

Taxonomy

IDC'S Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide Taxonomy, 2018

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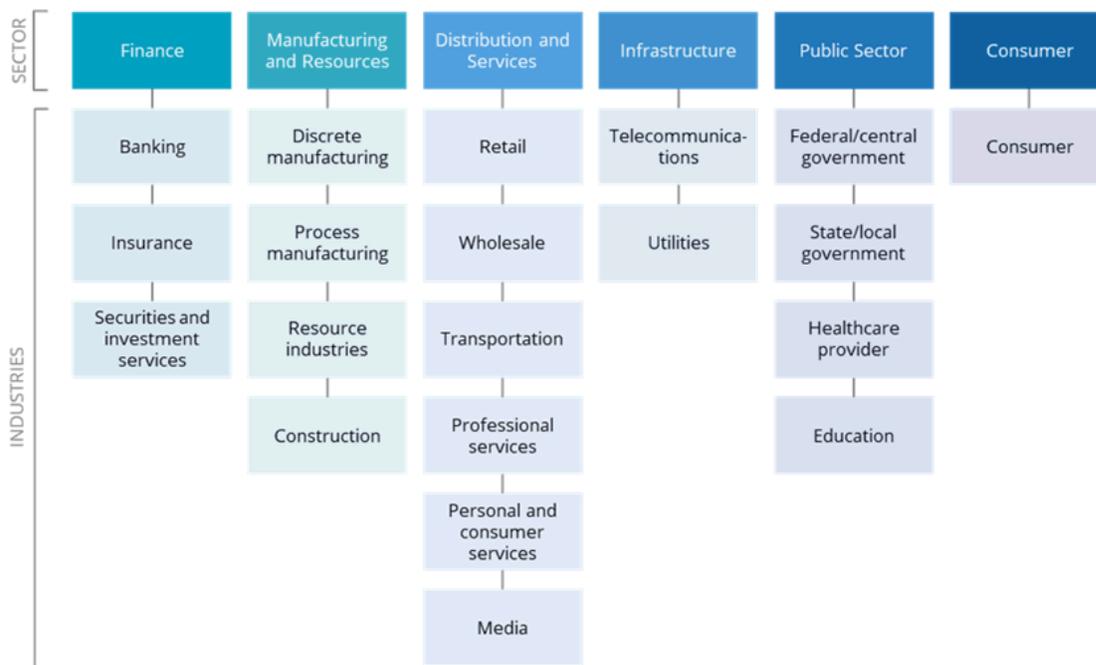
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IDC'S WORLDWIDE SEMIANNUAL COGNITIVE/ARTIFICIAL INTELLIGENCE SYSTEMS SPENDING GUIDE TAXONOMY

FIGURE 1

IDC's Standard Industries



Source IDC, 2018

IDC's Worldwide Semiannual Cognitive/Artificial Intelligence (AI) Systems Spending Guide taxonomy is intended to provide a framework to categorize and relate technology elements within this dynamic market. This document contains definitions for all the industries and technologies present within IDC's Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide. It also provides an overview of IDC's standard vertical and company classification systems and methodology. This IDC taxonomy:

- Defines cognitive/artificial intelligence systems as systems that learn, reason, and self-correct (The system hypothesizes and formulates possible answers based on available evidence, can be trained through the ingestion of vast amounts of content, and automatically adapts and learns from its mistakes and failures.)
- Provides a definitional guide to IDC's cognitive/artificial intelligence systems forecasts, spending guide, and related research documents
- Serves as a framework for how IDC organizes its cognitive/artificial intelligence systems research and forecasts, in addition to providing details on IDC's forecast methodology for the cognitive/artificial intelligence systems opportunity

SEMIANNUAL COGNITIVE/ARTIFICIAL INTELLIGENCE SYSTEMS SPENDING GUIDE TAXONOMY CHANGES FOR 2018

The changes in this iteration of the Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide taxonomy are detailed in the sections that follow.

Geography Changes: China as a Region

Starting with the 1H17 release of the Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide, China will be presented as a region. In prior iterations, China was included in the Asia/Pacific estimates.

Industry Changes: Deeper Industry Coverage, Removal of "Other Industries"

The 1H17 release brings deeper coverage by industry. Whereas earlier versions did not have all of IDC's standard industries represented and sized, the current deliverable includes analysis for all industries and includes spend for 19 of the 20 of them (consumer is not included). As a result of this expansion, the segment entitled "other industries" in prior versions of this research was removed.

Use Case Changes: Dissemination of Cross-Industry Use Case Spend

The 1H17 release brings deeper coverage by use case. Whereas earlier versions did not have all of IDC's use cases sized across all industries, the current deliverable includes analysis for all use cases across all industries. Because of this expansion, the segment entitled "cross industries" in prior versions of this research was removed.

TAXONOMY OVERVIEW

This IDC study provides a detailed description of IDC's Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide taxonomy. For 2017, this taxonomy includes a view of the horizontal technologies as well as a segmentation by industry and company size. It also provides an explanation of IDC's worldwide semiannual cognitive/artificial intelligence systems forecast methodology.

What Is a Vertical Industry?

A vertical industry is the set of all economic entities that offer goods and/or services designed to meet the specific needs of a group of customers or constituents. It is a well-defined segment as opposed to a broad, generic, and less specialized market. Because IDC's vertical research is rooted in deep economic and firmographic data, our taxonomy classification process parallels that of economic

classification systems whereby we arrange organizations into groupings based on similar processes, products, services, and other behaviors and characteristics.

When selecting the vertical industries for the taxonomy, we incorporate data from key reference code systems such as:

- **The SIC** for the Americas and Asia/Pacific regions
- **The NACE Rev. 2** for Western Europe, Central Europe, and the Middle East and Africa
- **The ISIC** for reference in building up internationally comparable statistics on a worldwide basis
- **The JSIC** for Japan

Economic Entities, Enterprises, and Establishments

An economic entity is a producing unit, organization, or business. In our standard taxonomy and forecasting methodology, economic entities are recognized at the enterprise level (as opposed to the establishment level). For classification purposes, the definition of an enterprise goes beyond the broad colloquial concept of a business or an organization. Rather, an enterprise implies ownership of or control over legal, administrative, and fiduciary arrangements and organizational structures and resources to achieve objectives. Whenever possible, in IDC research, an enterprise has a common IS strategy and associated budget and decision making. The business strategy of the enterprise is reliant upon the various parts of the organization working together. An establishment, on the other hand, can be thought of as a single physical location or local unit where business is conducted. An enterprise may be made up of many establishments, or in the case in which an enterprise is a single-location organization, the concept of enterprise and local unit/establishment coincides.

As noted previously, a vertical industry is made up of a group of enterprises that share common production and distribution of goods and services. Although an enterprise may operate in several product or service areas, IDC aggregates vertical industries based on the enterprise's principal activity as determined by the value contributed to the organization relative to other activities. For example, in the United States, this is referred to as the organization's primary SIC code. The NACE system is used in Europe to determine the enterprise's principal activity.

IDC's Sector and Associated Primary Vertical Markets

The objective of IDC's vertical industry taxonomy is to study and analyze IT adoption, spending, and trends in a worldwide consistent fashion. It is intended to assist organizations with their strategy, marketing, planning, sales, and operations. With this objective in mind, IDC has defined 20 primary vertical markets, which are collectively exhaustive and mutually exclusive.

What Is a Sector?

A sector is defined as a large grouping of organizations with similar, general economic activity. It is broader in scope than an industry or vertical. IDC's taxonomy divides economic activities into five sectors, excluding the consumer vertical: financial, distribution and services, infrastructure, manufacturing and resources, and public sector.

These macromarket views are best used when:

- Developing a vertical strategy and determining where your customer base is most developed
- Summarizing data points for an executive presentation
- Comparing synergistic sectors

Table 1 defines and provides company examples for each of IDC's primary vertical markets and sectors.

TABLE 1

IDC's Worldwide Sector and Vertical Taxonomy

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
Finance	Banking	Citigroup, Bank of America, Wells Fargo & Co., Bank of New York Mellon Corp., Ameribank Corp., Santander, American Express	6011, 6019, 6021, 6022, 6029, 6035, 6036, 6061, 6062, 6081, 6082, 6091, 6099, 6111, 6141, 6153, 6159, 6162, 6163	64	62, 63, 64
	Insurance	AIG, UnitedHealth Group, WellPoint Health Networks Inc., Allstate Corp., AFLAC Inc., Marsh & McLennan Companies Inc.	6311, 6321, 6324, 6331, 6351, 6361, 6371, 6399, 6411	65	67
	Securities and investment services	Merrill Lynch & Co., Morgan Stanley, Goldman Sachs Group Inc., Simon Property Group Inc., Equity Office Properties Trust	6211, 6221, 6231, 6282, 6289, 6712, 6719, 6722, 6726, 6732, 6733, 6792, 6794, 6798, 6799	66	65, 66
Manufacturing and resources	Discrete manufacturing	Bombardier, Boeing, United Technologies, Ford, General Motors, Polo Ralph Lauren Corp., Intel, AMD, IBM, Apple, Caterpillar	23–25, 31, 34–38, all of 39 excluding 3911, 3914, 3915, 3996, and 3999	14, 15, 16, 25, 26, 27, 28, 29, 30, 31, 32	11 (116–119), 13, 20, 25, 26, 27, 28, 29, 30, 31, 32
	Process manufacturing	Dow Chemical, DuPont, Kaiser Aluminum Co., Alcoa, International Paper Co., Reynolds Group, Nestlé, Tyson Foods, Unilever, P&G Co., PepsiCo, Coca-Cola, Bare Escentuals Inc., BP, ConocoPhillips, Tupperware, ExxonMobil	20–22, 26, 28–30, 32–33, 3911, 3914, 3915, 3996	10, 11, 12, 13, 17, 19, 20, 21, 22, 23, 24	9, 10, 11 (110–115), 12, 14, 16, 17, 18, 19, 21, 23, 24)

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IDC's Worldwide Sector and Vertical Taxonomy

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
	Construction	Toll Brothers Inc., PulteGroup Inc., D.R. Horton Inc., Lennar Corp., Dycom Industries Inc., MasTec Inc.	1521, 1522, 1531, 1541, 1542, 1611, 1622, 1623, 1629, 1711, 1721, 1731, 1741, 1742, 1743, 1751, 1752, 1761, 1771, 1781, 1791, 1793, 1794, 1795, 1796, 1799	41, 42, 43	6, 7, 8
	Resource industries	Chiquita Brands, Fresh Del Monte Produce Inc., Schlumberger Limited, Blue Diamond Growers, Arch Coal, CONSOL Energy Inc., Marathon Oil Corp., Apache Corp., Freeport-McMoRan Copper & Gold	111, 112, 115, 116, 119, 131, 132, 133, 134, 139, 161, 171, 172, 173, 174, 175, 179, 181, 182, 191, 211, 212, 213, 214, 219, 241, 251, 252, 253, 254, 259, 271, 272, 273, 279, 291, 711, 721, 722, 723, 724, 741, 742, 751, 752, 761, 762, 781, 782, 783, 811, 831, 851, 912, 913, 919, 921, 971, 1011, 1021, 1031, 1041, 1044, 1061, 1081, 1094, 1099, 1221, 1222, 1231, 1241, 1311, 1321, 1381, 1382, 1389, 1411, 1422, 1423, 1429, 1442, 1446, 1455, 1459, 1474, 1475, 1479, 1481, 1499	1, 2, 3, 5, 6, 7, 8, 9	1, 2, 3, 4, 5

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Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
Distribution and services	Retail	Best Buy, Pathmark, Home Depot, Walmart, Amazon, Target, Whole Food Market, TJX Companies Inc., Nordstrom Inc., CVS Health Corp., Sherwin-Williams Co.	5211, 5231, 5251, 5261, 5271, 5311, 5331, 5399, 5411, 5421, 5431, 5441, 5451, 5461, 5499, 5511, 5521, 5531, 5541, 5551, 5561, 5571, 5599, 5611, 5621, 5632, 5641, 5651, 5661, 5699, 5712, 5713, 5714, 5719, 5722, 5731, 5734, 5735, 5736, 5812, 5813, 5912, 5921, 5932, 5941, 5942, 5943, 5944, 5945, 5946, 5947, 5948, 5949, 5961, 5962, 5963, 5983, 5984, 5989, 5992, 5993, 5994, 5995, 5999	45, 47, 56	56, 57, 58, 59, 60, 61, 76, 77
	Wholesale	Tech Data Corp., Anixter International Inc., McKesson Corp., Cardinal Health Inc., Sysco Corp., Unified Grocers Inc.	5012, 5013, 5014, 5015, 5021, 5023, 5031, 5032, 5033, 5039, 5043, 5044, 5045, 5046, 5047, 5048, 5049, 5051, 5052, 5063, 5064, 5065, 5072, 5074, 5075, 5078, 5082, 5083, 5084, 5085, 5087, 5088, 5091, 5092, 5093, 5094, 5099, 5111, 5112, 5113, 5122, 5131, 5136, 5137, 5139, 5141, 5142, 5143, 5144, 5145, 5146, 5147, 5148, 5149, 5153, 5154, 5159, 5162, 5169, 5171, 5172, 5181, 5182, 5191, 5192, 5193, 5194, 5198, 5199	46	50, 51, 52, 53, 54, 55

TABLE 1

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Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
	Professional services	Microsoft, Accenture, Deloitte, Google, Facebook Inc., SAP, Fujitsu Inc., PayPal Holdings Inc.	6512, 6513, 6514, 6515, 6517, 6519, 6531, 6541, 6552, 6553, 7311, 7312, 7313, 7319, 7322, 7323, 7331, 7334, 7335, 7336, 7338, 7342, 7349, 7352, 7353, 7359, 7361, 7363, 7371, 7372, 7373, 7374, 7375, 7376, 7377, 7378, 7379, 7381, 7382, 7383, 7384, 7389, 7513, 7514, 7515, 7519, 7521, 7532, 7533, 7534, 7536, 7537, 7538, 7539, 7542, 7549, 7622, 7623, 7629, 7631, 7641, 7692, 7694, 7699, 8111, 8711, 8712, 8713, 8721, 8731, 8732, 8733, 8734, 8741, 8742, 8743, 8744, 8748, 8999	33, 58.2, 62, 63, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 80, 81, 82	39, 40, 68, 69, 70, 71, 72, 73, 74, 85, 87, 89, 90, 91, 92, 93, 94, 95, 96, 99
	Personal and consumer services	Marriott International, Wynn Las Vegas LLC, Six Flags Entertainment Corp., AMC Entertainment Holdings Inc., DHX Media Ltd., The American Red Cross, Goodwill Industries, Museum of Modern Art	7011, 7021, 7032, 7033, 7041, 7211, 7212, 7213, 7215, 7216, 7217, 7218, 7219, 7221, 7231, 7241, 7251, 7261, 7291, 7299, 7822, 7829, 7832, 7833, 7841, 7911, 7922, 7929, 7933, 7941, 7948, 7991, 7992, 7993, 7996, 7997, 7999, 8322, 8331, 8412, 8422, 8611, 8621, 8631, 8641, 8651, 8661, 8699	55, 59.13, 59.14, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99	75, 78, 79, 80, 94

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IDC's Worldwide Sector and Vertical Taxonomy

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
	Transportation	Union Pacific Railroad Company, Greyhound Lines Inc., United States Postal Service, FedEx Corp., Werner Enterprises, Royal Caribbean Cruises, American Airlines Group Inc., Delta Airlines Inc., Plains All American Pipeline	4011, 4013, 4111, 4119, 4121, 4131, 4141, 4142, 4151, 4173, 4212, 4213, 4214, 4215, 4221, 4222, 4225, 4226, 4231, 4311, 4412, 4424, 4432, 4449, 4481, 4482, 4489, 4491, 4492, 4493, 4499, 4512, 4513, 4522, 4581, 4612, 4613, 4619, 4724, 4725, 4729, 4731, 4741, 4783, 4785, 4789	49, 50, 51, 52, 53, 79	42, 43, 44, 45, 46, 47, 48, 49, 86
	Media	New York Times Co., Time Warner Inc., News Corp., The Walt Disney Company, CBS Corp., Comcast, 21st Century Fox America Inc.	2711, 2721, 2731, 2732, 2741, 2752, 2754, 2759, 2761, 2771, 2782, 2789, 2791, 2796, 4832, 4833, 4841, 7812, 7819	18, 58.1, 59.11, 59.12, 59.2, 60	15, 38, 41
Infrastructure	Telecommunications	AT&T Inc., Verizon Communications Inc.	4812, 4813, 4822, 4899	61	37
	Utilities	Commonwealth Edison Co., Waste Management Inc., National Grid, Duke Energy	3999, 4911, 4923, 4924, 4925, 4931, 4932, 4939, 4941, 4952, 4953, 4959, 4961, 4971, 4922	35, 36, 37, 38, 39	33, 34, 35, 36, 88
Public sector	Healthcare provider	Magellan Health Services, Brigham and Women's Hospital, Mayo Clinic, Kindred Healthcare Inc., Quest Diagnostics Inc.	8011, 8021, 8031, 8041, 8042, 8043, 8049, 8051, 8052, 8059, 8062, 8063, 8069, 8071, 8072, 8082, 8092, 8093, 8099, 8351, 8361, 8399	86, 87, 88	83, 84

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IDC's Worldwide Sector and Vertical Taxonomy

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
	Federal/central government	Department of Defense, Department of Health and Human Services, Department of Justice	9111, 9121, 9131, 9199, 9211, 9221, 9222, 9223, 9224, 9229, 9311, 9411, 9431, 9441, 9451, 9511, 9512, 9531, 9532, 9611, 9621, 9631, 9641, 9651, 9661, 9711, 9721	Part of 84	97
	State/local government	City of New York Police Department, California Department of Transportation, Massachusetts Department of Health and Human Services (including Mass Health insurer)	9111, 9121, 9131, 9199, 9211, 9221, 9222, 9223, 9224, 9229, 9311, 9411, 9431, 9441, 9451, 9511, 9512, 9531, 9532, 9611, 9621, 9631, 9641, 9651, 9661, 9711, 9721	Part of 84	98
	Education	University of Notre Dame, Framingham High School, Apollo Education Group Inc., Milton Academy	8211, 8221, 8222, 8231, 8243, 8244, 8249, 8299	85	81, 82
NA	Consumer	The consumer segment encompasses all home purchases by and for private households. Home-based businesses, however, are captured in the 1–9 employee segment and are classified in the appropriate primary vertical (typically in professional services).	NA	NA	NA

Source: IDC's Customer Insights and Analysis Group, 2018

DEFINITIONS

IDC defines cognitive/artificial intelligence as systems that learn, reason, and self-correct. The system hypothesizes and formulates possible answers based on available evidence, can be trained through the ingestion of vast amounts of content, and automatically adapts and learns from its mistakes and failures. The following glossary of terms are useful in understanding the full context of cognitive/artificial intelligence systems:

- **AI** is the study and research of providing software and hardware that attempts to emulate a human being.
- **Cognitive computing** is computing focused on reasoning and understanding that is inspired by human cognition. It is a subset of AI.
- **Machine learning** is the process of creating a statistical model from various types of data that perform various functions without having to be programmed by a human. Machine learning models are "trained" by various types of data (often, lots of data).
- **General-purpose cognitive/AI software platforms** are used to build intelligent applications that provide predictions, answers, or recommendations and are a platform for the development of cognitive applications. These applications automatically learn, adapt, and improve over time using information access processes combined with deep/machine learning.
- **Conversational AI software platforms** are a subset of cognitive/AI platforms that are specialized for the development of intelligent digital assistants and conversational chatbots. Conversational AI platforms use content analytics, information discovery, and other technologies (see the next bulleted list for more detail) to communicate with human beings.
- **Keyword and phrase recognition** is the system's ability to recognize specific words – this is a training exercise for the organization.
- **Rules and scripting** is a highly orchestrated process flow based on behavior: "if they say x, do y." Most often, these rules and scripts are created and modified by humans, not machine learning models.
- **Voice and speech recognition** is the translation of spoken or typed phrases into text to prepare it for analysis. In the past, these were created by human programmers, but most voice and speech recognition systems today are machine learning based.
- **Natural language processing** is the ability to extract people, places, and things (also known as entities) as well as actions and relationships (also known as intents) from sentences and passages of unstructured text.
- **Natural language generation** is the ability to construct textual/conversational narratives from structured or semistructured data.
- **Knowledge bases** are required for conversational AI applications to "understand" context; these applications need to have repositories of information about one or more subjects organized as entities/intents (see the previous bullet point on natural language processing) linked together so that the application can find answers to questions or ambiguous references. Building these knowledge bases can require lots of effort and time for an organization but may be crucial to building a sophisticated conversational AI application depending on the domain.

Recommendations, predictions, and advice based on this artificial intelligence provide users with answers and assistance in a wide range of applications and use cases.

IDC views the potential opportunity for cognitive/artificial intelligence systems by use case. This approach establishes a rich vocabulary and framework to enable meaningful conversations between

vendors and clients by painting a vivid, specific portrait of the potential end state. An IDC use case is a conceptual framework that provides a view of business value that is created when a set of technologies come together. Use cases are not defined by the technology itself. The parameters of a use case are defined by the value being created and recognized by an organization. Use cases can be categorized according to three primary benefits they provide:

- Creation of new products and services
- Optimizing operations
- Transforming the customer experience/creating customer loyalty

For each industry segmented in IDC's Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide, we have selected key use cases and developed adoption models. We selected the use cases that represent the majority of cognitive systems spending today and in the near short term. Our models allow for "other" use cases beyond those listed to account for the "long tail" opportunities that lie outside these key examples. These models help better imagine cognitive systems technology-fueled business scenarios that have the potential to transform existing industry processes and businesses.

Table 2 lists the use cases IDC is including in the Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide. This list will be frequently refined as some use cases are retired and new use cases become valid.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
Banking	Fraud analysis and investigation	Detection of illegal/illicit financial acts involving intentional deception and/or misrepresentation across different areas (i.e., operational and financial) of an organization; cognitive/AI systems will utilize rule-based learning to identify transactions that indicate fraudulent activity or the heightened risk of fraud; systems automatically learn the rules to identify numerous banking-related fraud schemes from bank employees and customers alike; these include but are not limited to corruption (i.e., money laundering), cash thresholds, billing fee waivers, check tampering, larceny, and financial statement fraud.
	Program advisors and recommendation systems	Utilization of embedded cognitive/AI computing capabilities to help businesses capture and extract detailed information and insight from enterprise documents such as processing of loan/mortgage applications needs and requirements; automatic classification and understanding of the document — including format structure, words, and numeric information; integration with recommendation systems (intelligent filtering engines that narrow the decision-making process) for the purpose of identifying best matching financial products or services.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Regulatory intelligence	Allows companies to more efficiently address their immediate regulatory compliance; moving beyond the use of traditional structured data to leverage unstructured information and external data; this can be applied in real time to help deliver actionable insights, limit exposure, and reduce the impact of compliance and conduct issues that arise.
	Automated threat intelligence and prevention systems	Systems that process the intelligence reports, extract the critical pieces of information, structure them in a fixed format, and push the information into the pipeline; connect the dots between different pieces of information; threat to database, systems, website, and so forth.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the banking industry.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

TABLE 2

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Industry	Use Case	Description
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Construction	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the construction industry.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
Discrete manufacturing	Quality management investigation and recommendation systems	Cognitive/AI manufacturing systems perceive out-of-spec changes in the manufacturing process; these process changes could be detrimental to the quality of the product; cognitive/AI systems recognize and know how to respond to these dynamic fluctuations by adapting the production to stay within quality targets.
	Regulatory intelligence	Allows companies to more efficiently address their immediate regulatory compliance; moving beyond the use of traditional structured data to leverage unstructured information and external data; this can be applied in real time to help deliver actionable insights, limit exposure, and reduce the impact of compliance and conduct issues that arise.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	Automated preventative maintenance	Machine log data from various sources contributes to a model that in turn will predict and alert of potential maintenance needs.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the discrete manufacturing industry.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

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Education	Adaptive learning	Modifies the presentation of material in response to student performance; intelligent cognitive/AI adaptive learning adapts trends in real time to every interaction a student makes both within and between the lessons.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the education industry.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

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Industry	Use Case	Description
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Federal/central government	Defense, terrorism, investigation, and government intelligence systems	Cognitive/AI software delivers critical data, information, and intelligence that help national security identify, monitor, and respond to personnel, assets, and infrastructure threats; intelligent unmanned vehicles employed for defense.
	Program advisors and recommendation systems	Cognitive/AI systems use natural capabilities to assist citizens' interaction or processing by the right government program based on needs and requirements.
	Automated threat intelligence and prevention systems	Systems that process the intelligence reports, extract the critical pieces of information, structure them in a fixed format, and push the information into the pipeline; connect the dots between different pieces of information; threat to database, systems, website, and so forth.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in government.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Healthcare	Diagnosis and treatment	Extract insights from the intersection of diverse data sets, including medical records, lab tests, clinical studies, and medical images, assist in diagnosis and personalized treatment at the individual patient level.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the healthcare industry.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Insurance	Automated claims processing	Automated and intelligent data capture and analysis for investigators and adjusters to investigate and adjudicate insurance claims.
	Fraud analysis and investigation	Cognitive/AI systems are used to detect deceptive or fraudulent insurance claims; cognitive/AI systems will utilize rule-based learning to identify transactions that indicate fraudulent activity or the heightened risk of fraud; systems automatically learn the rules to identify numerous insurance-related fraud schemes; and use of text analytics to analyze claims adjusters reports for anomalies along with statistical analytics.
	Program advisors and recommendation systems	Cognitive/AI systems use natural capabilities to assist applicant interaction or processing by matching the needs and requirements of the individual with the correct level of insurance product and coverage.
	Regulatory intelligence	Allows companies to more efficiently address their immediate regulatory compliance; moving beyond the use of traditional structured data to leverage unstructured information and external data; this can be applied in real time to help deliver actionable insights, limit exposure, and reduce the impact of compliance and conduct issues that arise.
	Automated threat intelligence and prevention systems	Systems that process the intelligence reports, extract the critical pieces of information, structure them in a fixed format, and push the information into the pipeline; connect the dots between different pieces of information; threat to database, systems, website, and so forth.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the insurance industry.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Media	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the media industry.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.

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Industry	Use Case	Description
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Personal and consumer services	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the personal and consumer services industry.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Process manufacturing	Pharmaceutical research and discovery	Cognitive/AI systems are aimed at finding correlations among genomic, clinical trial, and electronic medical records to assist with research and analysis of pharmaceutical research and discovery.
	Quality management investigation and recommendation systems	Cognitive/AI manufacturing systems perceive out-of-spec changes in the manufacturing process; these process changes could be detrimental to the quality of the product; cognitive/AI systems recognize and know how to respond to these dynamic fluctuations by adapting the production to stay within quality targets.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows, excluding non-intelligent robotic process automation such as screen scraping.
	Automated preventative maintenance	Machine log data from various sources contributes to a model that in turn will predict and alert of potential maintenance needs.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the process manufacturing industry.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
	Regulatory intelligence	Allows companies to more efficiently address their immediate regulatory compliance; moving beyond the use of traditional structured data to leverage unstructured information and external data; this can be applied in real time to help deliver actionable insights, limit exposure, and reduce the impact of compliance and conduct issues that arise
Professional services	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the professional services industry.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Resource industries	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in resource industries.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Retail	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the retail industry.
	Expert shopping advisors and product recommendations	Automated tools to learn about prospective customers and make shopping recommendations based on knowledge about those individuals; cognitive/AI natural language tools search through millions of social media conversations, blogs, forums, ratings and reviews, and reason to identify, measure, and recommend products.
	Merchandising for omni-channel operations	Retailers are meeting the new customer demands by deploying specialized cognitive/AI analytics to make sure the right product is in the right place at the right time.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	IT automation	Cognitive/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Securities and investment services	Fraud analysis and investigation	Detection of illegal/illicit financial acts involving intentional deception and/or misrepresentation across different areas (i.e., operational and financial) of an organization; cognitive/AI systems will utilize rule-based learning to identify transactions that indicate fraudulent activity or the heightened risk of fraud; systems automatically learn the rules to identify numerous securities and investment-related fraud schemes; these include but are not limited to high-yield investment fraud (i.e., pyramid and Ponzi schemes), broker embezzlement, late day trading schemes, and market manipulation.
	Program advisors and recommendation systems	Utilization of cognitive/AI computing capabilities help learn about the subject and recommend various sets of actions based on individuals' investment goals, risk tolerance, and the current and future state of the financial market.
	Regulatory intelligence	Allows companies to more efficiently address their immediate regulatory compliance; moving beyond the use of traditional structured data to leverage unstructured information and external data; this can be applied in real time to help deliver actionable insights, limit exposure, and reduce the impact of compliance and conduct issues that arise.
	Automated threat intelligence and prevention systems	Systems that process the intelligence reports, extract the critical pieces of information, structure them in a fixed format, and push the information into the pipeline; connect the dots between different pieces of information; threat to database, systems, website, and so forth.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the securities and investment industry.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
State/local government	Defense, terrorism, investigation, and government intelligence systems	Cognitive/AI systems deliver critical data, information, and intelligence that help state/local security identify, monitor, and respond to personnel, assets, and infrastructure threats.
	Program advisors and recommendation systems	Cognitive/AI systems use natural capabilities to assist citizens' interaction or processing by the right government program based on needs and requirements.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Public safety and emergency response	Smart public safety uses cognitive/AI systems for police, fire, EMS, and search and rescue to predict, prevent, and reduce crime; address new and emerging threats; improve emergency/disaster planning and response; reduce the cost of operations; and allocate resources more effectively. Smart cognitive/AI public safety works to create safe and livable communities by applying learned intelligence across advanced analytics, social media, collaboration and information sharing tools, and mobile technologies.
	Automated threat intelligence and prevention systems	Systems that process the intelligence reports, extract the critical pieces of information, structure them in a fixed format, and push the information into the pipeline; connect the dots between different pieces of information; threat to database, systems, website, and so forth.
	Automated preventative maintenance	Machine log data from various sources contributes to a model that in turn will predict and alert of potential maintenance needs.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in government.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Telecommunications	Automated threat intelligence and prevention systems	Systems that process the intelligence reports, extract the critical pieces of information, structure them in a fixed format, and push the information into the pipeline; connect the dots between different pieces of information; threat to database, systems, website, and so forth.
	Smart networking	Design and implement rules and parameters for governing the routing of inbound calling through the network. Expanded use of real-time analytics to make the network smart, which includes rules to specify how calls are distributed according to the time and/or date of the call as well as the location of the caller. Cognitive/AI systems provide a customized experience for the caller and maximize the efficiency of inbound call handling.
	Program advisors and recommendation systems	Cognitive/AI systems use natural capabilities to assist applicant interaction or processing by matching the needs and requirements of the individual with the correct level of telecom products and services.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the telecommunications industry.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.

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Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	IT automation	Cognitive/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Transportation	Asset/fleet management	Cognitive/AI infrastructure provides visibility of assets and control systems, remote management, and real-time operational intelligence offering route optimization; actionable responses to vehicle condition (remote diagnostics); and driver behavior (tracking of idle or stopped time).
	Freight management	Freight management logistics (air, rail, land, and water) combined with supply chain logistics intelligently monitors and provides end-to-end visibility; optimizes truck loads, container management, spare parts planning, dock availability, and customer experience management; and provides intelligent insight to suppliers on the type of product, place, and time of delivery to guarantee best pricing.
	Automated preventative maintenance	Machine log data from various sources contributes to a model that in turn will predict and alert of potential maintenance needs.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the transportation industry.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics
Utilities	Regulatory intelligence	Allows companies to more efficiently address their immediate regulatory compliance; moving beyond the use of traditional structured data to leverage unstructured information and external data; this can be applied in real time to help deliver actionable insights, limit exposure, and reduce the impact of compliance and conduct issues that arise.
	Automated Preventative Maintenance	Machine log data from various sources contributes to a model that in turn will predict and alert of potential maintenance needs.
	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the utilities industry.

TABLE 2

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018

Industry	Use Case	Description
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.
Wholesale	Automated customer service agents	Provide customer service via a learning program that understands customer needs and problems; reduce the time and resources spent in achieving customer issue resolution in the wholesale industry.
	Digital assistants for enterprise knowledge workers	Digital assistants help workers answer questions, predict future events, and provide recommendations internal to the workplace. Digital assistants help surface information related to a knowledge worker's ongoing daily efforts. Examples may include a worker completing a presentation with the help of a digital assistant going through existing files, notes, and presentations to provide additional content. These intelligent systems leverage machine learning on large data sets, enabling innovation, collaboration, and higher employee productivity — maximizing return on information assets.

TABLE 2**Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide by Industry Use Case, 2018**

Industry	Use Case	Description
	Intelligent processing automation	Intelligent automation of specific knowledge worker processes; the system learns to do more complex workflows — excludes non-intelligent robotic process automation such as screen scraping.
	IT automation	Cognitive/AI/AI-enabled systems orchestrate the linking of IT systems to become self-acting and self-regulating. Automate mundane software maintenance activities. The automation engine can perform decision-making and execution tasks of IT system. New events are learned from IT human operators, not programmed by software programmers. Examples may include automation of fixed price projects from IT service companies.
	Sales process recommendation and automation	Cognitive/AI computing engines can work with CRM systems to understand customer context in real time and recommend actions to the sales agents that are most relevant to the specific interactions and recommend the next best action for the sales process to try and qualify or close a sale.
	Supply and logistics	Enterprise cognitive/AI systems augment ERP capabilities, resulting in improved global visibility across the downstream and upstream portions of the supply chain; the combination of advanced algorithms with subtlety of human reasoning will anticipate supply and demand imbalances and make the daily recommendations for schedule adjustments across process silos; ultimately, this will optimize automated warehousing, delivery schedules, and logistics.

Source: IDC's Customer Insights and Analysis Group, 2018

Technology View of Cognitive/Artificial Intelligence Systems

IDC's worldwide semiannual cognitive/artificial intelligence systems size and segment the business analytics opportunity by six technology categories. Table 3 outlines these technologies and provides a brief description. For more detail, refer to the Learn More section.

TABLE 3

Cognitive/Artificial Intelligence Systems Technology Definitions

Category	Technology	Description
Hardware	Servers	A server is a computer or device on a network that manages network resources. For example, a file server is a computer and storage device dedicated to storing files. Any user on the network can store files on the server. A print server is a computer that manages one or more printers, and a network server is a computer that manages network traffic. A database server is a computer system that processes database queries.
	Storage	Storage is the part of a computer system or connected system or peripheral device that stores information for subsequent use or retrieval. It can take the form of storage, which is an integral component of functional computer systems, or additional systems and devices. This spending does not include spending on storage software (captured in system infrastructure software) or storage services (captured in IT services).
Software	Cognitive/AI platforms	Cognitive/AI software platforms provide the tools and technologies to analyze, organize, access, and provide advisory services based on a range of structured and unstructured information. These platforms facilitate the development of intelligent, advisory, and cognitively enabled applications. The technology components of cognitive software platforms include text analytics, rich media analytics (such as audio, video, and image), tagging, searching, machine learning, categorization, clustering, hypothesis generation, question answering, visualization, filtering, alerting, and navigation. These platforms typically include some kind of knowledge representation tools such as knowledge graphs, triple stores, or other types of NoSQL data stores. The platforms also provide for knowledge curation and continuous automatic learning based on past experiences, both good and bad.
	Cognitive/AI applications	This market includes cognitively enabled process and industry applications that automatically learn, discover, and make recommendations or predictions. The functionality for cognitively enabled apps may span a variety of areas including finance, sales, risk management, R&D, procurement, HR, marketing, and performance management. Anti-money laundering, patient outcomes, telco churn, retail pricing, asset management, and logistics are just some examples of industry-enabled cognitive applications. Cognitive/AI-enabled applications will become available in all segments of the market. Cognitive/AI applications learn about us, our likes, our dislikes, and what we do and then use that learning to answer questions, predict actions, and make recommendations. These applications use natural language processing, search, artificial intelligence, and machine learning to provide expert assistance in a wide range of areas. Usually, cognitive/AI-enabled applications are built using cognitive/AI software platforms, but not always.

TABLE 3

Cognitive/Artificial Intelligence Systems Technology Definitions

Category	Technology	Description
Services	IT services	Cognitive/AI IT services include IT consulting, systems and network implementations, IT outsourcing, application development, IT deployment and support, and IT education and training related to cognitive/AI software and infrastructure spending. IT services also involve helping buyers create the IT strategy of their overarching cognitive/AI journey.
	Business services	Business services comprises business consulting and horizontal business process outsourcing related to cognitive/AI software and hardware.

Source: IDC's Customer Insights and Analysis Group, 2018

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Methodology

The market data and forecast information presented in IDC's Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide program represent our best estimates of the spend by sector, industry, use case, and technology.

The data presented is the combination of qualitative and quantitative data from a number of primary and secondary sources, including IDC's worldwide vertical and company size market model, the research tanks of IDC's Insights businesses, and IDC's annual ICT survey of end-user organizations.

IDC models the breakdown of total IT spending by vertical and company size using a combination of available data on the number and revenue of companies within each vertical and company size class. The basic components of the model used to determine a market size and forecast for a specific product area by vertical market include supply-side data, demand-side data, industry trends, and the economic outlook to generate a model of IT services spending. IDC methodologies integrate these elements into a framework to determine the market segmentation for a base year and the forecast assumptions.

IDC's Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide taxonomy will be updated at least once a year to reflect any adjustments to definitions or approaches.

Related Research

- *Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending by Industry Market 2016-2020 Forecast* (IDC #US42749817, June 2017)
- *Cognitive/Artificial Intelligence Systems Net-New Spending Opportunities by Industry* (IDC #US42545417, May 2017)

Synopsis

This IDC study provides a detailed description of IDC's Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide methodology and taxonomy. It should be used as a companion piece for IDC's worldwide semiannual cognitive/artificial intelligence systems and all of IDC's worldwide industry research. Technology suppliers may utilize this approach and structure as well to help them build an industry-focused organization.

"IDC's worldwide semiannual cognitive/artificial intelligence systems present a comprehensive, global, and detailed view of the marketplace," said Marianne Daquila, research manager, IDC's Customer Insights and Analysis group. "It is an invaluable resource to help vendors define and standardize their vocabulary for the cognitive/artificial intelligence systems opportunity."

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

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