USF | Muma Business Review
A publication of the Muma College of Business | University of South Florida

*Volume 4, Number 19* | *Industry Analysis* | *31 DECEMBER 2020*

# Investigating Market and Regulatory Forces Shaping Artificial Intelligence Adoptions

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The Artificial Intelligence (AI) industry has experienced tremendous growth in recent years. Consequently, there has been considerable interest in the media regarding this emergent technology. Practitioners and academics are interested in learning how this market functions to make evidence-based decisions regarding its adoption. The purpose of this manuscript is to perform a systematic examination of the current market dynamics as well as identify future growth opportunities for the benefit of incumbents in addition to firms seeking to enter the AI market. The primary research question is: how do market and governmental forces reportedly shape AI adoptions? Drawing on predominantly practitioner focused literature, along with several seminal academic sources, the article examines and maps stakeholders in the market using the AI Industry Stakeholder Power/Interest Matrix. This approach allows for the identification and analysis of key stakeholders as well as power and influence within the industry. Semiconductor and cloud computing firms play a substantive role in the industry as they wield substantial power, as revealed by this analysis.

**Utilizing the stakeholder analysis framework, this article elucidates the market structure, competitive and regulatory forces influencing AI adoption decisions within firms, and subsequent profitability.**

Keywords: Artificial Intelligence, Machine Learning, Organizational Ethics, Stakeholder Analysis

# The Industry

Practitioners and academics similarly have a vested interest in understanding the structure as well as broad competitive and regulatory forces that shape the Artificial Intelligence market and its subsequent profitability. In recent years, Artificial Intelligence (AI) has garnered considerable hype and misinformation in local and national media. The primary question arises as to how market and regulatory forces reportedly shape AI adoptions in firms. This article intends to discurtain the hype and provide an evidence-based assessment of this market. Knowing how these forces operate within the market, practitioners and academics are empowered to formulate strategy and harness these market forces to maximize profitability.

It is interesting to note that Artificial Intelligence has a generalized definition, yet the definition is somewhat ambiguous. Examining some of the AI definitions from key actors that have been provided in the public space is an insightful exercise.

There are some interesting similarities and differences contained in these definitions. Multiple designations emphasize the pattern recognition and prediction functions of AI. Some definitions emphasize "human-like" advanced cognitive abilities such as decision-making, learning, and problem solving, whereas others underscore processing and automation functions which are low to mid-range cognitive abilities.

Artificial intelligence is thought to be the strategic technology leading the future

## Global Strategic Planning

This article focuses predominantly on the United States' marketplace. International Data Corporation estimates that worldwide spending on AI Systems will flourish to $98 billion by 2023, with over half of this investment derived from U.S. firms ("Worldwide", 2019). However, it is important to note that globalization plays an important role in today's business environment, especially in the AI market. Technological developments, such as AI, function as macro environmental forces that are driving globalization (Hill & Hult, 2019). Nearly all the dominant actors in this space, including multinational firms Amazon, Facebook, Microsoft, IBM, Apple, and Google, have a global presence.

After recognizing the significance of this technology, the United States' government established a strategic plan for the development and promotion of AI. As stated in the 2019 strategic plan, "Artificial intelligence enables computers and other automated systems to perform tasks that have historically required human cognition and what we typically consider human decision-making abilities" (Select Committee on Artificial Intelligence, 2019, p. 1). Priority areas contained within the plan including research and development funding, approaches for human-machine interactions, frameworks to address ethical, legal, and social concerns , security initiatives, open-source data sets, performance benchmarking for AI, and workforce requirements to support these initiatives (Select Committee on Artificial Intelligence, 2019).

As well, the European Commission (2020) has been working to create standards and operating guidelines to bring some structure to the AI field. The European Commission offers the following definition, "a generic term that refers to any machine or algorithm that is capable of observing its environment, learning, and based on the knowledge and experience gained, take intelligent actions or propose decisions. Autonomy of decision processes and interaction with other machines and humans are other dimensions that need to be considered" (Artificial Intelligence: A European Perspective, 2018, p.2).

Another AI powerhouse, the Chinese government, has invested considerable resources in designing an AI ecosystem that has helped them to become a world leader in this field. In a recent strategic plan, The People's Republic of China offers the following perspective on AI (State Council, 2017, p.2):

> Artificial intelligence is thought to be the strategic technology leading the future, the world's major developed countries regard the development of artificial intelligence as the major strategy to increase national competitiveness and enhance national security, therefore they intensify the introduction of plans and policies and the deployment of the core technology, top talent, standards etc. trying to grasp the initiative in the new round of international science and technology competition.

One such technological development, the Internet, has created many opportunities for consumers around the world to gather information about firms as well as the products and services they are producing in other countries (Hill & Hult, 2019). This development has created many options for buyers that are exploring different products. Furthermore, the Internet has created a low-cost marketing channel whereby firms can easily access customers on a global scale. This platform has enabled small firms to establish a large-firm online presence and achieve economies of scale related to their production.

## Economic perspectives

Economists categorize AI as being a transformative General Purpose Technology (GPT). Like the steam

**Table 1: Selected Definitions of Artificial Intelligence**

| Definition | Source |
|---|---|
| Artificial Intelligence is a branch of computer science dealing with the simulation of intelligent behavior in computers, and the capability of a machine to imitate intelligent human behavior | (Artificial Intelligence a, 2020, p.1) |
| the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from experience | (Artificial Intelligence b, 2020, p.1) |
| Artificial Intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment | (Nilson, 2010, p.13) |
| a programmed ability to process information | (Launchbury, 2019, p.1) |
| The theory and development of computer systems that can perform tasks that normally require human intelligence, such as visual perception, speech recognition, learning, decision-making, and natural language processing | (IEEE-USA, 2019, p.1) |
| the ability of a machine to perform cognitive functions we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem-solving, and even exercising creativity | (Chui, Kamalnath, & McCarthy, 2019, p.1) |
| AI is the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages | (Ransbotham, Khodabandeh, Fehling, Fountain & Kiron, 2019, p. 3) |
| a collective term for computer systems that can sense their environment, think, learn, and take action in response to what they're sensing and their objectives | (Rao, Verweij, & Cameron, 2016, p.1) |
| AI is the general study of making intelligent machines | (Introduction to AI, 2020, p.1) |
| AI is the field of computer science dedicated to solving cognitive problems commonly associated with human intelligence, such as learning, problem-solving, and pattern recognition…may connotate robotics or futuristic scenes | (What is Artificial Intelligence?, 2020, p.1) |
| an umbrella term for a family of techniques that allow machines to learn from data and to act on what they have learned rather than simply following rote instructions created by a program and emphasizes the characteristics of prediction, automation and optimization | (Thomas, 2019, p.2) |

engine and electricity, AI has the power and functional characteristics to positively impact virtually every sector of the economy (Bresnahan & Trajtenberg, 1992). Productivity gains in AI are positively related to productivity gains in complementary technologies (See Rosenberg, 1979) which, in turn, spurs additional innovation and investment in research and development. General Purpose Technologies, as defined by Bresnahan & Trajtenberg (1992), possess the following three characteristics: 1. Pervasiveness, 2. Advancement over time, and 3. Proliferation of innovation. Pervasiveness implies that this technology is widely distributed across industries and market sectors.

Rosenberg (1979) stresses the important role that complementary technologies play in activating productivity levels related to a single technology advancement. Essentially, technological innovations such as AI need to be viewed utilizing a systems lens. Innovations located throughout the value chain function as gates and subsequently prompt AI related productivity improvements (Rosenberg, 1979). Further, the author asserts that the inventor of an AI innovation may have to wait on another innovation to be developed prior to implementing the AI. A second characteristic of this technological interdependence is derived from the process of bringing a new technology product to market. Initially, the product is introduced to the market and consumers rapidly purchase the product. Over time, the technology product is gradually refined and modified to meet dynamic needs of end users. It may take considerable time for large productivity gains to be observed

as many of the changes are additive. This requires patience on the part of the inventors, developers, and investors (Rosenberg, 1979).

The consulting firm, Accenture, recently surveyed 6,672 business leaders and technology executives to learn about their perceptions of digital transformation within their respective firms (Daugherty & Wilson, 2019). The 2019 Technology Vision report revealed a group of complementary technologies, labelled DARQ, that propel companies forward in their digital transformation journey. DARQ includes "Distributed Ledger Technology (DLT), Artificial Intelligence (AI), Extended Reality (XR), and Quantum Computing (QC)" (Daugherty & Carrell-Billard, 2019, p. 17). DLT, which includes Blockchain, consists of a decentralized virtual network that allows for the dissemination of information across companies, networks, and geographic boundaries and collaboration in real time in order to build trust (Daugherty & Carrell-Billard, 2019; Dozier & Saunders, 2020). AI aids in rapidly examining data sets, identifying patterns and trends, and providing guidance to help foster evidence-based decision making. Further, AI is used in concert with other technologies like robotics and voice activated applications to automate tasks that are normally performed by humans. XR encompasses virtual reality and augmented reality which allows humans to have a lifelike experience with a brand or company while improving productivity and performance in the workplace (Daugherty, 2019). Quantum Computing is an advanced processing system in which computers estimate the characteristics of data based on mathematical formulas and develop sophisticated models rather than relying on simple zeros and ones as used in traditional computing.

It is helpful to review SMAC which facilitated the first digital revolution. SMAC consists of Social (S), Mobile (M), Analytics (A), and Cloud (C) (Olenski, 2016). Social includes all the social media applications that a firm uses to communicate with its customers such as Twitter, Facebook, LinkedIn, and Instagram, in addition to other channels. Mobile encompasses technologies like smartphones and tablets which allow consumers to access a firm on-the-go. Analytics packages allow a firm to make sense of the data provided by its customers and suppliers, as well as formulate appropriate marketing programs and offerings tailored to those needs. In his Forbes article (2016), Olenski claims that firms utilizing these four technologies jointly developed a thorough understanding of their customers and business partners, even to the point of being able to anticipate their needs and motivations. Many CIOs were tasked with making the decision to implement these tools and sometimes they did not have considerable experience with them. Yet, these leaders ended up using them for budgeting and prioritization decisions within the organization.

Firms operating in this space understood the true competitive advantage that could be achieved by utilizing all four technologies in concert (Olenski, 2016). As discussed by Olenski (2016), looking at these technologies from an alternative perspective revealed that firms that chose not to embrace these assets were left behind. Firms that plan to utilize DARQ recognize that they need to be fully utilizing SMAC as a foundation. Otherwise, they will not have the capabilities to take full advantage of these advanced technologies.

McKinsey surveyed 2,360 business leaders from a broad range of organizations about their experience in deploying AI within their respective firms. The survey focused on "33 AI use cases across eight business functions" (Cam, Chui, & Hall, 2019, p. 2). The results revealed that AI's predictive modeling capabilities enable firms to capture additional revenues in the customer service, marketing, channel management, churn management, and promotion functions of the business (Cam et al., 2019). Whereas preventive maintenance prediction models provided by AI allows firms to achieve significant cost reductions in the manufacturing areas of the business (Cam et al., 2019).

AI is distributed across virtually all industry sectors, however the top three sectors include High Tech, Automotive and Assembly, and Telecom.

Further, McKinsey's study confirmed that AI is distributed across virtually all industry sectors, however, this technology has penetrated some market sectors to a higher degree than others. The top three sectors include High Tech, Automotive and Assembly, and Telecom, whereas the lowest three sectors include Pharmaceuticals, Professional Services, and Infrastructure. The High Tech, Automotive and Assembly, and Telecom sectors displayed heavy use of machine learning, virtual agents, and robotic process automation. Notably, physical robotics, machine learning, and natural language text understanding were the dominant AI applications in the lowest three sectors. Machine learning appears to be the dominant application across all sectors (Cam et al., 2019).

## AI Applications

For context and setting the stage for the remainder of this manuscript, it is helpful to review the types of AI applications that are currently being deployed. Machine Learning has been the most visible AI

application and has served as a key contributor to the expansion of AI (Bringsjord & Govindarajulu, 2019). The field of Machine Learning (ML) consists of computer systems that generate statistical models and algorithms independently, solve complex problems, and predict results using either training data sets or historical performance records (Bringsjord & Govindarajulu, 2019). It is important to note that the quality of the data that is used for the training data set and entered into the system plays an important role in the quality of the output or prediction that is generated. If the data that is entered is inferior in quality, then the information that is generated from the ML will reflect that poor quality.

Within the ML domain, there are three primary categories: Supervised Learning, Unsupervised Learning, and Reinforcement Learning. In a Supervised Learning application, the user provides a set of data that has been labelled or identified to the system; subsequently, the system studies and learns the characteristics of that data set. When a new data set is introduced, the system applies those characteristics to the data in order to predict the results of a proposed calculation or formula (Rebala, Ravi, & Churiwala, 2019). In an Unsupervised Learning application, the user provides a large dataset, but does not provide an answer key or labels per se. Instead, the system studies the data set, identifies patterns in the data, and assigns groups of items that have similar characteristics based on its analysis which is subsequently used for predictions (Rebala, Ravi, & Churiwala, 2019). The computer system studies its external environment for signals and responding with an appropriate action in Reinforcement Learning. The system "learns" based on responses to modify its actions in response to those external signals (Rebala, Ravi & Churiwala, 2019). This learning method is used in dynamic problem-solving situations and situations with large solution sets such as computerized games and autonomous driving scenarios (Rebala, Ravi, & Churiwala, 2019).

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The McKinsey study referenced previously identifies Robotic Process Automation (RPA) as being a high growth technology used in the High Tech, Automotive and Assembly, and Telecom sectors. Boulton, in CIO Magazine (2018, p.1), describes RPA as

> an application of technology, governed by business logic and structured inputs, aimed at automating business processes. Using RPA tools, a company can configure software, or a "robot," to capture and interpret applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems.

Examples of RPA include deploying bots to field human resources-related questions from employees, or automated customer invoicing.

Computer vision is another subset AI field that has gained momentum in recent years. Analytics market leader, SAS, defines computer vision as "a field of AI that trains computers to interpret and understand the visual world. Using digital measures from cameras and videos and deep learning models, machines can accurately identify and classify objects, and then react to what they see" (Halper, 2017, p.6). The use of mobile technologies like smartphones and tablets makes it easy for users to upload images to the Internet and software applications for review. In recent years, computer vision programs have become remarkably more accurate in assembling photos, creating images, and identifying images based on a large database.

Natural Language Understanding (NLU) gains tractions as evidenced by systems like Amazon Alexa. Amazon defines NLU as a system in which "computers can deduce what a speaker actually means, and not just the words they say. In short, it is what enables voice technology, like Alexa to infer you're probably asking for a local weather forecast when you ask 'Alexa, what's it like outside?" (What is Artificial Intelligence?, 2019). Relatedly, Natural Language Processing (NLP) is another technology within the AI domain. SAS defines NLP (Halper, 2017, p. 6) as

> NLP involves analyzing, understanding, and generating responses ultimately to enable interfacing with systems using human rather than computer languages. For text, NLP often uses semantics to parse sentences for entities (people, places, things), concepts (words and phrases that indicate an idea), themes (groups of co-occurring concepts), or sentiments (positive, negative, neutral)".

Recently, Facial Recognition Technology has garnered both positive and negative attention. U.S. law enforcement agencies have used Amazon's Rekognition facial recognition technology for criminal investigations (What is Artificial Intelligence?, 2019). Examples of business use cases include using this technology to identify defective parts or products on an assembly line, study diseased crops in a field, or even identify passengers via digital passports for airport security. Despite the benefits of this technology, there are some documented issues and problems.

The Wall Street Journal reported on recent empirical evidence from the National Institute of Standards and Technology that Facial Recognition programs contain racial and gender bias (National Institute of Standards and Technology, 2019). IBM offers a definition of Facial Recognition Technology to include: "face detection, facial authentication, and facial matching" (Montgomery & Hagemann, 2019, p.1).

The use of virtual agents is another sub field of AI. Companies such as Microsoft offer virtual agents that can easily be deployed with limited knowledge and skills in coding and AI (Microsoft AI School, 2019). These virtual agents can assist with routing customer service calls to the appropriate department, or even fielding frequently asked questions from customers such as providing store operating hours, directions, and customer account balances or inquiries. The value in utilizing these programs is that the firm can provide customer service 24/7 while allowing for flexibility in handling dynamic call volumes in a cost-effective manner.

Some individuals perceive robotics and AI to be interchangeable. However, robotics and AI are not necessarily the same. According to Dell Technologies, "some robots may be programmed to perform the same tasks over and over without any 'intelligence' built in", whereas "smart robots may be programmed to carry out complex tasks that require more thought and adaptation" (Dell Technologies, 2019, p.1). For instance, a firm that manufactures fire hoses, Task Force Tips Inc., uses vision guided robots throughout the valve production process and employees that formerly worked in production now serve as technicians servicing the robots which has bolstered overall firm productivity (Dell Technologies, 2019).

Finding the right balance of human workers and robots is an important consideration for firms.

Finding the right balance of human workers and robots is an important consideration for firms. Introducing AI robots into the manufacturing process often stems from a need for increased speed and efficiency. In his *The Verge* article, Hawkins reported that Elon Musk admitted that the production delays of Tesla's Model 3 sedans were a result of "over-reliance on automation and too few human assembly line workers building the model 3" (2018, p. 1).

Finally, the topic of autonomous vehicles needs to be considered. Firms exploring this technology emphasize the safety aspect of autonomous vehicles. Semiconductor manufacturer, Nvidia (2020, p.1), describes the relationship between AI and autonomous vehicles as:

> AI gives cars the ability to see, think, learn, and navigate a nearly infinite range of driving scenarios. Nvidia uses the power of AI and deep learning to deliver a breakthrough end-to-end solution for autonomous driving – from data collection, model training, and testing in simulation to the deployment of smart, safe, self-driving cars" .

## Stakeholders

Upon reviewing this industry analysis, it is helpful to apply a stakeholder analysis approach as a lens to understand the dynamics of key stakeholders within the AI ecosystem. Beyond shareholders, there are many other actors that have a vested interest in this market space, and it is important for firms to consider their diverse needs.

### Cloud Computing providers

One group of stakeholders includes cloud computing providers. The explosion of cloud computing in recent years has spurred growth in the AI field. For companies to store and process the massive volumes of data they are accruing, they need to obtain storage capacity and advanced computing technology like graphic processing units. Cloud technology provides companies with the scalability and flexibility to handle these complex requirements. According to MarketLine's U.S. Cloud Computing Industry Profile (2019), cloud computing in the U.S. generated revenues of $85.4 billion in 2018 with an accelerating compound annual growth rate (CAGR) of 29.5%. MarketLine estimates that cloud computing's growth will slow to 27.15% between 2018 and 2023 and achieve a market value of $287.2 billion by 2023 (2019). The introduction of 5G technology and the Internet of Things (IoT) along with improved internet quality is contributing to the acceleration of cloud computing (MarketLine Cloud Computing, 2019), Four firms lead the industry including: AWS (Amazon Web Services), Microsoft Azure and Office 365, Google Cloud and IBM Cloud. A fifth firm, Salesforce, is rapidly gaining a foothold in this space (MarketLine Cloud Computing, 2019).

### Semiconductor manufacturers

Semiconductor manufacturers comprise another significant group of stakeholders. McKinsey studied the semiconductor industry and estimates that growth in AI will create opportunities for firms that manufacture high efficiency semiconductors. The firm's study projects that semiconductors supporting AI applications will increase by 18 percent annually over the next few years (Batra, Jacobson, Madhav, Queirolo, Santhanam, 2018). MarketLine reports

that the semiconductor industry earned $79.8 billion in revenues in 2018 and had a CAGR of 13.2% between 2014 and 2018 (2018). For the five-year period, 2018-2023, MarketLine projects the semiconductor industry will grow by 13.4% and generate $149.8 billion by 2023 (2018). Market leading firms that operate in this space include Intel, Texas Instruments, Qualcomm and Micron Technology (MarketLine Semiconductors, 2019).

Relatedly, manufacturers of graphic processing units (GPU's) represent another segment of stakeholders that have a strong relationship with the AI market. Nvidia is a market leader in this group as the firm produces GPU's for the gaming, data centers, automotive and virtual reality markets (MarketLine Nvidia, 2019). MarketLine's Nvidia Company Profile (2019) reports that the data center market achieved $71 billion in revenues in 2018 and anticipates annual revenue of $99 billion by 2022 with a CAGR of 8.4%. In addition to Nvidia, firms such as Advanced Micro Devices, Intel, and AMD have established a foothold in this market space.

## Computer manufacturers

Computer manufacturers are key stakeholders within the AI market space. According to Dun and Bradstreet's First Research Computer Manufacturing Profile (First Research Industry Profile, 2017), this industry within the United States contains three primary clusters including computer products (approximately 41% of revenues), storage devices (28% of revenues), and peripheral equipment (31% of revenues). In recent years, Computer Manufacturers have lost market share due to availability of computing capacities available through smart phones and tablets. In response, computer manufacturers have entered the AI space to capture production efficiencies as well as new revenue streams. For instance, IBM is a dominant player in this industry, and the firm's research lab introduced its well-known IBM Watson offering in 2010. IBM Watson gained notoriety in 2011 as a winning contestant on Jeopardy (A Computer Called Watson, n.d.; Best, 2013) which emphasized the high velocity and performance of the AI, consequently shepherding in a new era. Rival computer manufacturer, Hewlett Packard, launched its AI offerings in 2017. Hewlett Packard Enterprises, known as HPE, recognized that many firms did not possess the hardware and software infrastructure along with the expertise to manage AI adoptions. Consequently, HPE developed a "Deep Learning Cookbook" and wrap around support services to facilitate and manage AI adoptions (HPE Introduces, 2017).

Computer Manufacturers have lost market share due to availability of computing capacities available through smart phones and tablets. In response, computer manufacturers have entered the AI space to capture production efficiencies as well as new revenue streams.

## Internet publishing and broadcasting firms

Another pivotal group of stakeholders consists of Internet publishing and broadcasting firms which includes firms with a NAICS code of 51913B (Holcomb, 2019). This group of companies provides internet-based information and entertainment services such as "news, music and video" and mainly derives revenue from online advertising and sales of customer data (Holcomb, 2019). Some firms that comprise this category include Facebook, Google/Alphabet, Apple and Netflix (Holcomb, 2019). IBIS World estimates this industry generated $141.1 billion in 2019 with an annual growth of 13.6% between 2014 and 2019 and expected growth of 9.9% between 2019 and 2024. This industry includes social media advertising which has experienced explosive growth in recent years. The growth in smart phone usage has facilitated much of the growth trajectory in this market as more people have access to the Internet and are spending more time visiting social media sites which provides increased opportunities for online advertising.

## U.S. Search Engines

Like Internet publishers, U.S. Search Engines are another group of stakeholders that play a vital role in the AI landscape. IBIS World indicates this group includes firms like Google/Alphabet and Microsoft which operate search engines and generate income from advertisers that pay to post advertisements on the search pages. Consumers search for websites and content on the search engines for free, and in return, they receive wrap around value added services such as email, social networking sites, blogging platforms, in addition to other functions. IBIS World estimates the 2019 revenue for this industry as $89.7 billion with a 13.5% annual growth rate from 2014-2019, and a projected annual growth rate of 10.1% between 2019 and 2024 (Holcomb, 2019). This growth can be attributed to increasing consumer demand for Internet access and increased use of mobile devices to gather information on products and services (Holcomb, 2019).

## E-Commerce and Online Auctions

The industry comprised of E-Commerce and Online Auctions is another key stakeholder that has embraced the power of AI. Online retailers such as Amazon sell products and services primarily through

the Internet (Terdiman, 2018). These firms sell a wide variety of products including media items, clothing, electronics and even groceries. This is a recent development (Spitzer, 2019). MarketLine indicates that the online retail industry earned $297.8 billion in revenues during 2017 and is projected to reach $447.4 billion by 2022 which is more than a 50% increase over 2017 revenues (MarketLine Online Retail, 2018). Consumers have developed a comfort level with online retailers, and resultingly, they are shopping using their smart phones and tablets which is a key driver of revenue growth.

## Higher Educational institutions

Historically, educational institutions have played a critical role in gathering research, disseminating findings, and designing innovative AI products and services. Stanford University, Carnegie Mellon University AI, University of California - Berkeley, Harvard, MIT, Wharton School of the University of Pennsylvania, New York University have active innovation labs and have been instrumental in guiding companies, military, and government entities within the AI space. In 2019, Stanford University introduced the Institute for Human-Centered Artificial Intelligence, named HAI, to facilitate cross-disciplinary research, education, policy consulting, and communication to ensure government entities as well as companies are focused on designing AI that benefits humanity (Stanford University launches, 2019). AI pioneers, Herb Simon and Allen Newell, were faculty researchers at Carnegie Mellon University, so it is fitting that Carnegie Mellon has established a cross disciplinary research initiative which includes a department dedicated to Machine Learning research and development (Linder, 2017). University of California-Berkeley has created the Berkeley Artificial Intelligence Research (BAIR) Lab which includes faculty, graduate students and doctoral researchers in order to study the effects of AI on humanity. BAIR is focused on creating transparency around research collaborations and subsequently developed an open source area for researchers to store and share datasets.

In 1998, Harvard University established the Berkman Klein Center for Internet and Society to investigate diverse topics ranging from algorithm use in the legal system, governance issues related to autonomous vehicles, AI transparency and accountability, AI in relation to media information quality, and finally global governance issues, in addition to other projects (Berkman Klein Projects and Tools, 2020). The Berkman Klein Center encourages collaboration among researchers and publishes research findings to a wide range of audiences in order to educate and inform stakeholders. MIT's Computer Science and Artificial Intelligence Lab, CSAIL, has a long and eventful history in the AI field. Since its inception in 1963, CSAIL has focused on inventing new technologies and approaches for human-machine interactions that influence the daily lives of people worldwide (CSAIL Mission, 2020).

The Wharton School at the University of Pennsylvania established the Mack Institute for Innovation Management to oversee research on emerging technologies such as AI. This entity seeks to establish collaborations between the institution and the business community to identify research and educational funding opportunities (Mack Institute of Innovation, 2020). New York University has created the AI Now Institute which focuses on examining the effects of AI on our daily lives and providing research focused on issues such as bias, safety, and labor implications (AI Now, 2020).

Clearly, higher education institutions recognize that further research and public education is needed. Hence, some of the nation's premier educational institutions have established organizational structures to channel institutional resources as well as promote research and industry alliances to further these efforts. Moreover, these entities have developed communication channels to educate and inform the public of these important initiatives.

Another important development in the AI stakeholder space is the formation of strategic partnerships between business, academia, and government.

## Strategic partnerships

Another important development in the AI stakeholder space is the formation of strategic partnerships between business, academia, and government. The Partnership on AI is a strategic partnership that was formed in 2016 in order to foster cooperation, research, and education among key stakeholders in addition to the public (PAI, 2020). The organization's focus includes the following six themes: "1. safety-critical AI, 2. fair, transparent, and accountable AI, 3. AI, labor and the economy, 4. Collaborations between people and AI systems, 5. social and societal influences of AI, and 6. AI and social good" (PAI, 2020). Founding members include Apple, Google, Deepmind, Amazon, Facebook, Microsoft, and IBM (PAI, 2020), and current membership includes over fifty organizations.

## Trade associations

The trade association, Association for the Advancement of Artificial Intelligence (AAAI), plays a key

role in facilitating information sharing, research collaboration, and education among stakeholders in the AI market space. This association organizes AAAI conferences, publishes AI Magazine, and provides funding opportunities to promote education and research. Researchers need a dedicated space to share findings and connect with like-minded professionals; a need that is served by AAAI.

*U.S. Government*

Another stakeholder is the government. In 2019, the federal administration developed the American AI Initiative and organized a summit to obtain input on policy (The White House, 2019). A review of the Federal Government's proposed 2020 budget reveals this program is receiving $850 million for funding (The White House, 2019, p. 3) A key strategy element is providing funding resources to areas that the private sector does not typically support like early stage research. The goal is to foster technology transfer for early stage research projects, streamline funding administration, and provide tax benefits for firms that invest in these projects. To coordinate these initiatives, the National Science and Technology Council's Select Committee on AI was formed.

## Customers

Customers are also important stakeholders. Some consumers use AI to purchase goods or obtain services as well as information. They often utilize a personal assistant application such as Siri or a virtual assistant like Alexa to perform a supportive task such as providing directions or dimming a light in the house. Throughout the application, consumers are focused on the experience and expect the device or application to enhance it (Brill, Munoz & Miller, 2019). The consumer expects accuracy, timeliness, and dependability of the service provided by the AI.

Another important aspect of the customer experience entails the disclosure and use of personal identity and the benefits of that transaction. Consumers provide their name, address, email, and age in addition to other critical aspects of their identity with the objective of receiving something of value in return. Consumers signing up for a Facebook account, for instance, is an example of this privacy transaction. To obtain a personal Facebook account, consumers must disclose their first and last names, email address, password, gender, and age.

Tucker identifies the following three concerns in relation to privacy: "data persistence, data repurposing, and data spillover" (2019, p.2). Given today's cloud storage technology, companies can easily store data over a long period of time which emphasizes the characteristic of data persistence. Once a consumer establishes a Facebook account, the data will remain stored on the Facebook server indefinitely. If Facebook is notified of a person's death, the organization will create a memorial of the individual's page (Managing a Deceased Person's Account, 2020).

Data repurposing entails the long-term storage, potential sale, and unanticipated future use of the data that an individual provides. The issue concerning Facebook and Cambridge Analytica is an example of data being repurposed in unanticipated and unauthorized ways. In 2016 the United Kingdom's *The Observer* reported that Cambridge Analytica acquired user profiles and Facebook "likes" based on an app survey that users had completed through a research project (Facebook & Cambridge Analytica, 2018; Golbeck & Sinan, 2018). The firm used this information for marketing purposes during the 2016 Presidential election campaign without Facebook user consent specifically for that purpose.

The final concern is data spillover and subsequent privacy violations that occur during data collection. Using the Facebook and Cambridge Analytica situation to illustrate this concern, when Facebook users completed the app survey, the system captured user profiles of respondents as well as the user profiles of their network connections. These individuals that were part of the survey participant networks did not have knowledge of, nor did they provide consent for their data being captured and utilized in this manner.

Executives adopting AI, whether the technology is designed in-house or purchased from an outside company, routinely utilize a cost leadership strategy.

## Senior leadership (includes Boards of Directors)

It is also important to consider the roles and expectations of internal stakeholders in the AI market. Executives at the firms that are adopting AI, whether the technology is designed in-house or purchased from an outside company, routinely utilize a cost leadership strategy. As a result, Executives tend to maximize the use of AI in operational areas of the company including supply chain management and manufacturing. Preventive maintenance programs are typical AI deployments in these areas (Cam, Chui, & Hall, 2019).

Another area emphasizes the labor shortage and subsequent skills deficiency created by a flourishing U.S. economy (Forrester, 2019). Leaders recognize the challenges with attracting and retaining highly skilled and qualified workers. In response to this talent war, leaders have searched for opportunities to automate certain jobs or even tasks within jobs in order to offset this talent gap. Cognitive technologies

such as AI provide companies with the flexibility in order to adapt to the changing competitive environment (Forrester, 2019).

## Non-management employees

Non-management employees need to be included in this analysis. Bughin & Manyika (2019, p.4) report that "Stress, work safety, and fears about jobs are often cited as the largest sources affecting organizations' productivity today." Workers may experience stress due to repetitive mundane tasks and heavy workloads that are time sensitive (Bughin & Manyika, 2019). Further, hazardous tasks may be required for a job which can add to the worker's stress. NIOSH (Bughin & Manyika, 2019) advocates for companies making

## Methodology

This Industry Analysis represents a component of a traditional dissertation that is being submitted to meet the requirements of the Doctor of Business Administration degree at the University of South Florida. This investigation includes the following seven stages: 1. Practitioner-focused review journals, 2. Academic research institutions, 3. Management consulting firms, 4. Trade associations and industry alliances, 5. Company white papers and case studies, 6. Government agencies and institutions, and 7. Academic journals (Table 2).

I began reviewing practitioner-focused review journals such as Harvard Business Review, MIT Sloan Management Review, and the Wall Street Journal for the time period 2018 - 2020 since these publications appeared to have the most current information on the AI industry. The next step consisted of using a snowball approach and expanding the search to include working and white papers, e-newsletters, and articles published by premier academic research institutions such as Harvard's Berkman Klein Center, Stanford University, Carnegie Mellon University, and Massachusetts Institute of Technology. These organizations regularly publish research articles and disseminate their findings to the research community quickly, as compared to working through the traditional publishing channels with long time frames.

While reviewing the work of these institutions, it became apparent they had cultivated cooperative relationships with many consulting firms such as Boston Consulting Group, Deloitte, McKinsey, PWC, KPMG, CapGemini, and Gartner. These consulting organizations had websites containing detailed results from their research studies as well as strategy papers, use cases, and case studies for the AI industry. After completing my review of the extensive consulting firm resources, I searched for trade associations (AAAI, IEEE) and trade publications (Tech Republic, CIO Magazine) that were mentioned in the consulting firm papers which yielded several articles. Through this research, I learned that some market leaders in this space had their own in-house research teams and published company white papers and case studies that provided industry insights.

The next phase of my research focused on government institutions/agencies in addition to private research organizations. The government entities are developing strategies and policies to support the industry within the U.S. The National Bureau of Economic Research (NBER) was categorized in the private research entities group and appeared to have an expanding research stream. After analyzing the articles collected to date, I noted there was some missing information. The final step in this research process was to examine academic databases and journals to fill in these gaps. I searched the IBIS World database by NCAICS codes to identify industry profiles. It was interesting to note that Artificial Intelligence was spread across multiple industry profiles including retail, food service, and automotive sectors. The academic databases that I searched included Google Scholar and JSTOR. .

**Table 2: Literature Review Methodology for Artificial Intelligence Industry Analysis**

| 1. Practitioner-focused Review Journals | 2. Academic Research Institutions | 3. Management Consulting firms | 4. Trade Associations and Industry Alliances | 5. Company white papers and case studies | 6. Government Institutions/ Agencies and private research groups | 7. Academic databases and journals |
|---|---|---|---|---|---|---|
| 12 | 9 | 21 | 5 | 9 | 8 | 6 |

enhancements to working conditions in order to improve worker stress levels and productivity. Firms can deploy AI to handle repetitive tasks and jobs which pose hazards to humans as an approach for reducing employee stress levels and improving working conditions.

Further, workers express some concerns and potential fears about their jobs being displaced by AI. A recent study by Northeastern University and Gallup revealed that employees do not have a detailed understanding of AI technology (Northeastern-Gallup, 2019) which may contribute to the fear of the unknown. Education on AI technology is needed, especially among workers with jobs that are risk of being replaced or have the potential for being supplemented with AI (Northeastern-Gallup, 2019). This analysis leads to the question of which organization should provide training and education on these new cognitive technologies. The Northeastern/Gallup study revealed that most workers expected employers to provide this training as compared to higher educational institutions (Northeastern-Gallup, 2019).

As provided in the evidence presented here, external and internal stakeholders have a wide range of perspectives and expectations that must be addressed. AI poses both benefits and challenges to an organization and it is imperative that a firm develops a thoughtful adoption strategy that takes these diverse perspectives into account.

## Analysis

Since this manuscript has a practitioner-scholar focus, I began by reviewing Mendelow's seminal framework- The Power-Dynamism Matrix (Mendelow, 1981). This researcher argued that it is important for managers to align environmental scanning activities and scarce resources with stakeholder power levels and environmental dynamics (Mendelow, 1981). In 1999 Johnson & Scholes expanded this model, dubbed the Power/Interest Matrix, to focus on evaluating stakeholder interests as compared to power rather than environmental scanning and power.

Mendelow provided a list of four steps to aid users in preparing this analysis including: "1. Determine who the stakeholders are, 2. Rate the power of each stakeholder, 3. Rate the dynamism of each stakeholder, and 4. Allocate responsibility for scanning developments related to each group" (1981, p. 415). For this assessment, I substituted the term "interest" for dynamism and used a ratings scale of 1 to 5 with 1 being low and 5 being high for each respective item. The "interest" score includes: "frequency of being included in decision-making and frequency of influence by technology and economic shifts" from Mendelow's matrix (1981, p.415). The "power" score reflects the following four dimensions: "possession of resources, ability to dictate alternatives, authority level, and influence level" (Mendelow, 1981, p. 415).

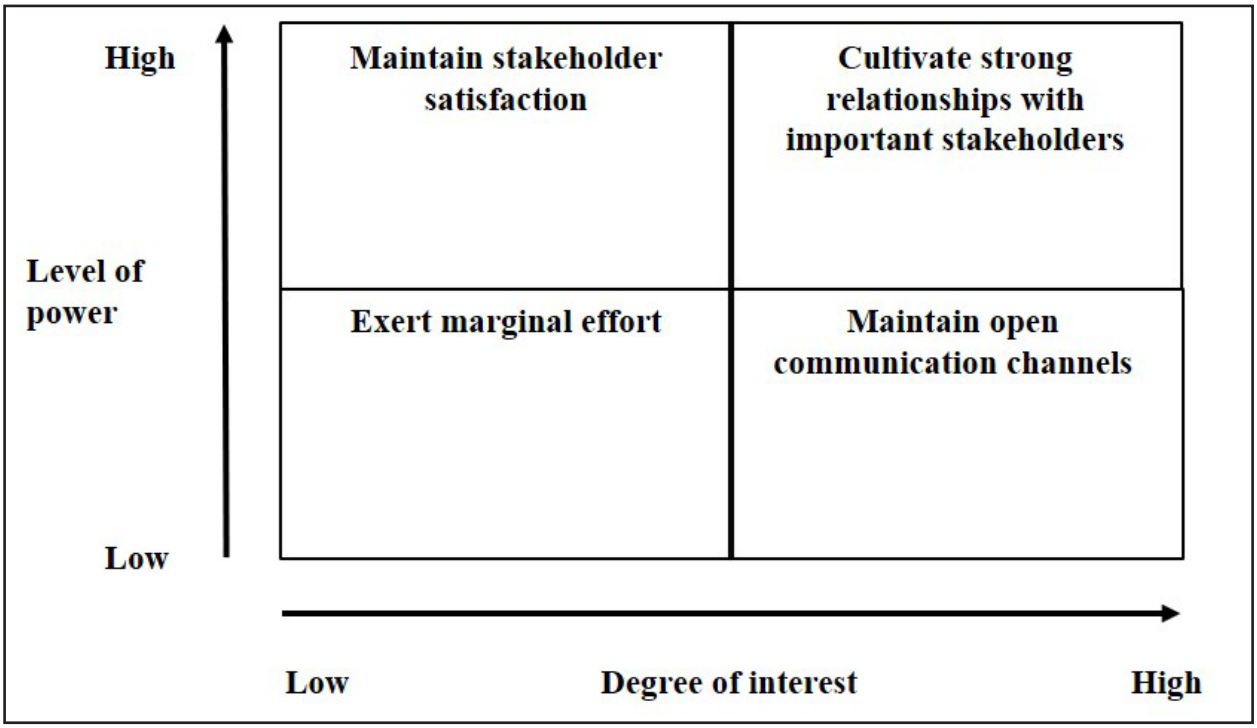


**Figure 1: Artificial Intelligence Stakeholder Power/Interest Matrix (Adapted from Johnson & Scholes, 1999; Mendelow, 1981)**

**Table 3: Interest and Power Scores for AI Industry Stakeholders**

| Stakeholder | Interest Score | Power Score | Selected References |
|---|---|---|---|
| Cloud Computing provider | 4.5 | 4.5 | (MarketLine Cloud Computing, 2019) |
| Semi-conductor firms | 2.8 | 4.5 | (MarketLine Nvidia, 2019) |
| Computer manufacturers | 2.5 | 3.5 | (First Research, 2019) |
| Ecommerce and Online auctions | 4.0 | 4.8 | (Terdiman, 2018) |
| Search engines | 3.5 | 4.0 | (Holcomb, 2019) |
| Internet publishers | 2.5 | 3.5 | (Holcomb, 2019) |
| Consulting firms | 4.0 | 4.5 | (Cam, Chui & Hall, 2019) |
| Academic institutions | 4.0 | 2.5 | (Berkman Klein, 2020; Stanford University, 2019) |
| Trade associations | 4.0 | 2.8 | (IEEE, 2019) |
| Government agencies | 2.0 | 4.0 | (The White House, 2019) |
| Customers | 4.0 | 2.8 | (Tucker, 2019) |
| Senior executives | 4.5 | 4.0 | (Forrester, 2019) |
| Non-management employees | 4.0 | 2.0 | (Bughin & Manyika, 2019) |

This is prepared from the perspective of a company that is interacting with these stakeholders. As the basis, I reviewed the industry profiles obtained from IBIS World, MarketLine and the other industry resources referenced in this report, and assigned scores based on the profiles shown in Table 3.

After entering this information into an excel spreadsheet, the matrix that I generated is shown in Figure 2.

## Discussion

The Stakeholder Power/Interest Matrix (Johnson & Scholes, 1999; Mendelow, 1981) served as a powerful tool for exploring the AI industry stakeholder relationships. Organizations that reside in the top left quadrant possess a high degree of power, yet their interests in individual businesses was mainly a distant one. The stakeholders residing in this category included Government agencies, Semiconductor firms, Internet publishers, and Computer manufacturers. Since these stakeholders were powerful, it was important that firms search for opportunities to maintain a position of good standing.

Interestingly, my analysis revealed there were no organizations positioned within the lower left quadrant with low power and low interest. My sense from reviewing the literature was that most firms in this space were fairly engaged. According to the literature, government agencies seemed to have the lowest activity levels, but I expect an increase in the near future as big technology firms begin to call for the government to step in and develop governance measures.

Organizations positioned within the lower right quadrant had a high degree of interest, yet their power was limited. This group included non-management employees, customers, academic institutions, and trade associations. The approach for interacting with this group included maintaining open and frequent communications. Many of the higher education institutions were publishing regular newsletters, podcasting, and blogging to disseminate their research findings to the public. Some non-management employees perceived AI as potentially taking their jobs, so they certainly had a vested interest.

The top right quadrant represented the key players and important stakeholders. The group included cloud computing providers, consulting firms, ecommerce organizations, search engine firms, and senior

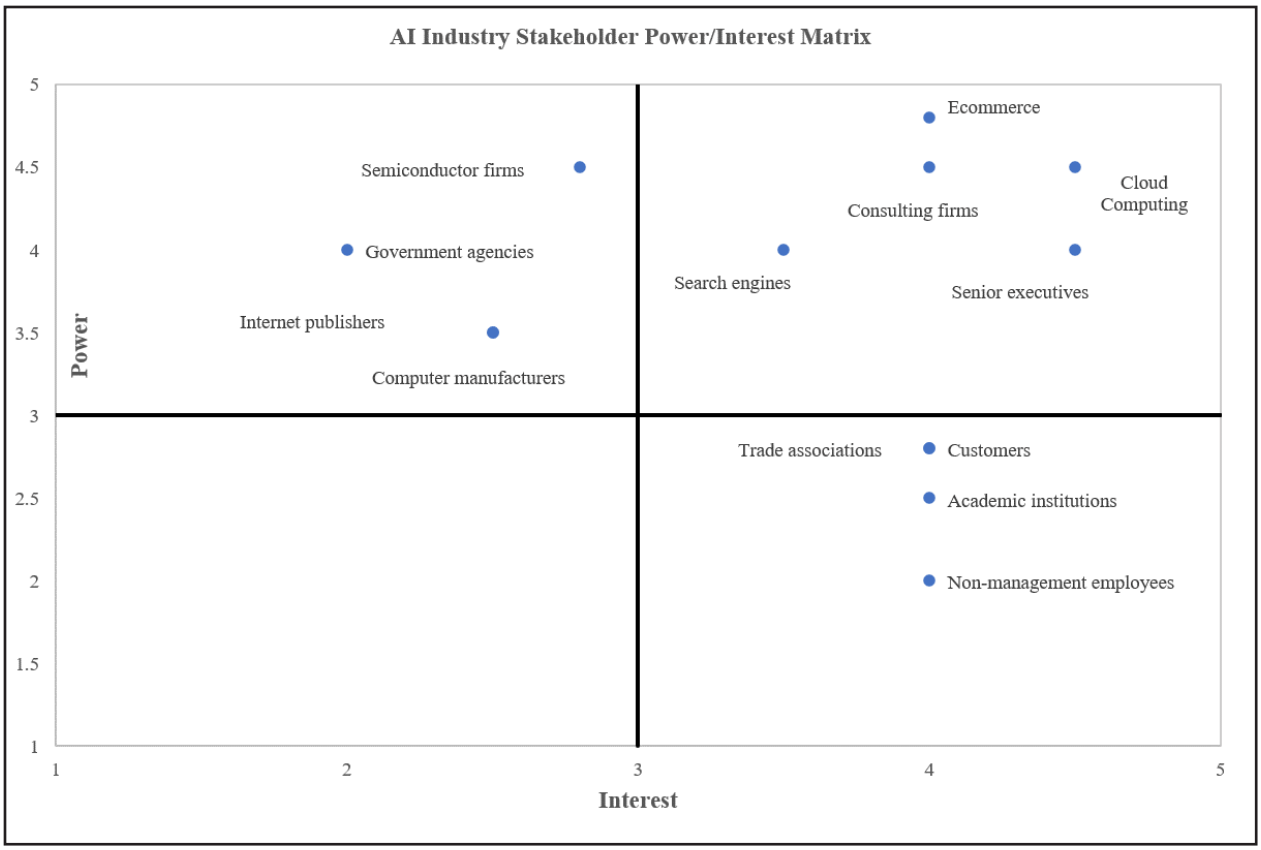


**Figure 2: Artificial Intelligence Stakeholder Power/Interest Matrix**
**(Matrix was adapted from Johnson & Scholes, 1999; Mendelow, 1981. Data was generated by author.)**

executives. These stakeholders were very engaged in the industry and represent potential partners and collaborators. Firms should seek opportunities to collaborate with these organizations for mutual benefit.

As a follow-up to this study, a future research area would be to survey technology executives either within a single company or from multiple firms to capture their perspectives on this matrix. Another potential future research area is to apply the Technology-Organization-Environment (TOE) framework to develop a deeper understanding of how these contexts shape the adoption process. A third research area would be to take a deep dive and explore how a company is using their own proprietary AI in the form of a case study.

## Conclusions

Through this study, my focus was on developing an understanding of how the AI market is structured as well as the resulting market forces and subsequent profitability. By evaluating the practitioner literature, this analysis contributes to the extant literature in a variety of ways. This article contains a summary of key industry definitions and a stakeholder analysis which illuminates power dynamics and influence within the industry. The AI Industry Stakeholder Power/Interest Matrix illuminated the power and influence dynamics between stakeholders within this dynamic industry. Since the pool of literature focusing on this topic was limited within the academic sphere, I expanded my research to include practitioner and governmental sources. As a result, these findings effectively addressed the primary research question: *how do market and governmental forces reportedly shape AI adoptions?*

Semiconductor and cloud computing firms possess a great deal of market power and have established dominant market positions as a result. Smaller and medium sized firms will struggle to gain market share if they are competing for the same customers in that market space. From a customer perspective, cloud computing technology allows the firm to access AI technologies without having to invest in massive data storage and server capabilities. Further, cloud computing firms can provide massive data sets that are needed in order to run AI which brings the technology closer to smaller firms.

## References

**References marked with an asterisk were included within the systematic review.*


*"A Computer called Watson". (n.d.) In *Icons of Progress*. Retrieved from https://www.ibm.com/ibm/history/ibm100/us/en/icons/watson/

*AI Now Institute. (2020). In *NYU Tandon School of Engineering*. Retrieved from https://engineering.nyu.edu/research-innovation/centers-and-institutes/ai-now

*Artificial Intelligence: A European Perspective. In *EU Science Hub*. Retrieved from https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113826/ai-flagship-report-online.pdf

Artificial intelligence a. In *The Merriam-Webster.com Dictionary*. Retrieved from https://www.merriam-webster.com/dictionary/artificial%20intelligence

Artificial intelligence b. In *Encyclopedia Brittanica*. Retrieved from https://www.britannica.com/technology/artificial-intelligence

*Batra, G., Jacobson, Z., Madhav, S., Queirolo, A. Santhanam, N. (2018). In *Artificial-intelligence hardware: New opportunities for semiconductor companies*. Retrieved from https://www.mckinsey.com/~/media/McKinsey/Industries/Semiconductors/Our%20Insights/Artificial%20intelligence%20hardware%20New%20opportunities%20for%20semiconductor%20companies/Artificial-intelligence-hardware.ashx

*Berkman Klein Projects & Tools. (2020). *Berkman Klein Center at Harvard University*. Retrieved from https://cyber.harvard.edu/projects-tools

*Best, J. (2013). IBM Watson: The inside story of how the Jeopardy-winning supercomputer was born, and what it wants to do next. In *Tech Republic*. Retrieved from https://www.techrepublic.com/article/ibm-watson-the-inside-story-of-how-the-jeopardy-winning-supercomputer-was-born-and-what-it-wants-to-do-next/

*Boulton, C. (2019). What is RPA? A revolution in business process automation. In *CIO Magazine*. Retrieved from https://www.cio.com/article/3236451/what-is-rpa-robotic-process-automation-explained.html

*Bresnahan, T.F., & Trajtenberg, M. (1992). General purpose technologies: Engines of growth. *NBER Working Paper No. 4148*. https://doi.org/10.3386/w4148

*Brill, T. M., Munoz, L., & Miller, R. J. (2019). Siri, Alexa, and other digital assistants: a study of customer satisfaction with artificial intelligence applications. *Journal of Marketing Management*, 35(15/16), 1401–1436. https://doi.org/10.1080/0267257X.2019.1687571

*Bringsjord, S. & Govindarajulu, N. S. (2019). "Artificial Intelligence", *The Stanford Encyclopedia of Philosophy* (Winter 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2019/entries/artificial-intelligence/>.

*Bughin, J. & Manyika, J. (2019). Your AI efforts won't succeed unless they benefit employees. *Harvard Business Review*. Retrieved from https://hbr.org/2019/07/your-ai-efforts-wont-succeed-unless-they-benefit-employees

*Cam, A., Chui, M., & Hall, B. (2019). Global AI survey: AI proves its worth, but few scale impact. *McKinsey & Co*. Retrieved from https://www.mckinsey.com/featured-insights/artificial-intelligence/global-ai-survey-ai-proves-its-worth-but-few-scale-impact

*CSAIL Mission and history. (2020). In *CSAIL About*. Retrieved from https://www.csail.mit.edu/about/mission-history

*Chui, M., Kamalnath V., & McCarthy, B. (n.d.) *An Executive's Guide to AI*. Retrieved from https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/an-executives-guide-to-ai

*Daugherty, P. (2019). Managing technology for the post-digital era. *MIT Sloan Management Review*. Retrieved from https://sloanreview.mit.edu/article/managing-technology-for-the-post-digital-era/

*Daugherty, P. & Carrell-Billard, M. (2019). Accenture technology vision 2019: Full report. *Accenture*. Retrieved from https://www.accenture.com/_acnmedia/PDF-94/Accenture-TechVision-2019-Tech-Trends-Report.pdf

*Daugherty, P., & Wilson, J. (2019). Human + Machine: Reimagining work in the age of AI. *Accenture*. Retrieved from https://www.accenture.com/us-en/insight-human-machine-ai

*Dell Technologies. (2019). Artificial Intelligence solutions. *Dell Co.* Retrieved from https://www.delltechnologies.com/en-us/solutions/artificial-intelligence/index.htm

*Dozier, P.D., & Saunders. (2020). The inter-organizational perspective on blockchain adoption within an ecosystem. *Twenty-Eighth European Conference on Information Systems (ECIS2020)*, Marrakesh, Morocco.

*Facebook and Cambridge Analytica: What you need to know as fallout widens. (2018, March 19). In Technology. In *New York Times*. Retrieved from https://www.nytimes.com/2018/03/19/

technology/facebook-cambridge-analytica-explained.html

*Forrester. (2019). The Future of Work. *Forrester Research*. Retrieved from https://go.forrester.com/wp-content/uploads/2019/07/Forrester-Future-Of-Work.pdf?utm_source=-forrester_news&utm_medium=web&utm_campaign=futureofwork

*European Commission. (2020). What does the General Data Protection Regulation govern? In *Europa.eu*. Retrieved from https://ec.europa.eu/info/law/law-topic/data-protection/reform/what-does-general-data-protection-regulation-gdpr-govern_en

*First Research Industry Profile (2017). Computer Manufacturing. *Dun and Bradstreet*.

*Golbeck, J. & Sinan, S. (2018). Why the Cambridge Analytica scandal is a watershed moment for social media. In *Knowledge@Wharton*. Retrieved from https://knowledge.wharton.upenn.edu/article/fallout-cambridge-analytica/

*Halper, F. (2017). Advanced Analytics: Moving toward AI, Machine Learning, and Natural Language Processing. *SAS Best Practices Report*.

*Hawkins, A.J. (2018, Apr. 13). Tesla relied on too many robots to build the model 3, Elon Musk says. In *The Verge*. Retrieved from https://www.theverge.com/2018/4/13/17234296/tesla-model-3-robots-production-hell-elon-musk

*Hill, C. & Hult, T.M. (2019). *Global Business Today*. 11th edition. McGraw Hill. New York, NY.

*Holcomb, G. (2019). Industry report 51913b: Internet publishing and broadcasting in the US. In *IBIS World*.

*HPE Introduces new set of artificial intelligence platforms and services. In *HPE Newsroom*. Retrieved from https://www.hpe.com/us/en/newsroom/press-release/2017/10/hpe-introduces-new-set-of-artificial-intelligence-platforms-and-services.html

*IEEE-USA Position statement. (2019). *Artificial Intelligence*. Retrieved from https://globalpolicy.ieee.org/wp-content/uploads/2019/06/IEEE18029.pdf

*Introduction to AI and Machine Learning. In *Using AI for Social Good*. Retrieved from https://ai.google/education/social-good-guide/

*Johnson, G. and Scholes, K. (1999). *Exploring corporate strategy*. Prentice Hall, London. *

*Launchbury, J. (2019). A DARPA perspective on Artificial Intelligence. *DARPA*. Retrieved from https://www.darpa.mil/attachments/AIFull.pdf

*Linder, C. (2017). CMU creates new initiative to become world leader in artificial intelligence. In *Pittsburgh Post-Gazette*. Retrieved from post-gazette.com/business/tech-news/2017/06/27/CMU-artificial-intelligence-AI-new-interdisciplinary-department-Pittsburgh/stories/201806270124

*Mack Institute of Innovation. (2020). In *Mack Institute About*. Retrieved from https://mackinstitute.wharton.upenn.edu/about/

*Managing a Deceased Person's Account. (2020). In *Facebook Help Center*. Retrieved from https://www.facebook.com/help/275013292838654?helpref=hc_global_nav

*MarketLine Cloud Computing. (2019). *Cloud Computing Industry Profile*: *United States*, N.PAG.

*MarketLine Nvidia Company Profile. (2019). *Nvida Company Profile*, 1–44. Retrieved from

*MarketLine Online Retail. (2020). *Online Retail Industry Profile: United States*, 1–72.

*MarketLine Semiconductors. (2019). *Semiconductors Industry Profile: United States*, N.PAG.

Mendelow, A. (1981). Environmental scanning: The impact of stakeholder concept. *Proceedings of the Second International Conference on Information Systems*, Cambridge, Mass, December 1981.*

*Microsoft AI School (2019). *Microsoft.com*. Retrieved from https://aischool.microsoft.com/en-us/home

*Montgomery, C. & Hagemann, R. (2019). *IBM policy lab: Bold ideas for a digital society*. IBM. Retrieved from https://www.ibm.com/blogs/policy/facial-recognition/

*National Institute of Standards and Technology. (2019). *U.S. Leadership in AI: A Plan for federal engagement in developing technical standards and related tools.* Retrieved from https://nist.gov/system/files/documents/2019/08/10/ai_standards_fedengagement_plan_9aug2019.pdf

*Nilson, N.J. (2010). *The quest for Artificial Intelligence: A History of ideas and achievements. Cambridge University Press*. Cambridge, UK.

*Northeastern-Gallup. (2019). *Facing the future: U.S., U.K. and Canadian citizens call for a unified skills strategy for the AI age.* Retrieved from https://www.northeastern.edu/gallup/pdf/Northeastern_Gallup_AI_2019.pdf

*Nvidia. (2020). Deep learning AI. *Nvidia.com*. Retrieved from https://www.nvidia.com/en-us/deep-learning-ai/

*Olenski, S. (2016). Why marketers need a SMAC. In *Forbes*. Retrieved from https://www.forbes.com/sites/steveolenski/2016/05/26/why-marketers-need-a-smac/#537758086a3d

*PAI. (2020). About us. *Partnership on AI*. Retrieved from https://www.partnershiponai.org/

*Ransbotham, S., Khodabandeh, S., Fehling, R., LaFountain, B., and Kiron, D. (2019). Winning with AI. *MIT Sloan Management Review*. Retrieved from https://sloanreview.mit.edu/projects/winning-with-ai/

*Rao, A.S., Verweij, G., Cameron, E. (2017). *Sizing the prize What's the real value of AI for your business and how can you capitalise?* PWC. Retrieved from https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

*Rebala, G., Ravi, A.,& Churiwala, S. (2019). *An introduction to machine learning*. 1st edition. Springer.com. https://doi.org/10.1007/978-3-030-15729-6_1

*Rosenberg, N. (1979). Technological Interdependence in the American Economy. *Technology and Culture, 20*(1), 25-50. doi:10.2307/3103110

Ruehle, C.R., (2019). Investigating Ethical Considerations of Machine Learning Adoptions Within Organizations: A Systematic Literature Review. *Proceedings of the Ninth International Conference on Engaged Management Scholarship* (2019). https://doi.org/10.2139/ssrn.3454120

*Select Committee on Artificial Intelligence. (2019). *The National Artificial Intelligence Research and Development Strategic Plan – 2019 Update*. Retrieved from https://www.whitehouse.gov/wp-content/uploads/2019/06/National-AI-Research-and-Development-Strategic-Plan-2019-Update-June-2019.pdf

*Spitzer, D. (2019). Industry Report 45411a: E-Commerce & online auctions in the US. *IBIS World*.

*Stanford University launches the Institute for Human-Centered Artificial Intelligence. (2019). In *Stanford News*. Retrieved from news.stanford.edu/2019/03/18/Stanford_university-launches_human-centered-ai/

*State Council of the People's Republic of China. (2017). Artificial intelligence development plan. *In Forbes*. Retrieved from https://www.forbes.com/sites/cognitiveworld/2020/01/14/china-artificial-intelligence-superpower/#4258e332f053

*Terdiman, D. (2018). How AI is helping Amazon to become a trillion dollar company. In *Fast Company*. Retrieved from https://www.fastcompany.com/90246028/how-ai-is-helping-amazon-become-a-trillion-dollar-company

*The White House. (2020). *American Artificial Intelligence initiative: Year one annual report*. Retrieved from https://www.whitehouse.gov/wp-content/uploads/2020/02/American-AI-Initiative-One-Year-Annual-Report.pdf

*Thomas, R. (2019). *The AI ladder: Demystifying AI Challenges*. Retrieved from https://www.oreilly.com/online-learning/report/The-AI-Ladder.pdf

*Tucker, C. (2019). Privacy, algorithms, and artificial intelligence. In *The Economics of Artificial Intelligence: An Agenda*. NBER. Retrieved from https://www.nber.org/chapters/c14011

*"What is Artificial Intelligence?" Amazon AI. Retrieved from https://aws.amazon.com/machine-learning/what-is-ai/

*"Worldwide Spending on Artificial Intelligence Systems Will Be Nearly $98 Billion in 2023, According to the New IDC Spending Guide." *Investment Weekly News*. 21 September, 2019: 546. *Business Insights: Essentials*. Web. 9, June, 2020.

## Review

This article was accepted under the ***constructive peer review*** option. For futher details, see the descriptions at:

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