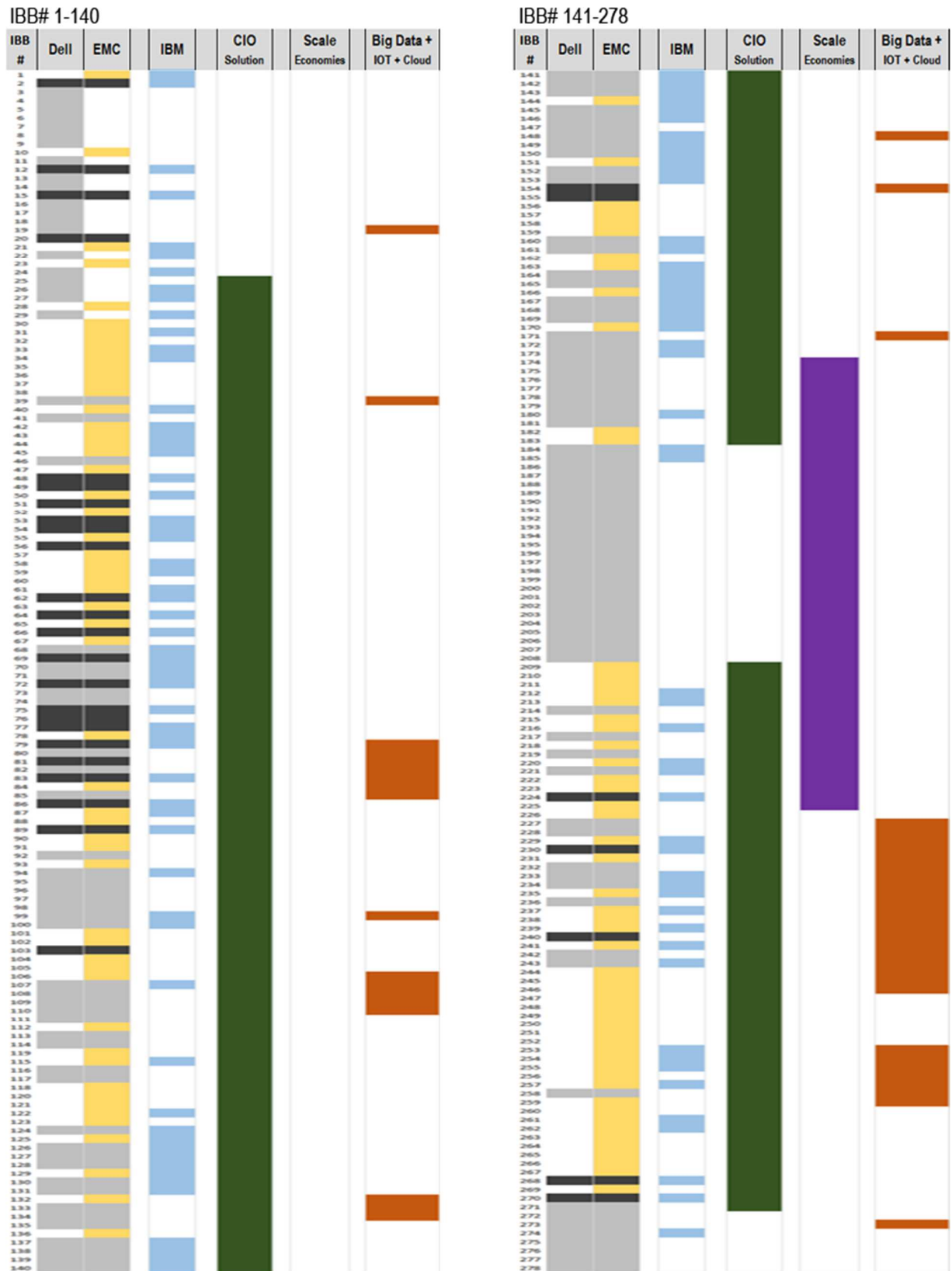




Figure 6 reveals the complexity of Dell + EMC, defined by many ultra-granular industries. Figure 6, like Table 7 is possible because each IBB industry is unique, without overlaps with other IBB industries, therefore enabling the assembling of industry composites out of ultra-granular IBB industry units.

Table 10 - Simplifying Dell + EMC Ultra-Granular Industry Complexity

Dell + EMC Merger Insights	Figure 6 color code	Industries Before Merger	Industries After Merger	Industry Count Increase	Percent Increase
Dell IBB Industries before EMC		169	278	109	64%
Dell + EMC overlap, strengthening industry			31		
New Dell industry enabled by EMC			109		
IBM industries Overlap		70	111	41	59%
Strategic Advantage = Single CIO Solutions		115	222	107	93%
Strategic Advantage = Manufacturing & Marketing economies of scale		38	52	14	37%
Strategic Advantage = Big Data + IOT + Cloud Platforms		30	49	19	63%

Table 10 collapses the ultra-granular industry complexity of Dell + EMC merger from Figure 6 into simple insights. For example, many might find it surprising that EMC brought an additional 109 industries to Dell's starting industry count of 169. And these 109 new industries gives Dell a 59% increase in competitiveness with IBM³⁴ and a 93% increase in achieving the strategic objective of offering CIO's complete IT solutions.

The value of IBB ultra-granularity for merger and acquisition analysis includes the following:

- Baseline for predicting survivability, advantage and stability as merged companies compete with competitors across many simultaneous industries.
 - For example Dell's improved competitive positioning against IBM.
 - For example Dell's new critical mass for complete CIO solutions.
 - For example Dell's new economies of scale.
 - For example Dell's expanded arsenal for cloud, IOT and big data solutions.
- Opportunities for new/divested product lines.
 - Once Dell + EMC consolidates, there will be opportunities to divest industries for cash or to add industries for strategic critical mass.

³⁴ Not all IBM ultra-granular industries were included in this Dell+EMC analysis. As of March 2016, IBM was defined by 675 IBB industries. Many of these industries were vertical industries along the lines of healthcare, automotive, banking, etc.



Implications for Analysts, Portfolio Managers and Strategic Planners

All sophisticated investors and analysts attempting to tame complex markets are similar to scientists who are attempting to understand nature. In their quest for knowledge, scientists create, reference and maintain classification systems that define nature in its most basic units. These classification systems are founded on all the true complexity of nature, defined by innumerable granular units like the atom, species and gene. And once these basic units are classified, the units and their classification relationships give great power to predict future outcomes or discover missing insights.

In business, a most basic unit of markets are Porter industry units that capture the fundamental forces of competitiveness. Every Porter industry has a unique market behavior, unique and indivisible from any other Porter industry. Industry Building Blocks [IBB] is an industrial classification system founded on these most basic or ultra-granular marketplace industries. IBB industries enable analysts, managers and planners to define companies in ultra-granular industry units that can be analyzed for expected outcomes and recombined into new groupings as part of competitive growth and survival.

In simple practice, all that is needed to access these ultra-granular industry units is a company or market theme name. And with these returned IBB industries, analysts and investors can mix and match the IBB industries for superior situational awareness, investment thesis formulation or investment tracking. The resulting IBB ultra-granularity and distilled complexity will complement existing decision processes with simple and powerful market insights.



Industry Building Blocks

Industry Building Blocks (IBB) has developed the most granular industry classification system available, with information on over 17,000 global industries. All IBB information is developed through proprietary research; and all company information is normalized using the Industry Building Blocks Classification System™. This normalization process enables IBB to uniquely provide side-by-side company comparisons at the line-of-business level, where true competition takes place.

Discovery Patterns

Discovery Patterns has been a pioneer in unstructured big data analytics for over a decade, creating unique software, big data processes and animated interfaces. Our original intelligence implementations were for Fortune 50 multinationals. Their needs for market planning laid the foundation for investor intelligence needs.

Discovery Patterns offers public intelligence ecosystems for the Internet of Things, healthcare, finance, digital currency, robotics, smart optics, cloud computing, smart homes, smart factories, wearable devices, smart garments, smart cities, energy transformations and smart retail. DP primarily is located in the greater Boston, Massachusetts, US area - enabled by worldwide cloud networks.

James J Andrus

James Andrus is the technical founder of Discovery Patterns, with fifteen years of experience in data science, unstructured big data analytics, information displays and intelligence services based on those analytics. He was educated as an engineer from the University of Cincinnati, and as a market analyst manager from the Kellogg School of Northwestern University.

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Alan is the owner of Industry Building Blocks (IBB) which has developed the most granular (five forces level) industry classification system available, with information on over 17,000 global industries. He has worked at GE, McKinsey, JPMorgan Chase, IBM, and OneBeacon Insurance, where he was the corporate planner. Alan is a Binghamton University tri alumnus with a BA from Harpur College, an MBA from the School of Management, and an MS from Watson School of Engineering.

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