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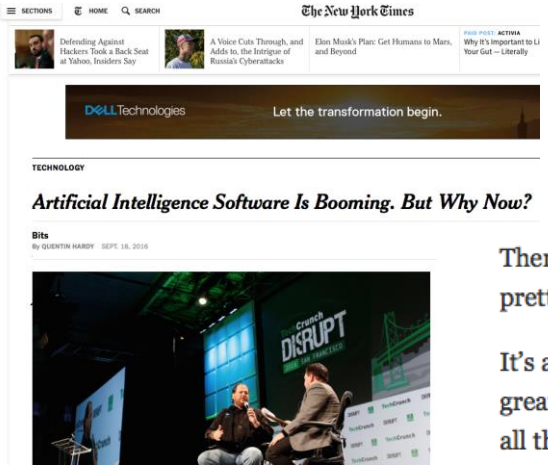
Getting Smarter by the Day: How Artificial Intelligence is Elevating the Performance of Global Companies

TCS Global Trend Study - Overview for Marketing & Communications

September 2016

Contents

But first, a good sign: The press wants to know about the real value of AI …



There are big pushes in A.I. in agriculture, manufacturing, aviation and pretty much every other sector of the economy.

It's all very exciting, the way great possibilities are, and clearly full of great buzzwords and slogans. But will other companies see any value in all this or understand if A.I. has value for them?

"No one really knows where the value is," said Marc Benioff, co-founder and chief executive of Salesforce. "I think I know — it's in helping people do the things that people are good at, and turning more things over to machines."

http://www.nytimes.com/2016/09/19/technology/artificial-intelligence-software-is-booming-but-why-now.html

This study will shed light on this!

About the study

- **Topic goals and focus**
  - Shed light on how large companies are using artificial intelligence today (and plan to use AI through 2025) to improve and transform their businesses
    - Which business functions are using the technologies, and to improve what activities?
    - How much are firms spending, and what's been the impact?
    - In what functions do they see AI have the most impact by 2020?
    - What are the keys to getting benefits?
- **Research scope**
  - Large companies ($1B+ on average)
  - Four regions of world: North America, Europe, Asia-Pacific and Latin America
  - 13 global industries
- **Research approach**
  - Data collection
    - Online survey (835 completes) in spring and summer
    - Average revenue: $20 billion (median of $2.8B)
    - Interviews with three leading practitioners: **Microsoft, Associated Press and Cloudera**
    - Extensive secondary research
  - Analysis: Led by TCS AI practice head Harrick Vin and digital enterprise head Satya Ramaswamy (author of two *Harvard Business Review* articles on digital topics)

How TCS defined what it researched:

Defined "AI/cognitive systems" as technologies that can do 4 things:

- **Sense**: collect data through a range of technologies that pour through text, images, video, numerical transactions, etc. (multiple sources of data)
- **Think**: based on the system's rules and algorithms, make decisions based on digital data collected (using AI, etc.)
- **Act**: use technology to execute a formerly manual process that had been based on manually collecting data (examples: robots on the factory floor, self-driving vehicles)
- **Learn**: continually update the system's sensing, thinking and acting capabilities (through automated means and human intervention; the system keeps getting smarter and smarter)

This year, the research will go to market in two parts and phases

Part 1

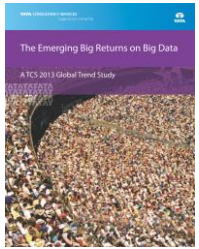
- Findings across 4 regions of world
  - North America
  - Europe
  - Asia-Pacific
  - Latin America
- Findings within each region
- Findings comparing “leaders” and “followers” globally
  - Leaders: highest revenue and cost improvements from AI initiatives in 2015
  - Followers: lowest revenue and cost improvements from AI initiatives in 2015

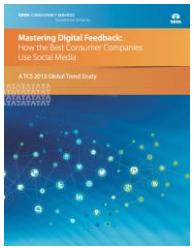
Part 2

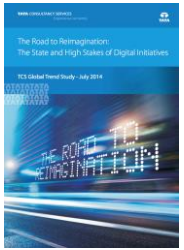
- Comparing findings across 13 global industries
  - Automotive
  - Banking & financial services
  - Consumer packaged goods (CPG)
  - Energy
  - Healthcare & life sciences
  - High tech
  - Industrial manufacturing
  - Insurance
  - Media, entertainment & information services
  - Retail
  - Telecommunications
  - Travel, transportation & hospitality
  - Utilities

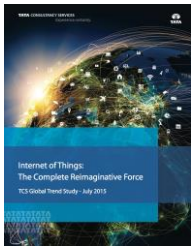
Research builds on 6 prior TCS studies on digital trends in large firms (in same regions and industries)

2011	2012	2013		2014	2015
Cloud computing	**Mobile technology**	**Big data & analytics**	**Social media**	**Digital technologies**	**Internet of Things**
The State of Cloud Application Adoption in Large Enterprises	*The New Digital Mobile Consumer*	*The Emerging Big Returns on Big Data*	*Mastering Digital Feedback: How the Best Consumer Companies Use Social Media*	*The Road to Reimagination: The State and High Stakes of Digital Initiatives*	*Internet of Things: The Complete Reimaginative Force*









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Study Report Part 1: Results across and with 4 regions of the world

8 key findings to date

1. **More than four out of five companies view AI to be essential, and nearly half see it as a transformative technology**
   - 84% are using the technologies and view them as important to staying competitive
2. **Only a few are making bold investments today, which may trigger a competitive imbalance tomorrow**
   - Average spend per company is $67 million, but median is only $3 million
   - Majority of firms with $20B-$50B in revenue each spent less than $20M on AI in 2015
   - 7% will spend at least $250 million this year; 2% will spend $1 billion or more
3. **The biggest AI spenders are North American and European companies**
   - North American average spend per company was $80M in 2015; Europe next at $73 million
4. **By the end of decade, AI's impact seen as expanding far beyond the IT function**
   - Most frequent user of AI today is IT department (68% of firms using AI there)
   - That's more than 2x the number (32%) of 2nd biggest functional user (customer service)
   - But by 2020, 32% of companies predict AI's impact will be greatest in sales, marketing and customer service; 30% say IT function

8 key findings (cont'd.)

5. **AI is helping employees do better work, and companies do work they couldn't do before**
   - In 11 business functions, AI is being used frequently to automate work, help employees do better work, and help companies do work that couldn't be done by people before

6. **Fears of AI as massive job-killer may be overblown: Technology seen producing many new jobs but automating jobs as well**
   - It varies by business function, but companies predict AI will result in net job loss of between 4% (e.g., in R&D) and 7% (e.g., procurement) by 2020
   - This data is based on projections of both jobs lost due to AI and new jobs created to harness AI
   - Caution: These are predictions, and only for those companies planning to use AI in those business functions by 2020 (which means not all, or in some cases, most companies)

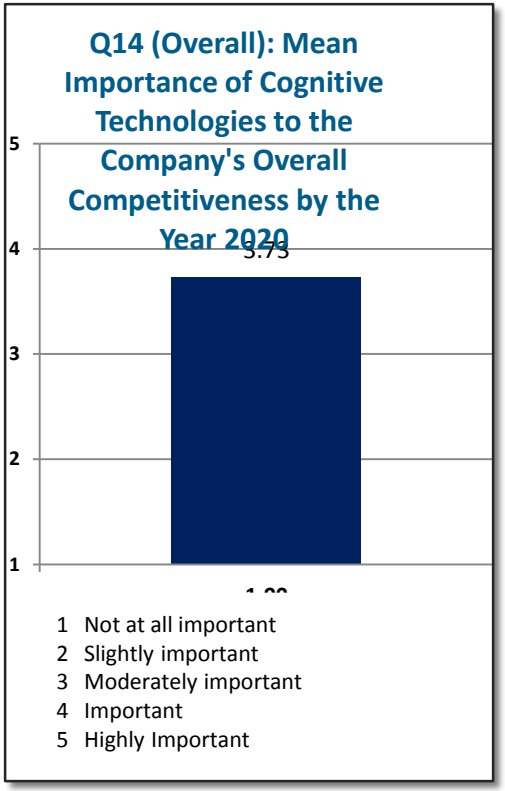
8 key findings (cont'd.)

7. **Companies rate four factors as most important to generating benefits from AI**
   - Making AI systems secure against hacking
   - Developing systems that continually learn on their own to make better decisions;
   - Developing systems that make reliable and safe decisions;
   - Getting employees and managers to trust what AI is advising them to do.

8. **Companies with biggest revenue and cost improvements from AI are different than those with lowest improvements in five key ways**
   - Use AI more broadly across their organizations, especially in areas that appear incidental to generating short-term revenue
   - Yet also focus on areas that directly impact their ability to make (and lose) money
   - Pay more attention to addressing fears of unemployment
   - Ensure their IT departments don't suffer 'Cobbler's Children' syndrome of using AI everywhere else but in IT
   - Outspend companies with smallest improvements from AI by a factor of five

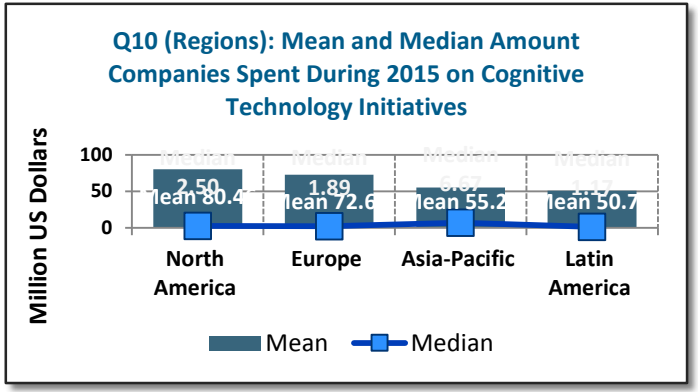
No. 1: 84% are using AI technologies, and view them as important to staying competitive this decade

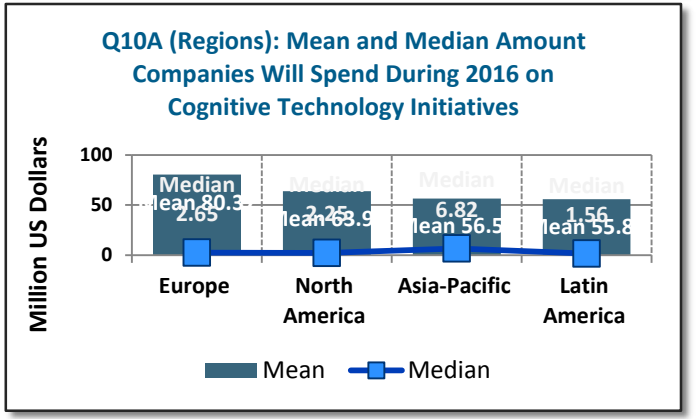
- A clear majority of large companies in four regions of the world are using cognitive technologies
  - 84% are currently using them
  - 11% aren't but plan to by 2020
  - 5% are neither using the technologies, nor plan to use them by 2020
- The rest of the survey data comes from companies that are either using the technologies today or don't but plan to use them by 2020
- Asked to rate how important the technology would be to their company's competitiveness by the year 2020, the average rating was 3.73 on a scale of 1-5
  - More than moderately important, but not highly important



Nos. 2 and 3: They will spend a sizable amount in 2016 on AI ($67M each on average), and 7% will spend at least $250M

- We asked about total spending on cognitive technology initiatives
  - The technology itself
  - Consulting and IT services to implement it
  - Etc.
- In 2015, they spent an average $70M per company (median $3M)
  - N. American companies had the highest average ($80M per company)
- In 2016, they plan to spend …
  - Mean of $67M; median of $3M
  - European companies plan to spend more (per company); North American is second
- And in 2020, they project spending an average $88M





No. 2 (cont.): How this compares in spending with other digital initiatives since 2011

- Adjusted by size of company (revenue), the average firm will spend far more on cognitive technology initiatives than it did on social media and mobile technologies
- But they will spend less than they spent on IoT, big data & analytics and digitization initiatives

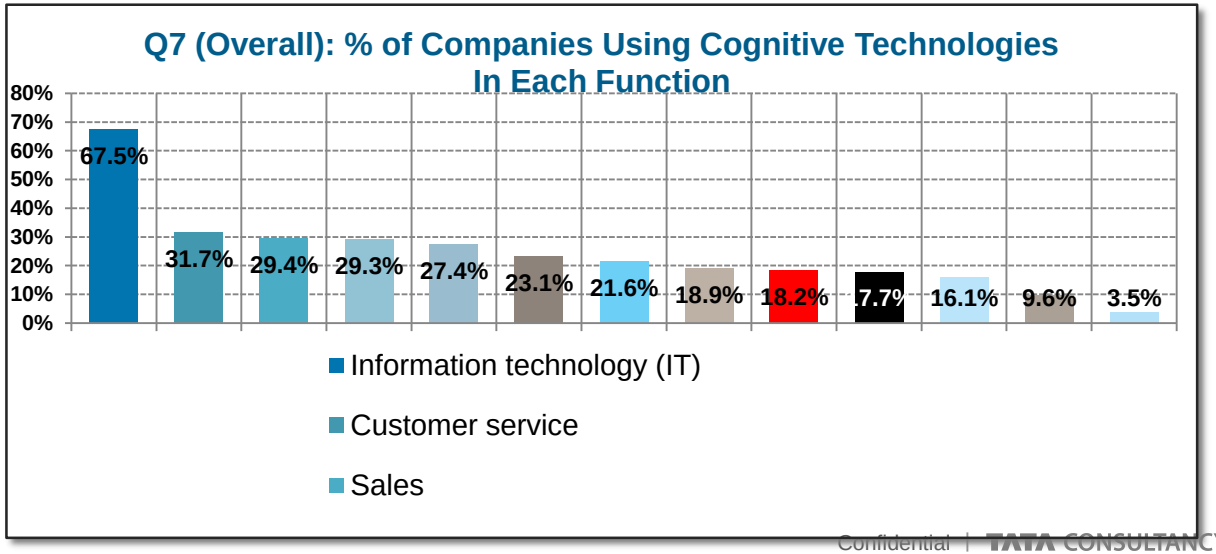
Spending on Digital Technologies Since 2011 (Average Per Company)

	2012	2013		2014	2015	2016
Technology	**Mobile technology**	**Big data & analytics**	**Social media**	**Digital technologies**	**Internet of Things**	**Cognitive technologies**
Average Spend	$20 million	$88 million	$19 million	$113 million	$86 million	**$67 million**
Average Spend Per $10B in Rev	$18.4M	$46.3M	$12.2M	$43.8M	$39.5M	**$33.1M**

Source: TCS Global Trend Studies in digital technologies

No. 4: Today AI is used far more often in IT than in any other function

- By far, the IT function is the most frequent user of cognitive systems
  - About two-thirds of companies (68%) are using it there
  - If AI is reducing IT labor, it's immediately improving the bottom line;
  - If it's improving computer security, it's helping the future bottom line (e.g., stolen customer information, etc.)
- Between 27% and 32% of companies use it in service, sales, marketing and finance
- Between 16% and 23% use it in R&D, production, corporate center, strategic planning, HR and distribution
- Less than 10% are using it in purchasing and legal departments



No. 4: Specifically, how firms are using AI in these functions

Function	% Using the Technology	% of Functional Users Using the Technology These Ways	Examples
Information technology	68%	• Detecting and deterring security intrusions (66%) • Resolving tech user problems (60%) • Reducing production management work (51%) • Gauging internal compliance in using approved vendors (51%) • Doing run-book automation (24%)	Microsoft use of machine learning to anticipate who will attack its computer networks
Customer service	32%	• Automating call distribution (48%) • Guiding contact center reps on how to resolve customer issues (42%) • Automating responses to routine customer questions (39%) • Solving complex customer problems (38%) • Identifying rep training needs (36%) • Automating personnel scheduling (32%)	Insurer USAA's "Eva" virtual agent (understands voice commands to transfer money, pay bills, etc.) Hilton robot called "Yobot" that stores and retrieves luggage
Sales	29%	• Guiding salespeople on discussions with customers: what to offer, how to negotiate, etc. (50%) • Qualifying sales leads/inquiries (43%) • Matching sales leads to the right salespeople (38%) • Shifting resources between online and offline sales initiatives (35%)	Staples use of voice recognition technology that lets business customers voice in orders Microsoft use of AI to better predict software license sales Intel use of AI to focus sales initiatives
Marketing	29%	• Anticipating future customer purchases and presenting offers accordingly (65%) • Improving media buying (56%) • Monitoring social media comments and brand affinity (56%) • Tailoring promotions (online or offline) (53%) • Enabling dynamic pricing (21%)	BMW's use of AI tool called "iGenius" to answer customer text message questions about its new electric vehicles Nestle robot ("Pepper") to answer questions about Nescafe coffee machines in stores
Finance and accounting	27%	• Financial trading (62%) • Identifying potential customer credit problems (53%)	Royal Dutch Shell and Baker Hughes' use of AI system that answers supplier questions about invoices

No. 4: Specifically, how firms are using AI in these functions

Function	% Using the Technology	% of Functional Users Using the Technology These Ways	Examples
R&D	23%	• Enabling our product to monitor and fix product problems (56%) • Enabling our product to operate without human intervention (50%) • Creating a product that can answer customer questions (44%) • Creating a product that gets smarter over time (41%) • Creating a product that protects itself against security intrusions (19%)	General Motors installation of driver monitoring devices in cars to detect whether drivers are becoming distracted and tired Merck & Co. use of a deep-learning system that went through 30,000 molecules and projected how they'd interact with 15 target molecules
Manufacturing or Operations	22%	• Automating and adjusting labor scheduling (54%) • Scheduling and load balancing manufacturing runs (46%) • Automating plant management (42%) • Identifying and correcting assembly line problems (42%) • Automating assembly line activities (35%)	National Oilwell Varco use of AI to automate oil drilling process Netflix use of computer vision technology to determine how to capture movie images for smaller screens (mobile devices)
Corporate level	19%	• Gauging customer sentiment (63%) • Identifying and advising on problems with customer payments, invoices, etc. (61%) • Determining why customers buy from us (52%) • Optimizing budget allocations (45%) • Determining broad economic trends (44%) • Gauging investor sentiment (42%)	Goldman Sachs' investment in AI startup (Kensho) to comb through online articles and spot trends

No. 4: Specifically, how firms are using AI in these functions

Function	% Using the Technology	% of Functional Users Using the Technology These Ways
Human resources	18%	• Improving the quality of people hired (71%) • Reducing time to hire new employees (62%) • Identifying employees who need training (57%) • Improving knowledge sharing (52%) • Decreasing employee turnover (48%) • Matching employees to jobs (38%) • Identifying employee issues that may lead to legal liability (29%)
Strategic planning	18%	• Identifying potential acquisition targets (50%) • Identifying new markets to enter (41%) • Identifying potential investments (32%) • Identifying new competitors (32%) • Identifying current competitors' new strategies (27%)
Purchasing	10%	• Automating the request for quotation process (60%) • Identifying potential suppliers (50%) • Identifying wasteful spending (50%) • Predicting supply shortages (40%) • Determining the best vendors to use (40%) • Identifying fraud (30%) • Identifying supplier quality problems (20%)

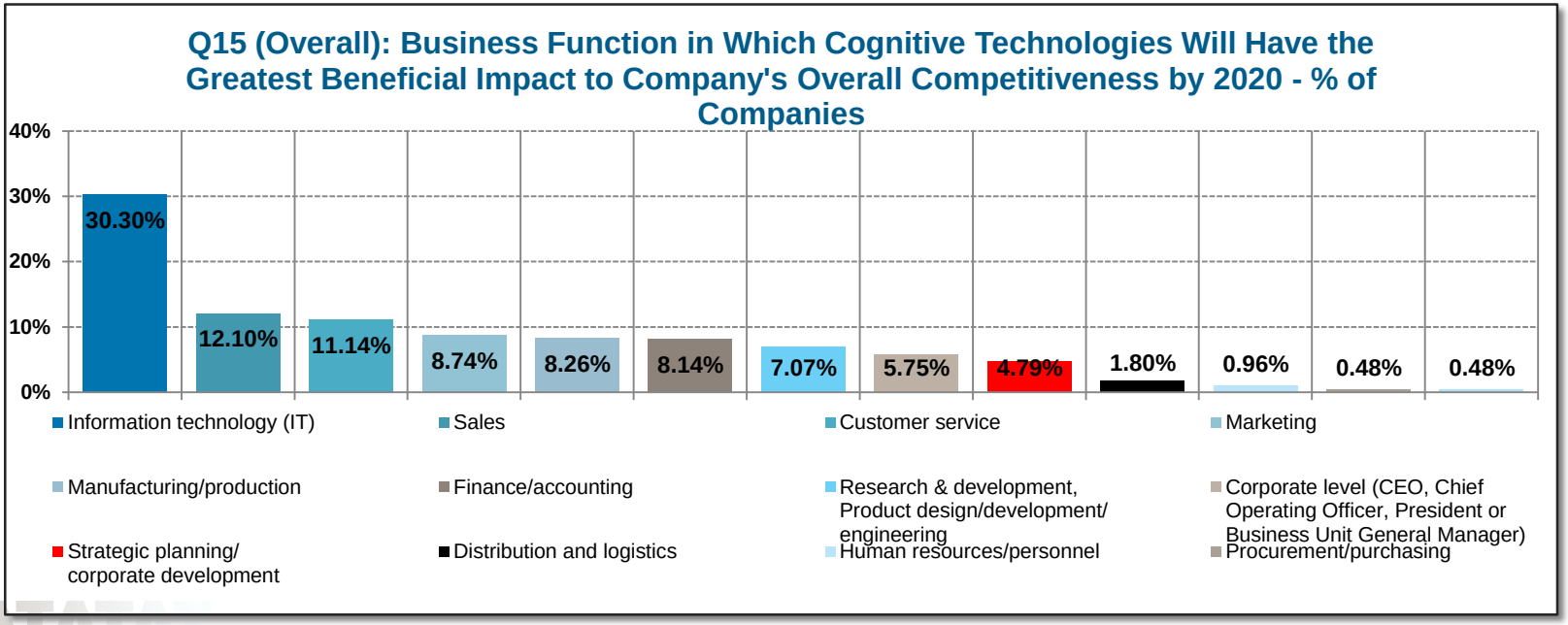
No. 4: How Microsoft uses AI in its products and business processes

- Interviewed Joseph Sirosh (corp VP, head of machine learning)
  - Joined Microsoft in 2013 from Amazon (led large-scale machine learning; VP, global inventory platform; CTO of consumer business)
- Microsoft has been using machine learning extensively for eight years to improve products and business processes
  - Bing search engine; relies entirely on machine learning models to product more relevant results ("transformation"-type AI initiative)
    - Impact: Big improvement in search results quality
    - Impact: Big increase in market share (from 10% to 20% of search market)
  - Business processes such as detecting intrusions into its computer networks
  - Fraud detection on purchases (xBoxes, MSFT laptops, etc.)
    - Losses have been "greatly reduced"
  - Content pages of Microsoft websites — MSN, Bing search, Hotmails, Microsoft News, xBox, etc. — are filtering content based on machine learning models ("transformation"-type AI initiatives)
    - Irrelevant and objectionable content now rarely shown
- AI now key to preventive maintenance for Microsoft cloud customer databases ("transformation"-type AI initiative)
  - Machine learning technologies scour 1.8 million customer databases to predict maintenance needs
  - Also detects security threats.
  - Impact: Microsoft is investing tremendous amounts for a cloud system it believes is more secure than customers' on-premises systems

Microsoft

No. 4: But by 2020, biggest beneficiaries of AI collectively seen as being functions outside of IT

- We asked managers to predict which business function in their company will benefit the most from cognitive technologies by the year 2020
  - There was little agreement on this: IT cited most often, but only by 30%
  - Sales (12%) and service (11%) were next, followed by marketing (9%), manufacturing (8%) and finance (8%)



No. 5: Companies are using AI in three broad categories: replace people, help people, enable whole new work

SURVEY DATA

Replacing People

- Customer service: Automating responses to routine customer questions (39%)
- Production: Automating assembly line activities (35%)
- IT: Doing run-book automation (24%)
- R&D: Creating a product that can answer customer questions (44%)
- Customer service: Automating call distribution (48%)
- Service: Identifying rep training needs (36%)

Helping People

- Customer service: Guiding contact center reps on how to resolve customer issues (42%)
- Corporate: Determining broad economic trends (44%)
- Corporate: Gauging investor sentiment (42%)
- Finance: Identifying potential customer credit problems (53%)
- IT: Gauging internal compliance in using approved vendors (51%)
- HR: Improving the quality of people hired (71%)
- HR: Reducing time to hire new employees (62%)

Enabling Companies to Do Whole New Things

- Corporate: Determining why customers buy from us (52%)
- Marketing: Anticipating future customer purchases and presenting offers accordingly (65%)
- Purchasing: Identifying wasteful spending (50%)
- IT: Detecting and deterring security intrusions (66%)
- R&D: Enabling our product to monitor and fix product problems (56%)
- Customer service: Solving complex customer problems (38%)

Note: **Percentages above are of those companies using AI in those business functions**

EXAMPLE

Associated Press:

- Haven't laid off reporters or editors
- In fact, created a new position to handle and maintain statistical financial data

Associated Press:

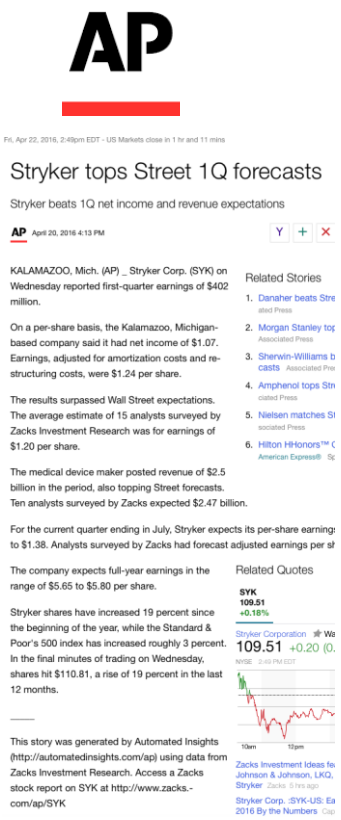
- Giving staff the starting text for earnings stories they write
- Helping staff identify patterns in companies, industries, etc.

Associated Press

- Writing weekly NFL player performance articles (new content)
- Increasingly the number of quarterly earnings stories by 12-fold (from 300 to 3,700)

No. 5: AI at The Associated Press

- 170-year-old news service today is a $568 million firm (2015 revenue)
  - Non-profit owned by its customers (media outlets)
  - Global business: staff in 280 locations and 110 countries
  - Produces 2,000 stories a day; 1 million photos & 50,000 videos per year
- Difficult environment because of the decline of its core customers for many years: daily newspapers
  - Media customers wants more (news) from AP for less
  - AP wages were 62% of revenue in 2014
- In July 2014, the AP put into action an AI system (built Automated Insights) that automated the writing of short quarterly earnings stories
  - In the past, its 65 business reporters could only churn out about 300 earnings stories a quarter (it's not all they do!)
  - Today the software is producing 3,700 earnings stories a quarter
  - Error rate is lower than what it was when people wrote the stories
  - Now looking to automate writing of sports stories (e.g., NCAA baseball games)
- What AP has done well:
  - Addressed fears of job loss directly: "It hasn't cost us any jobs, so whatever uneasiness that have might have there has been erased"
  - Stressed to staff that it was not eliminating jobs but rather freeing them up for more interesting reporting work
    - Staff doing many more enterprising stories (that take more time)
  - Top-level interest and involvement in the initiative
  - Kept the data clean: "automation maintenance is a full-time job"



AP

Stryker tops Street 1Q forecasts

Stryker beats 1Q net income and revenue expectations

AP April 20, 2016 4:13 PM

KALAMAZOO, Mich. (AP) _ Stryker Corp. (SYK) on Wednesday reported first-quarter earnings of $402 million.

On a per-share basis, the Kalamazoo, Michigan-based company said it had net income of $1.07. Earnings, adjusted for amortization costs and re-structuring costs, were $1.24 per share.

The results surpassed Wall Street expectations. The average estimate of 15 analysts surveyed by Zacks Investment Research was for earnings of $1.20 per share.

The medical device maker posted revenue of $2.5 billion in the period, also topping Street forecasts. Ten analysts surveyed by Zacks expected $2.47 billion.

For the current quarter ending in July, Stryker expects its per-share earnings to $1.38. Analysts surveyed by Zacks had forecast adjusted earnings per sh

The company expects full-year earnings in the range of $5.65 to $5.80 per share.

Stryker shares have increased 19 percent since the beginning of the year, while the Standard & Poor's 500 index has increased roughly 3 percent. In the final minutes of trading on Wednesday, shares hit $110.81, a rise of 19 percent in the last 12 months.

This story was generated by Automated Insights (http://automatedinsights.com/ap) using data from Zacks Investment Research. Access a Zacks stock report on SYK at http://www.zacks.-com/ap/SYK

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Stryker Corp. :SYK-US: Ea 2016 By the Numbers

No. 5: How Cloudera uses AI to enable customer service levels that wasn't humanly possible before

- Silicon Valley venture capital-funded provider of software for processing and analyzing big data
  - $670M in funding since 2008 launch
  - 1,200 employees worldwide today
  - Known for providing Apache Hadoop for enterprises from the cloud
- AI has been instrumental in helping Cloudera customers find patterns in their data
  - "Machine algorithms can ingest [huge volumes of] data and look for patterns" – Mike Olson, co-founder and chief strategy officer (whom we interviewed)
- Machine learning also has become critical to Cloudera's own business – specifically, in troubleshooting customer issues
  - Cloudera now opens 15% of its tech support cases for customers before customers are aware they have an issue
  - Cloudera's systems ID customers' Hadoop clusters that are likely to have a problem before it becomes a problem

No. 6: Companies predict some jobs will go, but new ones will be created as well

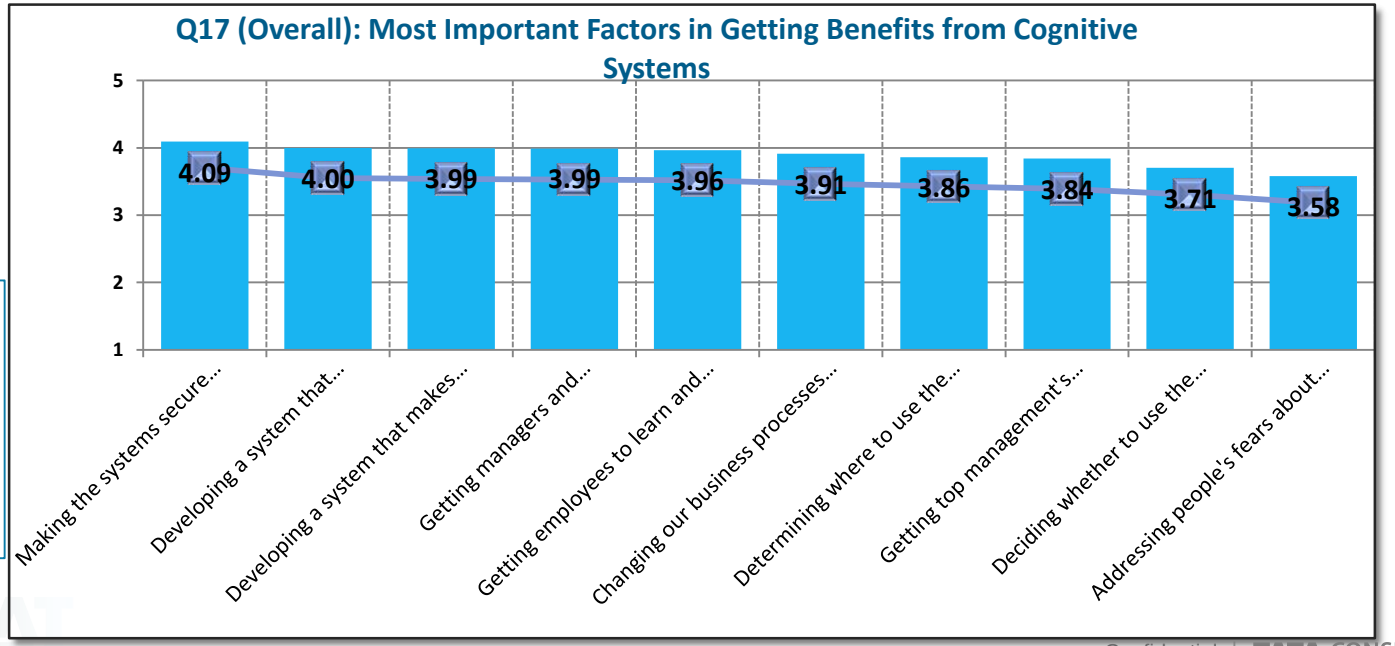
- We asked managers to predict the jobs impact of AI in their functions by 2020 – both lost and gained
- Surprisingly, corporate center predicted the highest % of jobs (23%) that the technology could eliminate
  - But also predicted it would increase jobs 18% there
  - Other functions ranged between 12% and 15% increases in jobs
- Every function predicted a sizable number of new jobs would need to be created as a result of the technology
- But net-net, function by function, a predicted net loss of jobs ranging from 4-7%, depending on the function

Q18 and Q19: Predicted % of jobs in their functions that could be lost and gained by the year 2020 because of cognitive technologies

Function	Average % of Jobs by 2020 That Cognitive Technologies are Predicted to Eliminate	**Average % of Jobs by 2020 That Cognitive Technologies are Predicted to Create**	Net Impact by 2020
Corporate center (CEO, COO, presidents, divisional GMs, etc.)	23%	**18%**	**-5%**
Procurement	21%	**14%**	**-7%**
Legal	21%	**15%**	**-6%**
Information technology	20%	**15%**	**-5%**
Human resources	19%	**14%**	**-5%**
Distribution & logistics	19%	**15%**	**-4%**
Finance and accounting	19%	**14%**	**-5%**
Strategic planning/corporate development	18%	**14%**	**-4%**
Marketing	18%	**13%**	**-5%**
Manufacturing/production	17%	**12%**	**-5%**
Customer service	17%	**13%**	**-4%**
Sales	17%	**12%**	**-5%**
R&D	17%	**13%**	**-4%**

No. 7: Making systems secure is most important factor in getting benefits from AI

- Asked to rate 10 success factors, managers rated two to be more important than the rest
  - Making cognitive systems secure against hacking
  - Developing cognitive systems that continually learn, in order to make better and better decisions
- Rated least important among the 10 issues: addressing employee fears of losing their jobs to AI



1. Not at all important
2. Slightly important
3. Moderately important
4. Important
5. Highly important

No. 8: How AI leaders are different from AI followers

- We analyzed two groups of survey participants
  - **Leaders**: greater than average cost reductions and revenue gains from their initiatives in 2015 (151 surveys)
  - **Followers**: less than average cost reductions and revenue gains (also 151 surveys)
  - Note: Leaders were bigger companies ($30B vs. $15B average revenue)
- There many striking differences between the two groups, including:
  - Leaders spent a lot more on cognitive systems initiatives in 2015:
    - Average of $157M vs. $18M per company
    - Even on a per revenue basis, leaders spent nearly five times more (0.5% of revenue vs. 0.1% for followers)
  - Leaders are much more likely use AI in finance, corporate center, HR, distribution, and procurement than followers are
  - Leaders placed much higher importance on …
    - Getting employees to adopt the technologies
    - Using the technologies to boost executive decision-making capabilities
    - Using the technologies to identify new revenue opportunities
  - Leaders projected the technologies will lead to >3 times the average percentage increase in jobs in their functions by 2020 (a 25% increase vs. a 7% increase for followers)

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Study Report Part 2: How 13 global industries are using AI

10 Key Findings

1. **More than 80% of companies in 13 industries use AI today, and in five sectors at least 90% are doing so**
   - Energy, high tech, telecom, retail and automotive
2. **In 12 of the 13 industries, most frequent user of AI is the IT function but in one industry (consumer packaged goods), most common adopter is sales**
3. **Most important goal for AI initiatives across industries is <u>not</u> reducing headcount through automation**
   - In fact, it was the lowest rated of six goals in insurance; high tech; energy; retail; CPG; industrial manufacturing; and travel, transportation and hospitality
   - Two highest-rated goals are improving product and service quality (especially in the automotive and utilities industries), and helping customers get more value from the company's offerings (particularly in the insurance and utilities sectors).
4. **There is little unanimity on where AI will have greatest impact in each industry by end of decade**
   - But most common answers are manufacturing function in automotive and CPG industries, sales function in retail and utilities, and the customer service function in insurance.
   - In seven other industries, the IT function seen as greatest beneficiary of AI
5. **Three industries outspent the others on AI in 2015: insurance, consumer packaged goods and high tech**

10 Key Findings (Contd.)

6. **Telcos had highest average cost and revenue improvements from from AI in 2015; utilities had lowest**
7. **Three industries were ahead of the others in the proportion of companies with major cost and big revenue improvements from their AI initiatives:** telcos, high tech and retail.
8. **Companies in all 13 industries view AI as more than moderately important to their competitiveness by the year 2020.**
   - But 3 rate AI as more important than the others: industrial manufacturing, high tech, and travel, transportation and hospitality.
9. **To get value from AI, majority of industries say top success factor is building AI systems that can't be hacked.**.
10. **AI viewed nearly equally as a force for both improvement and transformation.**
    - When asked to indicate what proportion of their AI investments were to improve the business as it operates today vs. to transform it (to offer whole new products and services, etc.), executives said the majority of their investments were for "improving" the status quo.
    - However, they categorized a surprisingly high percentage of their AI investments – 46% this year, rising to an estimated 48% by 2025 – to be of the transformational type.

These and other selected industry findings

- **Who spent the most on AI in 2015?**
  - Insurance, CPG, high tech and telcos
- **Who will spend the most on AI this year?**
  - Insurance, telcos and banks
- **In what areas of their business are industries using AI most frequently?**
  - In the IT function
- **Who values AI the most to …**
  - Improve product quality? Utilities
  - Help customers get greater value from products? Utilities, insurers and travel firms
  - Reduce key process cycle times? Utilities
  - Improve executive decisions? Utilities, industrials, media, energy and banks
  - Identify new revenue opportunities? Travel, retail, energy and insurance firms
  - Automate work and cut costs? Utilities
- **Which industries had the highest % in revenue improvements from AI in 2015?**
  - Telcos, high tech and retail
- **Which industries had the highest % in cost reductions from AI in 2015?**
  - Telcos, retailers and high tech companies
- **Which industries view AI as more important to their competitiveness by 2020?**
  - Industrial manufacturers, high tech companies, and travel, transportation & hospitality firms

No. 2: Where AI is used depends heavily on the industry

- Most frequent users of the technology in IT function are in high tech and utilities
- In service, it's CPG and insurers
- In sales, CPG and retail
- In R&D, autos and industrials
- In production, autos and industrials
- In distribution, energy and retail companies

Function	Industries Most Often Using Cognitive Technologies in These Functions (% of Companies Using Them)
Information technology	High tech (80%) Utilities (77%)
Customer service	Consumer packaged goods (48%) Insurance (46%)
Sales	Consumer packaged goods (52%) Retail (49%)
Marketing	Consumer packaged goods (48%) Retail (40%)
Finance/accounting	Banking & financial services (40%) Consumer packaged goods (38%)
Research & development	Automotive (35%) Industrial manufacturing (34%)
Manufacturing/production	Automotive (58%) Industrial manufacturing (51%)
Corporate center	Media, entertainment and information services (28%) Industrial manufacturing (26%)
Strategic planning/ corporate development	Media, entertainment and information services (36%) Energy (26%)
Human resources	Energy (26%) Consumer packaged goods (24%)
Distribution/logistics	Energy (39%) Retail (36%)
Procurement	Automotive (23%) Media, entertainment and information services (20%)
Legal	Media, entertainment and information services (16%)

No. 4: Where AI is predicted to have the biggest impact by 2020 depends on the industry

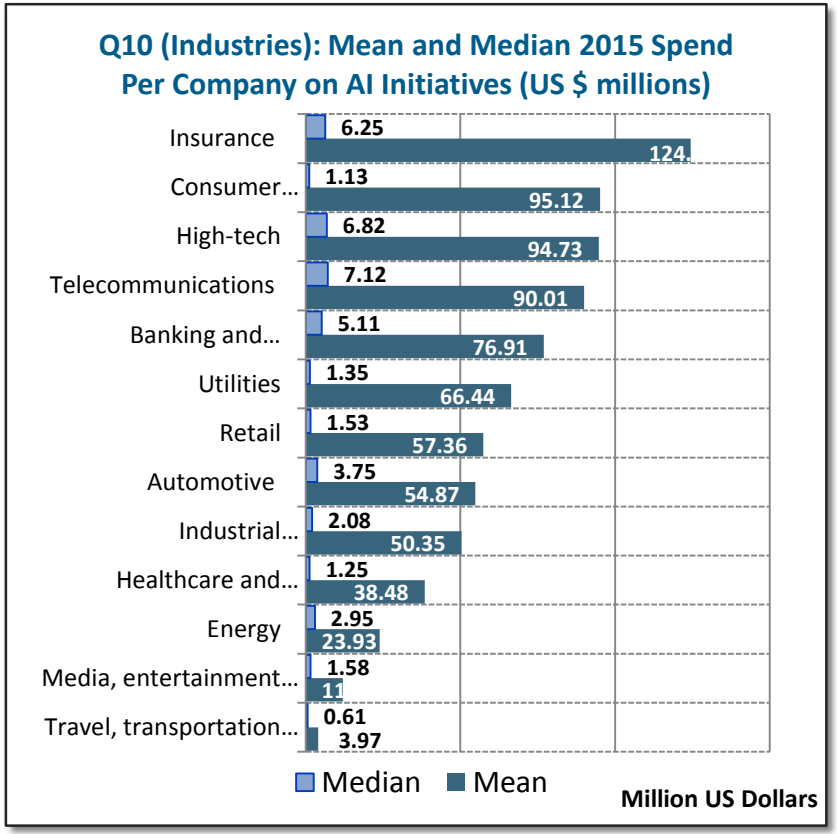
By function, which industries predict the greatest impact from AI

- Manufacturing/-production
  - CPG
  - Autos
- Sales: retail, CPG and utilities
- Finance: energy
- Customer service: insurance
- IT: eight of 13 industries
- Note: **Yet little unanimity about where impact will be greatest**

Industry	Most Frequently Cited Area of Greatest Impact by 2020	Second Most Frequently Cited Area of Greatest Impact by 2020
Banking and Financial Services	Information technology (25%)	Finance/accounting (20%)
Insurance	Customer service (27%)	Information technology (20%)
Telecommunications	Information technology (42%)	Sales (12%)
High-Tech	Information technology (51%)	Customer service, R&D (8%)
Utilities	Information technology (19%) Sales (19%)	Production (15%)
Energy	Finance/accounting (21%)	Information technology (17%)
Retail	Sales (31%)	Information technology (29%)
Consumer packaged goods	Manufacturing, sales, IT (19%)	Marketing, R&D (12%)
Automotive	Manufacturing (41%)	Information technology (17%)
Media, entertainment & information services	Information technology (32%)	Sales (14%)
Travel, Transportation & Hospitality	Information technology (24%)	Marketing, customer service (18%)
Healthcare and Life Sciences	Information technology (29%)	Customer service (14%)
Industrial Manufacturing	Information technology (21%)	Manufacturing (20%)

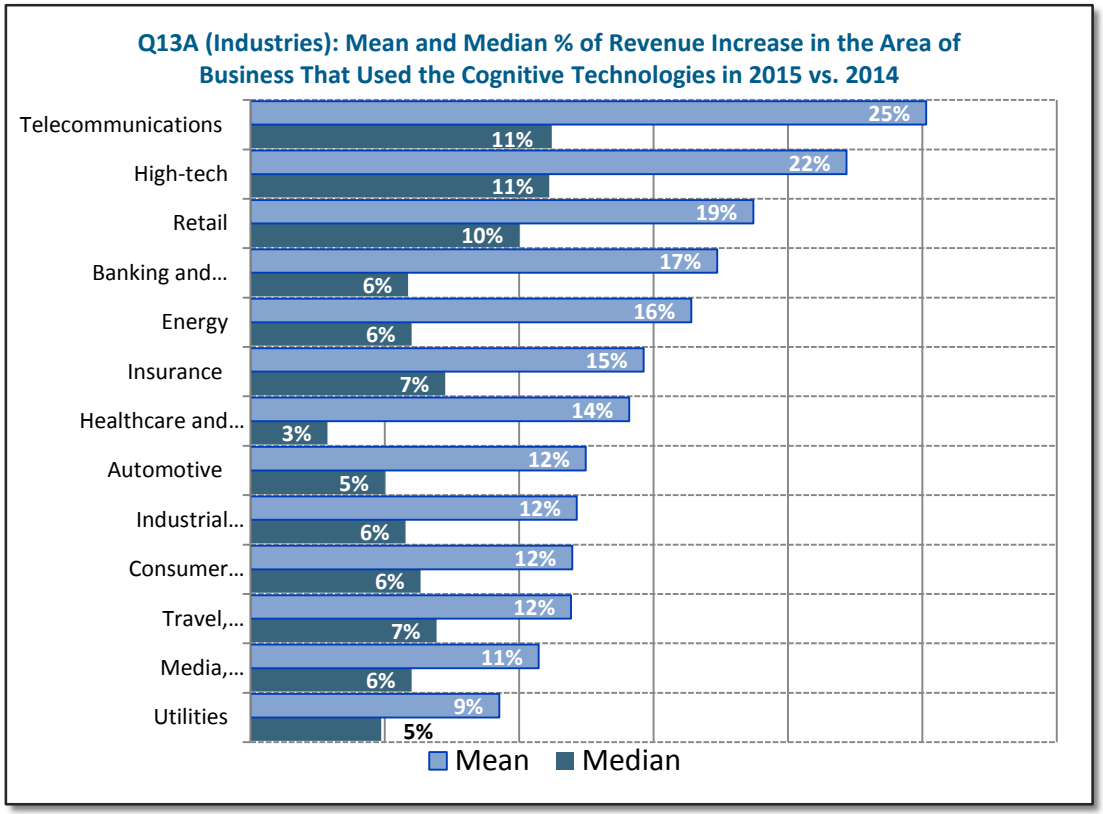
No. 5: Insurers spent the most on AI in 2015, travel-related companies the least

- Average spend by insurance firms: $124 million per firm
- CPG companies are No. 2: $95 million
- High-tech is third: $95 million
- Telecom is fourth: $90 million



No. 6: Where AI had the biggest revenue impact: telcos and high-tech

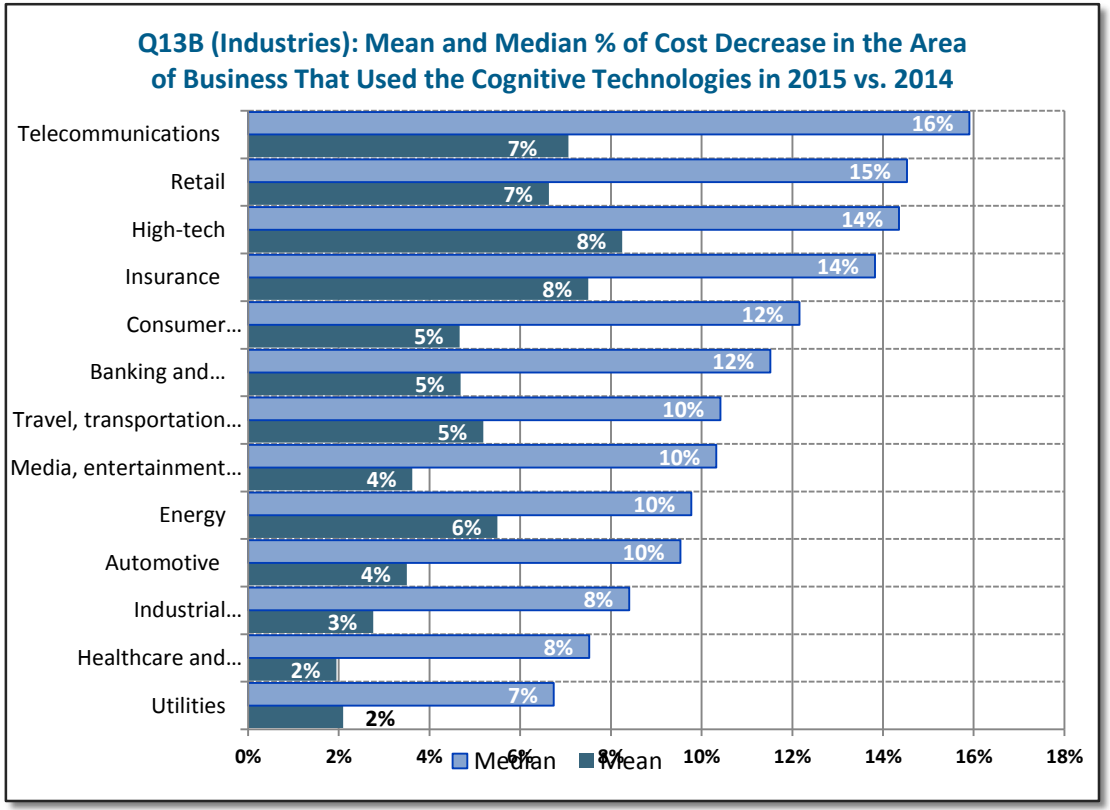
- In the area of their business in which they used AI, the sectors with the greatest revenue impact in 2015 (over 2014 were:
  - Telcos (25% average increase)
  - High tech (22%)
  - Retail (19%)
- At the bottom:
  - Utilities (9% increase)
  - Media-related firms (11%)



No. 6: Where AI had the biggest impact in cost reduction: telcos, retailers and high tech

- Industries with the largest average cost decreases via AI in 2015:
  - Telcos (16% average decrease)
  - Retail (15%)
  - High tech (14%)

- Smallest cost decreases:
  - Utilities (7%)
  - Industrial manufacturers and healthcare firms (8%)



No. 7: Telcos, high tech and retailers had highest % of companies with big benefits from AI in 2015

- We asked participants to estimate the revenue and cost impact (% increase or decrease) from their cognitive systems initiatives in 2015 (vs. 2014) in the area of the business that had the initiatives
  - We wanted to identify the companies that achieved both substantial cost decreases and revenue increases
  - These numbers are from companies that had at least a 16%+ cost decrease and at least a 21%+ revenue increase
  - We then calculated the % of companies in each industry that achieved such cost and revenue improvements
- 3 industries had the highest percentage of firms that achieved both metrics: telecom, high tech and retail
  - Healthcare and utilities had the least

Q13A-B: Percent of companies in each industry that achieved both large cost and revenue benefits in 2015 (vs. 2014) in the part of their businesses that had cognitive systems initiatives

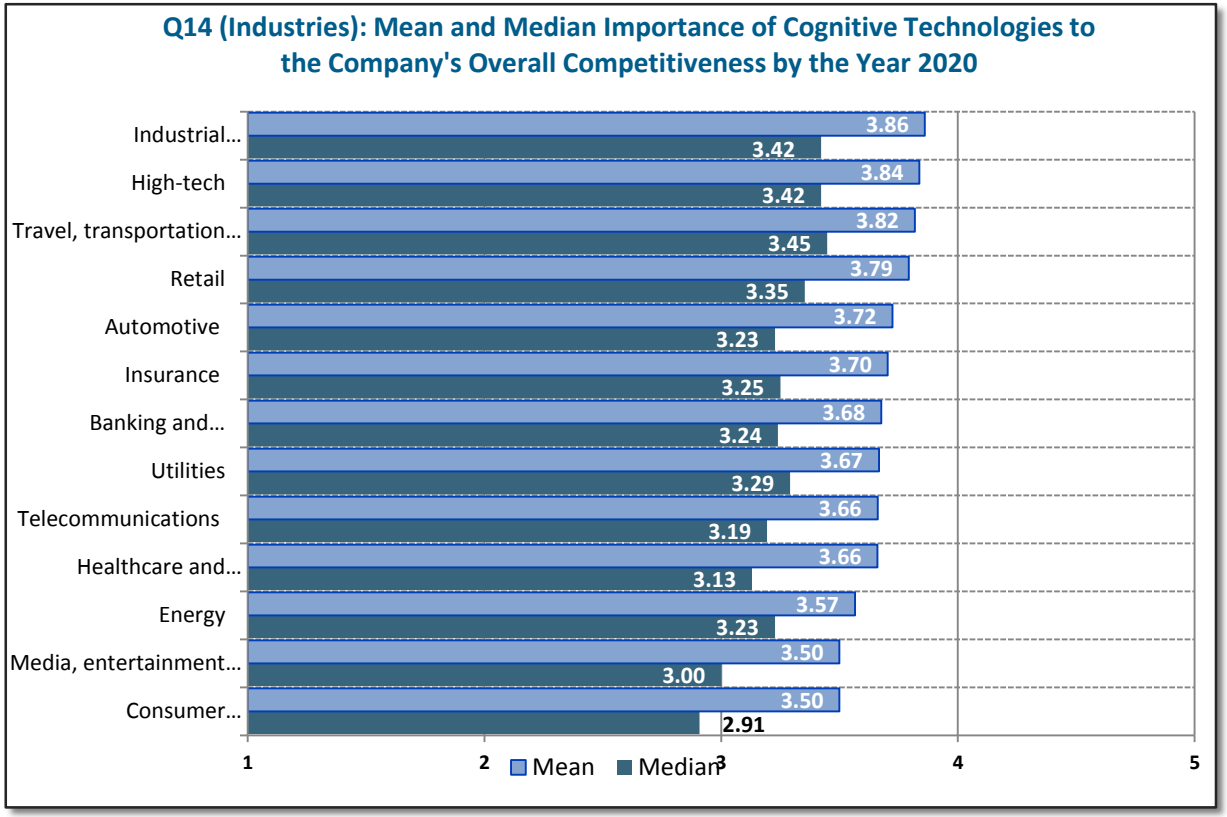
1st Tier	• Telecom (28.8%) • High tech (27.5%) • Retail (24.1%)
2nd Tier	• Energy (17.4%) • Automotive (17.2%) • Insurance (16.7%)
3rd Tier	• CPG (15.4%) • Travel, transportation and hospitality (15.2%) • Media, entertainment and information services (14.3%) • Banking and financial services (13.7%) • Industrial manufacturing (13.0%)
4th Tier	• Healthcare and life sciences (8.9%) • Utilities (7.4%)

Companies had to have achieved at least a 16% cost decrease and at least a 21% revenue increase from their cognitive systems initiatives (in the area of the business of those initiatives)

No. 8: Who sees AI as most important to competitiveness by 2020?

- On a scale of 1-5, three industries rate AI highest a competitive tool by 2020:
  - Industrial manufacturers
  - High-tech
  - Travel, transportation and hospitality
- Less likely to see AI as critical to success and survival by 2020:
  - CPG
  - Media-related
  - Energy companies

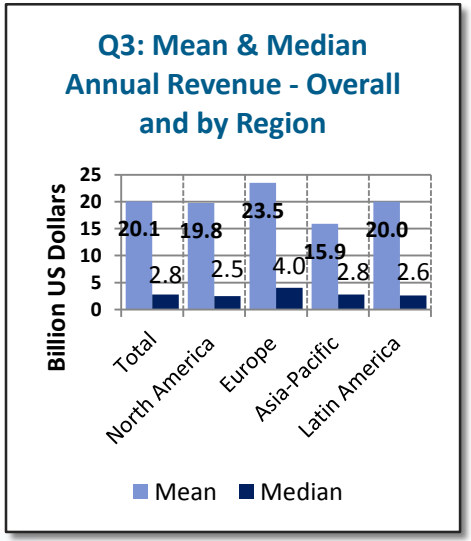
1. Not at all important
2. Slightly important
3. Moderately important
4. Important
5. Highly important

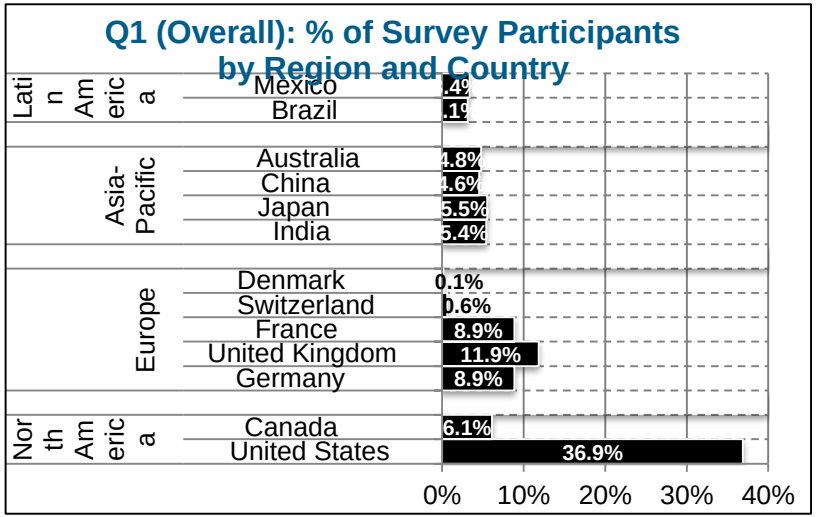


Appendix: Survey demographics

Survey demographics

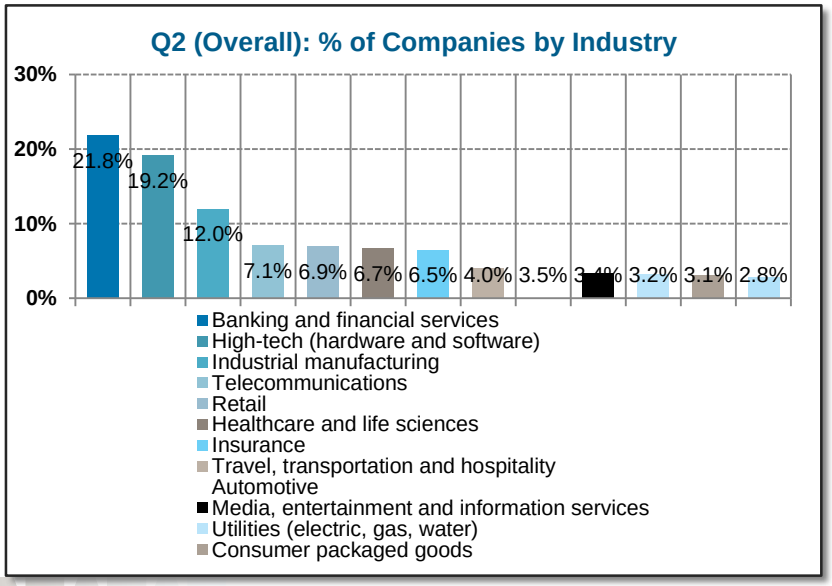
- 835 surveys in all: 89% of which are using cognitive technologies today, 11% don't use the technology but plan to by the year 2020
- Large companies: average revenue of $20B (median $2.8B)
- 43% from N. America; 30% Europe; 20% Asia-Pacific; 7% Latin America

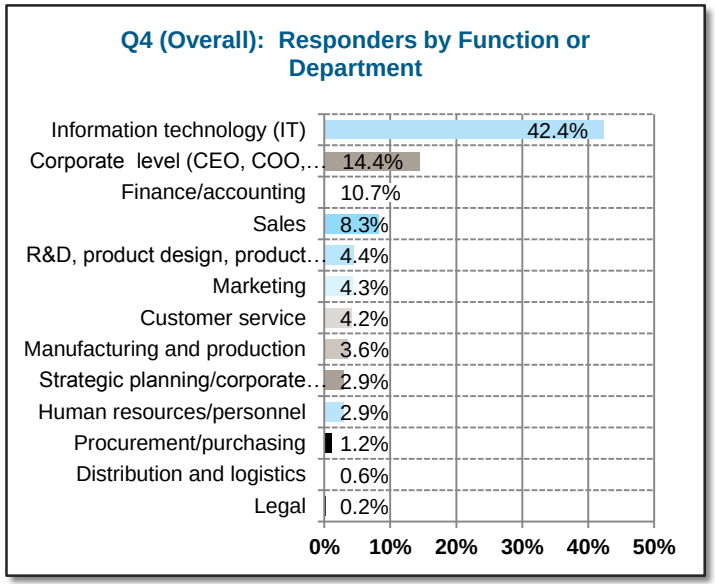




Survey demographics (cont.)

- Strong participation across 13 industries, with extensive participation from BFS, high-tech and industrial manufacturing companies
- Views on what's happening with the technology from around their organizations (and especially IT, where we found much of the action to be today)





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