Quantifying Process

PREPARING FOR THE AGE OF DATA UBIQUITY

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Jefferies

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Preparing for an Era of Data Ubiquity

The world has moved on in the 12 months since we published *Quantifying Strategy*. "Alternative data" and "big data" have become just another category of "data." More than 70% of top hedge funds and 75% of top mutual funds now have data science initiatives, and private equity firms are also increasingly – and publicly – nurturing their own data efforts.[1] Corporates in every sector are regularly finding innovative ways to efficiently and productively use the data produced as part of their normal course of business. But data is increasingly only *part* of the story.

> IN AN ERA OF DATA UBIQUITY, WHEN INFORMATION IS EVERYWHERE, THIS WEALTH OF INFORMATION CAN CREATE A POVERTY OF ATTENTION - AND WITH IT, THE NEED TO ALLOCATE ATTENTION MORE EFFICIENTLY.[2] ORGANIZATIONS ARE FEVERISHLY WORKING TO EXPLOIT THE "INTERNET-LEVEL" SHIFT THAT'S EMERGING FROM THE DATA EXPLOSION – SQUARELY TURNING THEIR FOCUS TO THE PROCESSES THAT WILL GIVE THEM A COMPETITIVE ADVANTAGE OVER THE LONG TERM. *QUANTIFYING PROCESS* IS AT THE HEART OF TURNING THE DATA DELUGE INTO A STRENGTH, AS INVESTORS TRY TO BUILD A 'GOD'S EYE VIEW' FROM NEW INFORMATION AND TOOLS COMING ONLINE.

Investing – and indeed, running any business – has always been data driven. But what that means in an era of data ubiquity differs starkly from when information was scarcer. "Getting there first" was often the fastest route to arbitraging opportunities, whether "there" meant a piece of data, a new investment process or identifying patterns and aberrations. Because so much data has come online so quickly, decision makers have struggled with building agile and sustainable frameworks and processes to incorporate these new resources.

Quantifying Intuition broadly mapped the data science landscape across investment firms – bucketing them into one of four categories: i) Early adopters, ii) Early mainstream, iii) Mainstream, and iv) Nascent adopters. *Quantifying Strategy* dove deeper, exploring how nearly 50 Early Adopter and Early Mainstream firms were actively building their data science efforts. *Quantifying Process* gets more granular still – examining the data itself and the workflows and infrastructure that turn new information into actionable insights.

We explore the diverse ways data makes its way from point of origin to investment process, and how firms are working to turn data and analytics from a cost, into a profit center. We also address the regulatory and cybersecurity questions that have emerged, as firms work to maintain an edge when information is everywhere.

It's estimated we're only using *1%* of currently available data, and that is before accounting for all the new forms of data coming online.[3] Harnessing and leveraging these new tools more efficiently and effectively than competitors is necessary, making the frameworks, workflow and resourcing a true differentiator.

It is our hope that *Quantifying Process* further enhances the conversation around how investors are bracing for the approaching data onslaught. As always, we welcome your feedback and look forward to engaging with you and answering any questions you may have about the rapidly changing data landscape.

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PREDICTIONS

1	The percentage of top investment firms with a dedicated data effort will **surpass 90%** by 2020.[4]
2	**Data will *not* be democratized**. Given that data ubiquity can cause distraction, inefficiency or mission creep – firms with the most robust and agile data *processes* that minimize noise and build a better investing mosaic, will win.
3	In 3 years, the **Integrated approach** (as outlined on page 10) will be the standard framework for investment firms and companies to embed data efforts across their organizations.
4	The enormous growth in **language translation tools**, and the move towards simultaneous translation will demystify foreign markets and increase interest in Emerging Market investing.
5	A "**data grid**" – much like our current power grid – will emerge (largely from IoT growth), prompting new regulation and creating new sectors of investing, much like MLPs or Utilities.
6	Those lacking a "**practitioner's bridge**" for their data effort will risk falling behind due to cultural challenges of effectively using new forms of data.
7	**Broad, accurate and immediate data sets** will be the most valuable, given their contribution to building real time snapshots of different landscapes. But reliable access to these types of data sets could be challenged by individual states exercising rights over what they view as **data sovereignty**.
8	**Revenue streams from data-centric product lines** will become standard for nearly every corporate, excluding those that run afoul of privacy laws (i.e. – HIPAA, et. al.), turning data from a cost into a profit center.
9	Cybersecurity is at the heart of this explosion in data; **cybersecurity related intellectual property** will become among the most valuable in the market.
10	**Agility** of data infrastructure will become paramount – firms will need to focus on building processes that can adapt as new forms of data come online.

We formulate predictions on the basis of innovations and fact patterns we can currently identify. But predictions will – and *can* – only be partially accurate. New breakthroughs (5G, the next connected device, or other unknown unknowns) may increase data output by a considerable magnitude – making agility the critical component of data infrastructures. Stay hungry, stay agile.

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An "Internet-Level" Shift

The question is no longer who has access to the *best* data. The myth that unique data sets give investors a silver bullet has been replaced by the more accurate belief that regularly incorporating new data sources is critical to building more complete and long term investing mosaics. New data is merely an additional input to the multi-variable analysis that is financial modeling. The question *now* is how to build an efficient, repeatable process to source, evaluate and incorporate data in an era of information ubiquity - and what is the return on doing so?

The myth that uncovering a less traveled or completely unique data set gives investors a "silver bullet" has been replaced by the more accurate belief that finding new data sources is critical to building a more complete and long term investing mosaic.

Process, Process, Process: Why Does It Matter Now*?*

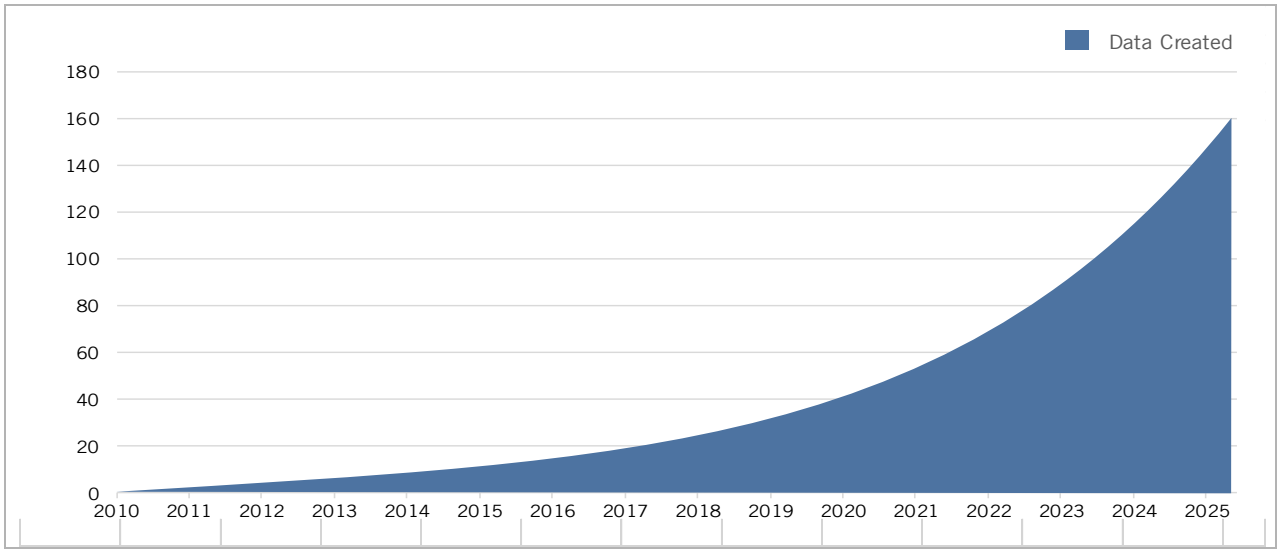
We are preparing for an era we can only somewhat currently define – which will have an "internet-level" impact across sectors and investment processes. If you knew in the early 1990s that a new technology called "the internet" was starting to gain traction and your investment professionals, traders and back office would use it for nearly endless use cases, you would have strategically adapted. People had PCs, phones and Bloomberg terminals at work, and could communicate instantaneously then – but many still had a hard time understanding the shift that was about to occur.

> *"Sure, getting there takes up gobs of memory, a special kind of Internet connection and a modem that's probably twice as fast as the one you bought just last year. But once you've made your way onto the World Wide Web, getting around is getting easier all the time – thanks to a new class of Web 'browser' software programs."* The New York Times, January 29, 1995

Remember when it was the "Internet," capital "I"? If decision makers had known how fundamentally it would change our lives and how we do business, they would have embraced it wholeheartedly at the beginning, instead of working to incrementally keep up and leverage it. The coming data ubiquity is this era's "internet-level" paradigm shift.

CHART 1

Annual Expected Growth of the Datasphere



Source: Data Age 2025: The Evolution of Data to Life Critical. IDC

And ubiquitous it will be. Many of us think we are already drowning in data, but IDC estimates that by 2025, the global datasphere will grow tenfold - from 16 zettabytes of data in 2016 to 163 zettabytes. What does that mean in practice, and how much of it will be "actionable?" We chart expected growth of various data verticals in Table 1 below, to indicate the magnitude of the road ahead.

Part of the reason why data is widely believed to be "the new oil" are the inherent, broad and unique use cases through which it creates value. Two investors with similar portfolios could use the same data set differently – they have different conviction levels, different entry and exit points, different hedging strategies, different durations. The same set of transaction data could contain entirely different signals for investors who initiated a position in a stock years ago and were considering unwinding it to harvest gains, versus those who may be considering upsizing a position. Similarly, corporates leverage data for a variety of use cases - from initiating new customer interactions, enhancing customer relationships, or creating new revenue streams.

TABLE 1

Growth in Selected Forms of Data

	Now	2020
IoT	**15+ billion** devices	**200 billion** devices[5]
VOICE	**1 billion voice searches** per month "Siri, what is……."	Voice will **account for 50%+** of all searches globally[6]
IMAGE	**4.7 trillion** images stored[7]	**Over 6 trillion** images stored[8]
VIDEO	**73%** of all internet traffic	**82%** of all internet traffic[9]
GOVERNMENTAL & PUBLIC DATA	Over **300,000** datasets	**Over 350,000** datasets[10]
INTERNET PENETRATION	**48.9%** worldwide internet user penetration	**53.7%** worldwide internet user penetration[11]
WEB	**2 zettabytes** of global IP traffic	**3.3 zettabytes** of global IP traffic[12]
SATELLITES	**1,738** active satellites[13]	**20,000** satellites[14]
EMPLOYMENT	Monthly, self reported surveys at 651,000 **static worksites**, and webscraping of company websites[15]	Inclusive of data from the **"gig" economy**[16]
SHIPPING (total) **Ground** **Air** **Maritime**	Max. 10 seconds latency Reported in real time[17] Reported monthly[18] Reported every 2 – 10 seconds	**Real time** across shipping subsectors

Source: Jefferies Prime Services

While all forms of data will witness considerable growth, much of it will emerge from IoT and sensors, creating information sources valuable to investors across nearly all sectors. Industrials firms like Caterpillar are working to create subscription data services for customers.[19] Energy firms can marry sensor data with seismic data to gather a much more holistic and real time view of activity. REITs will bring together satellite, sensor, transaction and governmental/public data to understand near real-time issues among their properties.

To date, financial firms have largely leveraged data in pursuit of a stronger investment process, mutual funds more typically looked to use at the enterprise level to improve business development or operational efficiencies, and corporates have both focused on product enhancement and improving productivity. At the corporate level, the Jefferies Equity Research team drilled into individual sectors, releasing more than a dozen *Powered by Data* reports, exploring the data trends that are likely to power various industries in the years ahead (see full list in Appendix I).[20]

CHART 2

Objectives for Data Usage to Date

Alternative Investment Firms	Mutual Funds	Corporates
Enhance investment process *Streamline processes*	*Enterprise efficiency*	*Enterprise efficiency* *Enhance product or revenue lines*

We expect these approaches to shift and converge; such that alternative investment firms, mutual funds and other asset managers and corporates look at data as both a tool for organizational efficiency and optimization *and* a potential new revenue stream or product line.

For investors – the data generated for different sectors will result in varying degrees of use in the investment process.

TABLE 2

Potential Leveraging of Data By Sector Investing

Source: Jefferies

Say What? As language translation tools improve, investors gain more transparent access to foreign markets

Part of what will drive data ubiquity is eliminating or minimizing language barriers. New types of data (exhaust, IoT, video and image) create vast pools of information, but so do processes that make current information more broadly available.

For those looking to invest in foreign countries, who want to gain a more holistic understanding of the local market, real time language translation tools are increasingly serving as a gateway to building a more comprehensive view of the economy.

Only 10% of India's 1.3 billion people speak English – about 130 million, and an even smaller percentage of mainland Chinese do.[21] For those looking to invest in foreign countries, who want to gain a more holistic understanding of the local market, real time language translation tools are increasingly serving as a gateway to building a more comprehensive view of the economy.

Nuances in understanding language and communication – ranging from subtle body cues in management meetings to full translation of local market news or social media – have long been critical to forming more clear investment theses. Breakthroughs in artificial intelligence are allowing much closer to accurate, real time translation of public statements, articles, chat rooms and other forms of communication. Even as firms look to translate their *own* products (most recently, for example – Amazon's embrace of Hindi for its website and apps in India), with 95% of online video consumption happening in vernacular or local languages – simultaneous translation will only help bring down barriers to better understand local markets.

Human language has remained stubbornly challenging to "hack," however, as historic translation tools have struggled with conventions like humor, irony or sarcasm – which human translators can more easily identify. But the vast adoption of voice tools (think GoogleHome) are feeding machines the necessary deluge of data to improve and come closer to perfecting accurate, real time translation.

What does this mean for investors? Let's take China as one example. Of the nearly 50 main newspapers in China, a number of them still are not published natively with English translation – those not fluent in Pekingese (the Beijing dialect) need to wait until Google, Microsoft or another reliable third party could do so. Newspapers, public remarks by regulators or other officials, financial statements, or internet pages are increasingly available in investors' native language without needing an expensive – and sometimes less accurate – third party to translate them.

It would follow then, that as these communication and language barriers continue to disappear, investors may become more comfortable with exploring foreign markets as they get a better, more transparent and accurate sense of the landscape. This is not to say that investors will rush to look abroad; but a small handful of firms are actively exploring how to leverage translation tools together with natural language processing (NLP) to conduct research in the same way many firms in the U.S. now regularly pull and scrape 10-Ks and Qs for a better understanding of their companies.

Could the data revolution create a "data grid" like a power grid – giving rise to new regulations and sectors of investing?

Data is valuable. And given changes in convention for its creation, movement and storage, it is possible policy makers will look to regulate and protect the flow of data as they do power – and to a lesser extent, money. Some countries are already considering new regulations focused on

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"data sovereignty," which will also have implications for investors who have come to rely on certain data sources.

The infrastructure and interconnection needed to move and process data in particular make this possible. Much of the data contributing to the considerable growth in the coming years is from sensors, smart devices, the Internet of Things (IoT) and images/video that will require considerable bandwidth to move and store. IDC estimates that by 2025, individuals will interact with smart/connected devices nearly 5,000 times per day.[22] Like the power grid – a grid network, through which electricity or other power forms flow – the coming data grid would essentially be a power grid through which data would flow, and it may require new forms of regulation. That could, in turn, give rise to a new sector of investing like MLPs or Utilities.

What Data Processes Currently Exist: The Push, Pull or Integrated Approaches to Data Infrastructure

Data professionals have emerged between front and back office employees as a new vertical of specialists

How are financial firms preparing for the coming age of data ubiquity? They are well on their way to dedicating headcount, resources and infrastructure to building data processes. A growing number report favoring (if not requiring) job candidates who are fluent in Python, R or other coding languages, while others are teaching all new hires how to code – much in the same way they've traditionally taught financial modeling. It is also clear that some firms are working hard to be seen as public thought leaders in this space. Data professionals have emerged between front and back office employees as a new vertical of specialists.

Corporates aren't much different, but are more likely to be centralizing their data efforts in one "sleeve" of the organizational chart. But they, too, are intently focused on being able to leverage and syndicate their increasing data knowledge across front and back office teams.

CHART 4

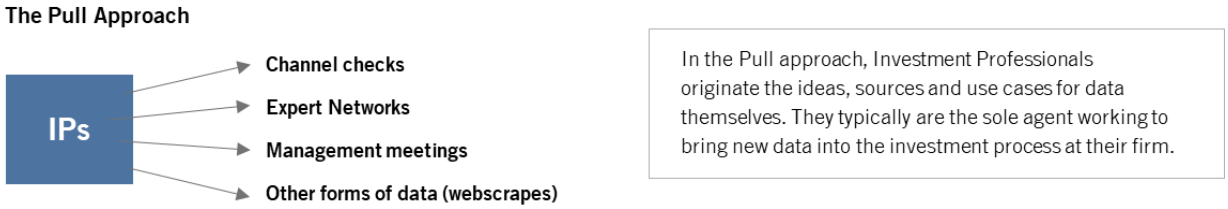
Evolving Roles Within Investment Firms: Data Professionals Emerge as New Vertical of Specialists

	Investment Professionals (IPs)	Data Professionals (DPs)	Business Professionals (BPs)
Titles & Roles	CIO, PM, Analyst, Trader, CRO	Data scientist, data analyst, quant, data sourcing team, ingestion, translator	COO, CFO, IR/Marketing, Accountants, Tax, and Risk[23]
Responsibilities	Build, develop, validate and execute investment theses	▪ Source, ingest and deliver data that can help IPs build better investment processes ▪ Identify KPIs for IPs and BPs and	Vertical specific; often serve as an extension of the firm with LPs and service providers
Metrics & Methods of Evaluation	Investment performance metrics across time	▪ Increase in how frequency or who leverages data resources ▪ Impact on investment process, including: conviction, timing, hedging	Vertical specific, typically evaluated on ability to help drive organizational success and efficiencies

What processes are investment firms building to help take advantage of new forms of data and other informational tools? Current data processes for financial firms fall into one of three frameworks:

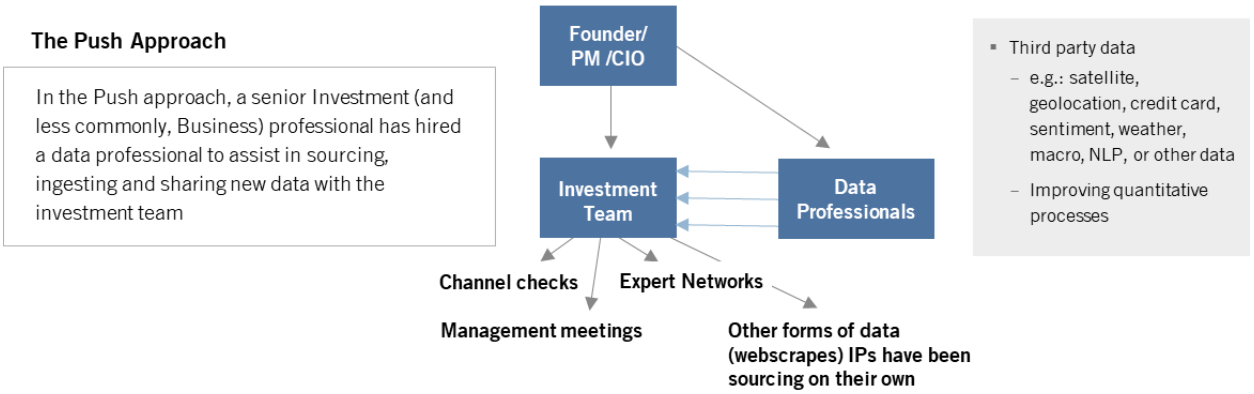
The "Pull" Approach

The Pull Approach is the old baseline – investment professionals (IPs) create investment theses and research processes and "pull" or seek out additional tools for building their mosaics themselves. They conduct channel checks, engage with experts or leverage third party data sets they have come across in their normal course of business (i.e. – governmental data or webscraping). This model typically does not have a data professional in house, and IPs are reliant on identifying, sourcing and ingesting information on their own "pulling" the data towards them unilaterally.



The "Push" Approach

In some cases, a senior leader has hired one or a small handful of dedicated data science professionals at a firm where data was not a traditional core competency. Sometimes this is without the full understanding or buy in of the investment team, or it is early in the transition to an Integrated model. Here, the data professionals (DPs) source, onboard and *push* data to the investment professionals (IPs) to use in their research processes, for the most part in an investigative or fact-finding stage to understand what increasing role data can play. This is often an intermediary step between the old/baseline "Pull" approach, where data usage is entirely directed by the investment professionals, and the Integrated approach where it is more dynamic and iterative.



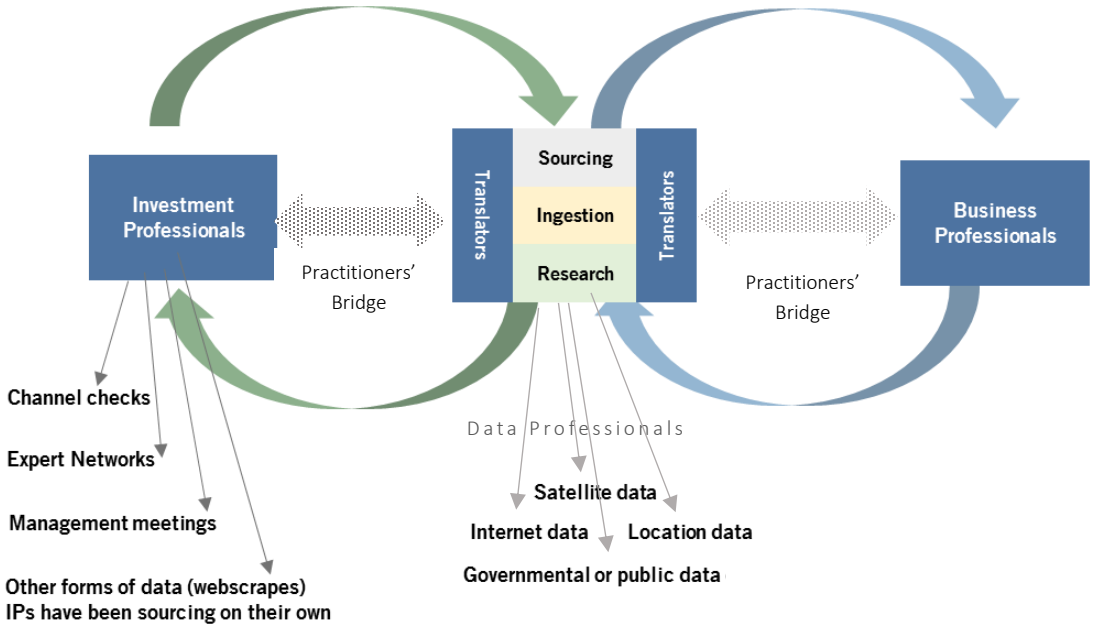
The Integrated Approach

We believe this is the future of data for the majority of firms. Some are already far down this road and have mature Integrated frameworks, but we believe in 3 years, most firms will have structured their data process to be a hybrid of the push/pull approaches, whereby Investment and Data professionals engage in ongoing dialogue and resourcing to establish new indicators, metrics and use cases for data.

In this model, translators (which we wrote about in our February 2018 State of Our Union report), can be of critical importance – serving as the interface between IPs and DPs – streamlining communication and helping better inform both groups as to each other's goals, competencies and challenges. In the Integrated model, data usage has been identified as an important resource for the investment process, and has entered the firm in an iterative fashion. Even those with mature Integrated models are still working through optimal sourcing, ingestion and incorporation models. While data sourcing individuals may be the "front line" external to identifying new sources of information, internally – the translators are the front line for liaising with investment professionals and understanding, identifying and weaving new data sources into their processes.

The Integrated Approach

In the Integrated Approach, investment, data, and sometimes business professionals participate in a dynamic manner – IPs and DPs collaborate on what forms of data are most useful. The DPs source and ingest them, and work with IPs to incorporate in investment processes. In some cases, the DP build out is multidimensional, with different subgroups focused on sourcing, ingesting and research; in others a small handful of individuals conduct all processes themselves.



Source: Jefferies Prime Services

ROI: Moving from Cost to Profit Center

Return on Investment (ROI) is a critical metric for any business resource allocation. Evaluating and quantifying the return on these data initiatives remain in their nascent stages. As in the early days of many new innovations (spreadsheets, the internet, advanced computing), granular and quantifiable return attribution can be challenging. But some patterns are emerging as investors grapple with assessing the new roles, resources and data that are getting incorporated into the firm.

As data becomes increasingly valuable, even in early stages of data adoption, firms talk about converting data and analytics efforts from a cost center to a profit center. But in the early days on that road, and like any other new research tool – whether expert network, channel check, etc. – it often takes time to understand the magnitude of importance in any single position or trade. Was an expert consultation or new data set *THE driving factor? A* factor? Somewhere in between? Currently, firms are looking at data value in one of the following ways (or a combination thereof).

Quantitative metrics around portfolio analysis

Some funds try to granularly tag and identify data resources with certain investment processes or positions. They then work to attribute the data's input on position sizing, decision making, etc. to attribute magnitude or score to it. This can be extremely challenging, particularly in large organizations.

Measuring organizational impact or uptake

In other instances, some firms who strongly believe we are in the early stages of data ubiquity are more focused on building organizational muscle memory. These firms focus on measuring how *many* investment or non-investment professionals increasingly use data resources, or measure the *frequency* of use vis-à-vis reverse inquiry or other types of engagement.

CHART 5

Estimating Return on Investment: Factors to Consider

Portfolio Analysis I Quantifying:	**Organizational Impact**
▪ Conviction (sizing up or down) ▪ Timing (initiation or unwind) ▪ Hedging ▪ Duration ▪ Other portfolio concerns	▪ Increase in number of investment and business professionals leveraging data resources ▪ Increase in frequency of investment and business professionals leveraging data resources

Source: Jefferies Prime Services

This can be a challenging and sometimes frustrating process – particularly for firms that are in the earlier stages of establishing these data efforts. Some look to past experience, whether conducting channel checks for the first time or engaging with a new expert, and think of it as an R&D expense that will help the firm in the long term.

Regulatory and Cybersecurity Concerns Related to Data Ubiquity

There have been numerous headlines in 2018 related to data security. In Europe, GDPR went live, and data privacy is continually in the headlines in the U.S. Regulation and cybersecurity are tightly intertwined, and many firms are increasingly focused on navigating both more effectively.

Cybersecurity as an additional driver for resourcing

As data processes increasingly become part of firms' intellectual property, the individuals, infrastructure and resources dedicated to protecting them are in view. Some organizations are increasingly complementing annual training focused on personal responsibility and spearphishing, with extremely robust cybersecurity checks and balances. And while cybersecurity professionals were in headlines a few years ago as investment firms increasingly woke up to the threat, they are quietly still in considerable demand, with firms steadily building these efforts.

Cybersecurity can be a challenge for firms because it is unlikely to be a problem that is ever "solved." And like estimating the ROI of data initiatives, sometimes the ROI for cyber efforts come into question. This remains an emerging and evolving space, and one we will keep an eye on in the coming months and years.

Regulation – jurisdictional divergence requires organizational vigilance

Facebook and Cambridge Analytica. Delta and 24(7).ai. Under Armour. Kmart. Macy's, Saks, and Adidas.

The many headlines in 2018 related to data security – nearly none of them pleasant. When corporates are found to be leveraging the personal data of consumers without appropriate consent, their businesses and reputations have suffered. The potential implications for investment firms are no less pressing. In the wake of these scandals, legislators, companies and individuals have visited and revisited one question with increasing urgency: How should access to personal data be regulated? And what impacts will such regulation have on the potential consumers of data?

In Europe, the response has been proactive. The General Data Protection Regulation (GDPR) went live in May and makes regulation unified and strict. It prioritizes individuals' privacy above corporate interests—first, by broadening the definition of personal data, and second, by reinforcing individuals' rights to their own data privacy and its erasure as it becomes outdated (the latter is the so-called "right to be forgotten").

GDPR also increases the penalty for noncompliance, to up to 4% of the offender's annual revenue. For context, Facebook's $700k fine for the role it played in the Cambridge Analytica scandal would instead be closer to $2 billion under the GDPR.[24] It applies to any "economic operator" within the member states of the EU, including non-European companies.[25] As a result, corporates leveraging big data must now focus their attention on data governance and security, ensuring that any data sets they use have excellent pedigrees and can easily be edited, redacted, or sent back to linked individuals on an ongoing basis.

In the U.S., by contrast, while some American companies will be required to be compliant with the GDPR, by and large there is no functional equivalent to Europe's GDPR yet. As one hedge fund manager was quoted saying in the *Financial Times*, "It's like the Wild West. … I have yet to see a clean legal opinion on all this. And we've looked for one."[26] Instead, it has fallen upon individual U.S. companies in America to set the tone of the conversation around regulating access to big data.

Apple, for example, has rewritten its Terms of Service throughout the spring of 2018. The new Terms of Service require that app developers obtain explicit consent before collecting consumers' data and only use this data for specific, agreed-upon purposes. These guidelines are comparable to those set forth in the GDPR. Meanwhile, AT&T, Verizon and Sprint have all ceased allowing third parties to use their location data. Though not necessarily spurred by governmental action, the trend in America has been to prioritize data governance.

What this has meant for investment managers is marked increase in webinar viewing, breakfast or conference attendance, and conversations with counsel as they work to improve the processes behind data consumption and governance. Legal and compliance departments are now intimately involved with all phases of data sourcing and ingestion, and are working to understand cross jurisdictional variations in approaches to data regulation.

The Road Ahead | How Jefferies Can Help

We believe that while headlines have focused on different parts of the growth of available data, few have focused on what the **future of data ubiquity** may mean in practice to both investors and corporates. While we largely focus on investment firms here – and the processes they have built to manage and take advantage of this internet-level shift – the opportunities and challenges for corporates are no less considerable.

Data matters, but in many cases, process matters even more. In an era when information is constantly released and updated, it will be those organizations that prioritize building efficient and agile workflows to source, ingest and syndicate new data and information across the organization that will come out on top. The regulatory, compliance and cybersecurity issues that arise on the back of these trends will also become C-suite level issues, as decision makers work to ensure their firms manage the risks associated with leveraging these new, and sometimes cutting edge tools.

The Jefferies Data Science Working Group is dedicated to helping clients think through the strategic and organizational implications of the coming data ubiquity. The answers are not the same for every firm. In fact, two firms with similar "headline" characteristics (size, strategy, maturity, organizational footprint), can have two completely different ways of preparing for what lies ahead. We look forward to working with you as you think through these critical issues, and welcome any questions you may have.

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Appendix I. Jefferies *Powered by Data* series

Compendium

Jefferies Equity Research

Powered By Data: Reports Highlighting Where Data Use Could Be Most Impactful

July 3, 2018

Consumer

Andy Barish and Alex Slagle

Powered By Data: Unlocking New Off-Premise Growth in Competitive Environment

July 12, 2018

Kevin Grundy

Consumer Products: Initial Assessment of HPC and Beverage Cos. in Data Analytics

March 28, 2018

Akshay Jagdale

Food: The Makings of a Brand Resurgence

June 6, 2018

Randy Konik

Consumer/Specialty Retail: Assessing Who's Winning/Losing The DATA WARS in Retail

March 19, 2018

Stephanie Wissink

Cosmetics: Deep Dive: Beauty Tech Is Next Natural Evolution for Growing Industry

March 22, 2018

Financials

Dan Fannon

Re-Positioning the Robo & What Web Analysis Can Tell Us

May 17, 2018

John Hecht

Consumer Finance: How Tech-Based Alternative Data Apps Benefit Cons. Finance

May 18, 2018

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