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## Information Technology Firms: Creating Value through Digital Disruption

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### Abstract:

Information technology (IT) firms compose the majority of the most highly valued corporations in the world based on market capitalization. To date, only Apple and Amazon—both IT companies—have reached or nearly reached a USD trillion-dollar market capitalization. The value that IT provides speaks to how managers exploit disruptive technologies to create value in both IT and non-IT firms. A panel held at the 2018 Americas Conference on Information Systems (AMCIS) discussed various ways in firms build value around IT through successful management. This paper reports on the panel discussion from a variety of perspectives, which include practitioner and researcher worldviews. This panel report also provides a sample frame that researchers can use in quantitative research involving IT firms and advocates for increased research to understand the wide range of strategies IT firms use to create value.

**Keywords:** IT Firms, Digital Disruption Strategies, Disruptive Digital Technologies.

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# 1 Introduction: The Emerging Prominence of Information Technology Firms

Information technology (IT) firms create value, either through direct sales or user interactions, by using digital disruption. In fact, IT firms are frequently created to disrupt industries (Greenwood & Gopal, 2015), and the enormous recent market valuations that prominent corporations such as Apple, Amazon, Microsoft, and Facebook have attained often motivate such endeavors. IT firms operate in digital-only competitive spaces in which they need to initiate digital disruptions to maintain performance and a public image of innovativeness (Dery, Sebastian, & van der Meulen, 2017). Digital business models have and continue to transform all sectors of the economy. Indeed, digital disruptions have significantly changed information-based products such as newspapers (Karimi & Walter, 2015), media (Gottfried, 2016) and advertising (Wilmot, 2017), they have also changed capital-intense sectors such as hospitality (Kane, 2017), automobile manufacturing (Mocker & Fonstad, 2017), and agriculture (Schumpeter, 2014). For this reason, strategy makers in all firms should address digital disruption (Vermeulen, 2017).

Researchers and practitioners widely accept that technology-based firms must innovate to survive and prosper (Banker, Wattal & Plehn-Dujowich, 2011). Unfortunately, researchers have conducted little research on strategies that focus on digital disruption. For example, perhaps the most prominent digital disruption strategy for IT firms concerns investing in research and development (i.e., R&D) (Jha & Bose, 2016). IT firms also commonly manifest market value during merger and acquisition events (Chang & Cho, 2017). Other strategies for digital disruption include leveraging internal IT firm competence by offering operations for outsourcing (Wickramasinghe & Jayaweera, 2011) or using data analytics (Chen, Preston, & Swink, 2015).

## 1.1 Theoretical Perspective

The 2018 Americas Conference on Information Systems (AMCIS) adopted the theme “digital disruption”, which informed the theoretical perspective of the panel and which we see as having roots in the broader theory of disruptive innovation (Bower & Christensen, 1995). Disruptive innovation theory acknowledges that smaller companies with fewer resources can overtake larger incumbents by serving the less profitable customers that large companies ignore (Christensen, Bohmer, & Kenagy, 2000). Disruption occurs when the mainstream (or more profitable) customers begin to adopt the entering company’s products or services. Entrants achieve such disruption by introducing new product functionality or services and moving upstream in terms of customer sophistication (Christensen, Raynor, & McDonald, 2015). Of course, large companies also often create disruption through innovation, as Alphabet, Alibaba, and Facebook have shown (Bughin & Van Zeebroeck, 2017). Further, as IBM has shown, firms emphasizing disruptive innovation to create value need not be young (Haigh, 2018).

More specifically, disruptive digital innovation constitutes disruptive innovation that pertains to information technology-based products and services. As such, any firm that develops or uses IT in innovative ways may engage in digital disruption. However, we view IT firms (i.e., firms that provide exclusively digital products and services) as critical intellectual sources for understanding digital disruptive innovation practice and theory. The digital component also makes IT firms critical sources our discipline may use to advance innovation management research (Yoo, 2013).

According to disruptive innovation theory, a firm can sustain digital disruption only if business model innovation accompanies it (Teece, 2010). Therefore, this discussion has relevance to research at the organizational level and particularly in regards to how managers exploit IT to attain a competitive advantage for their firms. For decades, scholars in various disciplines have proposed frameworks that allude to how digital disruption influences organizational users (see Lucas, Clowes, & Kaplan, 1974), processes (e.g., Porter, 1985), and firm value (e.g., Melville, Kraemer, Gurbaxani, 2004). Change-oriented organizational theories such as information processing, organizational learning, punctuated equilibrium, and dynamic capabilities have explicitly addressed the dynamic relationship between technology and organizations. Researchers now also widely accept that digital technologies both enable and constrain organizations as they adapt in their changing environment (Orlikowski, 1992). Thus, classic IS literature suggests in various ways that digital technology represents an important catalyst for disruptive innovation that contemporary organizations may exploit.

Because the information technology management concept has played such an important role in these frameworks (and others) and in sustaining organizational value, we focus our attention on companies with

recognized expertise on the topic. Arguably, stakeholders in IT firms manage information technology more proficiently than anyone else in society. Furthermore, the IT firms have a long evidentiary track record that spans back several decades (see commercial data sources such as Compustat, CRSP, Bloomberg Terminals, etc.). Specifically, we view competent information technology management as integral for IT firms to not only successfully operate but also exist. Thus, focusing on IT firms may be an invaluable resource for advancing our knowledge about IT management practice. Indeed, digital products have more intangible and tenuous valuable propositions than non-digital products (Teece & Linden, 2017), and, therefore, the topic of IT firms has never been more important.

## 1.2 The Panel

At the 2018 AMCIS, a panel presented a discussion on digital disruption in IT firms. The panel articulated practitioner strategies for creating value in small to large IT firms, provided insight as to how firms can create value from an emerging disruptive technology, and set forth a research agenda. The panel also discussed disruptive technologies such as mobile payment platforms (Kazan, Tan, Lim, Sørensen, & Damsgaard, 2018) and automated machine learning (AutoML) as sources of unique business models for companies that want to capitalize on these intellectual capabilities.

## 1.3 Organization

In this paper, we present the panelists' diverse views in the order in which the panelists offered them. In Section 2, Gary Templeton introduces the topic and shares his rationale to advocate for more research on IT firms. In Section 3, Aaron French, an acknowledged expert on social networking sites who created the social networking site and app Sociable, discusses opportunities for digital disruption for IT start-ups. In Section 4, Chief Financial Officer Ben Pace explains how he evaluates technology investments for C Spire, a wireless telecommunications company. In Section 5, Kai Larsen, who has written a book on AutoML, shares how firms can leverage advanced technologies to attain value. In Section 6, Stacie Petter identifies ideas for developing research agendas for scholars interested in studying the science of IT firms. Finally, in Section 7, Gary Templeton concludes the paper.

# 2 A Sample Frame Ripe for IS Research (Templeton)

## 2.1 Defining IT Firms

IT firms are real-world phenomena that will remain significantly influential in practice for many years to come, and, consequently, the study of IT firms is a legitimate research topic. IT firms create value through a wide range of strategies, such as through services or hardware. For our purposes, we do not exclude firms whether they use computer-based technology to improve firm processes (Besson & Rowe, 2012) or to do entirely new things (Yoo, 2013; Yoo, Henfridsson, & Lyytinen, 2010). If a company operates in a digital space and/or focuses on creating value through computer-based technology, we consider it an IT firm. We know about a lot of these substantial companies from news reports. IT firms, such as Amazon, Facebook, and Microsoft, create a great deal of value not only for their shareholders but also individuals, groups, organizations, and society. Many know these companies for their extraordinary market valuations and how they help their customers co-create value.

## 2.2 A Sample Frame

Table 1 depicts a sample frame of IT firms from Standard and Poor's Compustat quarterly archives (1961-2018)<sup>1</sup> that I organized by Standard Industrialized Code (SIC). The United States Securities and Exchange Commission uses these codes to classify corporations by industry. I organized the 22 industries into four categories: hardware, telecommunications, trades, and services. While one could categorize the firms in various ways, one can clearly see that the categories describe firms from similar industries. For example, companies with a SIC in the 3000s deal with hardware, companies with a SIC in the 4000s deal with telecommunication, companies with a SIC in the 5000s deal with trade, and companies with a SIC in the 7000s deal with services. The stated sample sizes reveal opportunities to achieve adequate statistical power when applying statistical procedures to these subsamples. This sample frame contains 4,366 unique companies over the 58-year period.

**Table 1. A Sample Frame of IT Firms based on their SIC**

SIC	Industry title	Category	n	%
3570	Computer & office equipment	Hardware	1236	0.7
3571	Electronic computers		3771	2.1
3572	Computer storage devices		4033	2.2
3575	Computer terminals		1495	0.8
3576	Computer communications equipment		6640	3.7
3577	Computer peripheral equipment, NEC		6813	3.8
3661	Telephone & telegraph apparatus		8351	4.6
3663	Radio & TV broadcasting & communications equipment		11081	6.1
3669	Communications equipment, NEC		4126	2.3
4812	Radiotelephone communications		Telecom	7581
4813	Telephone communications (no radiotelephone)	15914		8.8
4822	Telegraph & other message communications	387		0.2
4899	Communications services, NEC	7174		4.0
5045	Wholesale—computers & peripheral equipment & software	Trade	4045	2.2
5734	Retail—computer & computer software stores		521	0.3
7370	Services—computer programming, data processing, etc.	Services	30145	16.7
7371	Services—computer programming services		2196	1.2
7372	Services—prepackaged software		41632	23.0
7373	Services—computer integrated systems design		16669	9.2
7374	Services—computer processing & data preparation		5903	3.3
7377	Services—computer rental & leasing		478	0.3
7385	Services—telephone interconnect systems		613	0.3

## 2.3 Significance

The popular press is replete with stories on fascinating technologies that instantiate value for IT firms such as Apple and Amazon, which have had market capitalizations at or near US\$1 trillion. Amazon has a widely recognized ability to co-create value with other firms. If Amazon begins to sell a new product or enter a new marketplace, suppliers and competitors will subsequently receive media attention. The previously inconceivable valuations that IT firms have attained demonstrate their ability to reach unprecedented market valuations. Table 1 shows that, by early October, 2018, five of the top six companies in the world in terms of market capitalization were IT firms. This evidence suggests that IT firms have significant influence in the global economy.

<sup>1</sup> I collected all data for this project using Wharton Research Data Services (WRDS), which included Compustat. One can access WRDS at <https://wrds-web.wharton.upenn.edu/wrds/>

**Table 1. Largest Companies in the World by Market Capitalization (SymbolSurfing, 2018)**

Rank	Company (ticker)	Market capitalization (in US\$ billions)
1	Apple (AAPL)	1,090
2	Amazon (AMZN)	982
3	Microsoft (MSFT)	877
4	Alphabet (GOOGL)	838
5	Berkshire Hathaway (BRK.B)	537
6	Facebook (FB)	483
7	JPMorgan Chase (JPM)	379
8	Exxon Mobil (XOM)	364
9	Visa (V)	347
10	Bank of America (BAC)	299

## 2.4 Heterogeneity of Value Creation

In disparate disciplines, the literature describes unique ways in which IT firms create value. For example, the online company salesforce.com uses the cloud as a backbone for providing a wide range of support for the sales function. Alphabet represents another example: it has created value through 220 mergers and/or acquisitions since 2001<sup>2</sup> in addition to its core products. The IT firm SAS has offers data-analytics tools and consulting as its distinct strategy. Apple, a company known for creating value through R&D investments with products that include the iPod, iPad, iPhone, iTunes, iPad Mini, Apple TV, and more, demonstrates yet another important strategy that has emerged among IT firms.

In comparing two prominent IT firms, Nintendo and EA Sports, we found a level of strategic heterogeneity that some may find surprising. These video gaming companies have an international brand profile, yet few academics have studied them. We searched for Nintendo among peer-reviewed business journals and found only two papers about the company's economic aspects. Further, journals from outside the information technology area published them: the *Journal of Business Forecasting* and the *Journal of Business Strategy*. We performed a similar search for EA Sports and found no papers on the company's economic aspects. While many IS scholars may assume that these two firms resemble each other, they actually significantly differ and create value in different ways. Nintendo creates about 95 percent of its revenue through hardware sales, while EA Sports generates 100 percent of its revenue through software sales. Thus, one is a hardware company and the other is a software company. This example shows that IT firms are unique, interesting, and ripe for research. We can say the same about Twitter and Facebook. While these companies are both social networking sites and invest in R&D to derive value from the user data they store, they also create value in different ways.

Finally, IS researchers can attain value in studying and seeking to improve IT firm performance even though some firms have already attained incredibly wealth. Thousands of IT firms are family businesses, start-ups, or small-to-medium sized firms that offer many opportunities for insight and study.

## 2.5 A Research Void

For the above reasons, I believe IT firms represent a significant topic that researchers should investigate. IS researchers acknowledge that digital and information technological innovation occurs across a wide range of industry sectors. However, researchers should also acknowledge the special role that IT firms can play in studying the nature of IT innovation management. IT firms must master digital business strategy to sustain themselves (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). Because researchers have conducted so little research to capitalize on this specialized knowledge, I believe that many unexplored topics that one would consider low-hanging fruit remain.

<sup>2</sup> One can find a running list of Alphabet mergers and acquisitions since 2001 from [https://en.wikipedia.org/wiki/List\\_of\\_mergers\\_and\\_acquisitions\\_by\\_Alphabet](https://en.wikipedia.org/wiki/List_of_mergers_and_acquisitions_by_Alphabet)

## 3 Using Disruptive Technologies to Create Value at Sociabile (French)

### 3.1 Industry Context

Social networking, along with many other technologies, has revolutionized and disrupted all industries alike in the 21st century. Social networking has affected the way companies present themselves, advertise, and communicate with their customers. Social networks such as Facebook and Instagram reach billions of users, which creates both a challenge for companies to manage and an opportunity to expand their reach by narrowly targeting customers based on highly specific demographic, geographic, and sociographic criteria. When evaluating the most visited websites, YouTube, Facebook, and Twitter rank second, third, and tenth, respectively. The smartphone revolution has further fueled social networking usage: indeed, the top nine most downloaded apps are all social networking apps (four from China and the other five from the United States). These technologies have disrupted the advertising landscape as well. Whereas TV, radio, and print constituted the primary sources of reach in the 1990s, one can now reach users via myriad channels that span hundreds of apps and websites across dozens of platforms. While businesses have evolved from sending mass broadcasts to targeting specific customers, the latter method involves challenges and/or ethical concerns. The growth of social networks and increased amount of information readily available has also brought privacy and ethical concerns to the forefront. Digital dossiers that contain user-provided and third-party data have revolutionized the way in which companies track and target individuals.

### 3.2 Means to Create and Capture Value

Due to the power of such data, the primary revenue model for most social networks has revolved around advertising and the connection of businesses to customers. While this highly profitable approach has resulted in inflated stock prices for many social networking ventures, recent events have disrupted the social networking market and shed doubt on this business model's sustainability. In 2009, a popular local social networking company called LouisvilleMojo based out of Louisville, Kentucky, closed the doors to its social networking site due to a significant reduction in advertisement partners due to the recession. Proctor & Gamble cut US\$200 million in digital advertising in response to the questionable value of social platforms as an advertising medium. More recently, in 2018, the Cambridge Analytica scandal in which millions of Facebook users had their personal data used for political purposes without their consent heightened privacy concerns. The controversy stemming from this revelation led several companies such as Mozilla, Sono, Pep Boys, SpaceX, Tesla, Commerzbank, and others to pull their ads from Facebook.

### 3.3 Firm Role in Disruption

While social networking has become a technology-disrupting business, the industry may itself face disruption due to new technology and a changing business environment. I am developing a new social networking company called Sociabile (social + mobile). It will focus on alternative revenue models that do not rely on user data. Through increased focus on digital products and alternative revenue strategies, Sociabile seeks new ways to add value to the social networking industry. With new social networking companies focusing on privacy and the protection of user data, the market will likely disrupt existing social networking platforms and put pressure on them to change. Other technologies primed to disrupt social networking include 5G networks, blockchain technologies, and virtual reality. The combination of these three technologies has already resulted in revolutionary advancements. For example, one company, called Decentraland, has created a blockchain-technology powered virtual world where social networking takes place using virtual reality. With 5G technology on the horizon, virtual reality will become mobile with ubiquitous access through mobile devices. Blockchain technology will allow users to control their own information rather than third-party companies who store user data on their servers. This connectivity will dramatically shift how individuals and companies will store and use data while also disrupting how people will connect to each other and how businesses will reach them. These technologies will directly impact all industries with additional indirect impacts due to the changing landscape of social networking, but the opportunities that they present far outweigh the disruption they will cause.

## 4 Using Disruptive Technologies to Co-create Value at C Spire (Pace)

### 4.1 Industry Context

C Spire, a diversified technology provider based in Ridgeland, Mississippi, began over 50 years ago as a local telephone company. In 1988, the owners began participating in the cellular trend by buying wireless licenses and began the company known today as C Spire. The company considers itself a diversified technology company because it provides solutions to its customers using its wireless and fiber infrastructure and also delivers IT and cloud solutions to businesses. The company is innovative and has experienced growth throughout its history. Today, it is the sixth largest wireless carrier in North America and the largest privately owned wireless carrier in the United States. The company has just under one million wireless subscribers. The company began building fiber in 2000 and has since deployed about 8,000 miles (approximately 12,874k kilometers) of fiber (primarily in Mississippi).

### 4.2 Means to Create and Capture Value

In providing fiber services, C Spire enables its commercial customers to achieve success by providing significant bandwidth advantages. C Spire as a name takes its inspiration from the phrase “customer inspired”, which also alludes to the company’s mission to explore what services and products their customers need to be successful in business and life. The company pursues an extreme approach to customer experience: it focuses on ensuring the customer never needs to call customer support. It uses social media interactions with customers as one way to minimize customer support contact. Customers interact with blogs and other content rather than having to track down a company representative. If a customer does call, C Spire offers interactions with a live person who will try to solve the problem as quickly as possible. However, the best customer service occurs when no problems arise—a function of innovative product design.

### 4.3 Firm Role in Disruption

The company innovates using disruptive technologies in a variety of ways and has learned valuable lessons. For example, in the wireless arena, C Spire survives by competing with industry leaders, such as AT&T and Verizon. That is, C Spire needs to innovate consistently with the industry leaders; however, due to C Spire’s size, the company cannot drive technology change like larger companies. Therefore, C Spire uses a fast follower strategy to remain successful and grow its business.

The company has also dispelled notions that the Mississippi economy has scarcely advanced. C Spire has consulted farmers in Mississippi who seek to use technology to increase productivity and, consequently, profitability. For instance, on innovative farms, computers drive most tractors, which means the farms need access to a reliable wireless network and infrastructure, and C Spire supports these needs. C Spire has also helped Mississippi catfish farmers monitor conditions in their ponds to enable them to increase yields.

C Spire has had some innovation failures due to being too early or not large enough. For instance, the company tried selling advertising on different platforms but could not find enough users or customers to pay for the services. From this failure, the company derived its current target marketing strategies. The company aspires to target groups that it cannot target via television advertising but can via digital media. Management recognizes that the company must focus its technology to target a market more effectively.

C Spire has product designers that drive innovation. The chief financial officer evaluates technology proposals using analytical and subjective criteria. The company uses Excel heavily to build pro forma analyses, which ensures that it uses the company’s limited resources in the best way. When these models show dire prospects, the company drops the project. The company learns from this process by tracking the success of capital budgeting processes. C Spire focuses on making products sticky (i.e., on ensuring customers want to remain loyal). Among other critical methods, C Spire has grown as a company over the last several decades due to its intense customer focus, which has resulted in highly satisfied customers and a low churn rate.



## 5 The Wealth Creating Potential of Automated Machine Learning (Larsen)

### 5.1 Academic-industry Relationships

Engagement in research on IT firms from a behavioral or a non-economic perspective often requires that one has access to firms to interview or survey its employees. Unfortunately, while not all IS researchers concede this point, the IS discipline has over time moved away from doing research relevant to practice (Nunamaker, Briggs, Derrick, & Schwabe, 2015; Lyytinen, 1999; Applegate, 1999). Often, academic reward systems do not encourage practically relevant research; therefore, as IS researchers, we must sometimes find other ways to engage with industry as part of our teaching or service loads. We have seen powerful examples of how IS researchers have engaged practitioners in theoretical research, presumably through their teaching leadership (e.g., Venkatesh, Morris, Davis, & Davis, 2003). IS faculty can involve themselves in teaching MBA and executive MBA classes to create these relationships and communicate the value of IS research to current and future top leaders. Well-known approaches to inform research that practitioners find relevant include conducting research with practitioner value and teaching practitioners currently in or soon to be in leadership roles.

IS programs exist across cities around the world, and those cities all differ in terms of the characteristics they offer. Some may have strong government presence, whereas others may have one or more major companies. Boulder, CO, is a hotbed for startups, which provides both advantages and drawbacks. The startup companies in Boulder tend to focus on technology, which an IS researcher may see as an advantage. However, technology-focused startups tend to need and focus on hiring computer scientists, physicists, and math PhDs for analytics roles. How, then, may an IS researcher add the value required to open doors into this community?

A vibrant startup community needs knowledge transfer. Universities specialize in creating and transferring knowledge, and, for a select few faculty, their knowledge creation skills will align with one or a few startups in the area and both parties will acknowledge this fit. More likely, an IS professor's knowledge transfer skills will apply, which means identifying structural problems in the knowledge transfer between and to startups, evaluating the kinds of skills and new technologies that the startup needs, and identifying experts to fill those gaps. I have used two strategies to bring about that union: 1) a Meetup group (which has grown to over 1,000 participants over time) and 2) a business analytics conference that served 250 attendees in its second year. While the first strategy requires relatively little time, the second requires significantly more time that one should avoid unless three or more faculty can share the burden. One should bring one's industry friends and collaborators into either approach. Over time, these strategies have the potential to create strong academic-industry relationships, one example of which I describe below.

### 5.2 The Case of the Automated Machine-learning Company

Because my research focuses on machine learning in the social and behavioral sciences context, I have been able to fill my teaching load with machine-learning (ML) classes over time. Therefore, I have engaged my classes in Kaggle ML competitions and brought top practitioners in the ML arena into the classroom, such as the chief analytics officer (CAO) of a local startup. I have also focused my service load in this area. One way I have done so involved creating a business analytics Meetup group branded with the university and college name and working with experts in the local environment to find speakers, such as relevant colleagues. Students in my classes often received extra credit to attend this and other Meetup events.

To serve research, teaching, and service needs, I examined the leaderboard for Kaggle ML experts, reached out to the person leading the list (from nearly 500,000 participants), and invited him to Boulder. I scheduled him for a Meetup presentation and appearances in undergraduate and postgraduate analytics classes. Right before he arrived, he had accepted a job with a ML company called DataRobot that focused on automated ML. When I reached out to my guest lecturer, the CAO he shared a story in which he brought DataRobot in to compete with his team of 30 machine learning experts, some of whom had decades of domain expertise. As he told the story, DataRobot beat his whole team right out of the box.

When I received access to the DataRobot tool, I had begun with Chih How Bong to extend an earlier paper that we wrote (Larsen & Bong, 2016) in which we solved a problem that had remained unsolved

since Thorndike (1904) stated it. Applying a common machine-learning measure, we obtained a  $F_1$ -score of 0.15 in that paper. A PhD student had then spent about three months to improve that numbers and achieved an  $F_1$ -score of .30. After we gained access to DataRobot, it took the tool 30 minutes to improve that score to 0.60. When we examined those results, we found that we could blend our knowledge with DataRobot's knowledge to improve the  $F_1$ -score further still.

The ML process often requires six months for a team to go from thinking about an idea to implementing a solution. The thought that a company could automate the data cleaning and preparation, the algorithm comparison and selection, and the hyperparameter turning and could create appealing visuals in as little as 30 minutes while providing accurate models that could beat out teams of experts made me cautiously optimistic about the company's uniqueness. I reached out to it in 2014 during a Meetup presentation, though I did not receive a response. I tried again two years later and got in touch with their new director of education. As a result, I attended two training sessions to better understand the company's software and committed myself to teach the tool in my class rather than a more traditional ML tool.

I often teach automated ML workshops because I believe automated ML tools represent a perfect tool for IS students and because one can integrate them into introduction to IS classes in a meaningful manner. In half a semester, one can introduce students to machine learning, teach them how to evaluate models, and help them discover their use in business. To cement this process, I further worked with a previous employee of DataRobot to write and publish a book on automated ML (Larsen & Becker, 2019).

## 6 A Research Agenda on IT Firms (Petter)

### 6.1 Where to Begin

IT firms have many forms that range from traditional organizations such as C Spire, to technology start-ups such as Sociable. Regardless of their form, IT firms must develop, implement, and use technologies such as machine learning in a dynamic market to create opportunities for digital disruption.

Academics interested in researching digital disruption among IT firms have multiple paths to follow. Some researchers purposefully choose to study firms in the IT sector because IT firms have qualities that pertain to the research area they have an interest in. Other researchers may not as purposefully seek out IT firms to study. Researchers may choose an organization opportunistically based on their ability to gain access to them. For researchers who have not as purposefully studied IT firms but who recognize the potential insights that they may gain from focusing more specifically on IT firms in research, they can begin studying IT firms in several ways.

However, I first note that, in studying IT firms, one must define "IT firm" in the context of one's research question(s) or objective(s). As we explain in Section 2.1, we view IT firms as firms that operate in a digital space and/or focus on creating value through computer-based technology. Some firms fit this definition well, such as Dell, Microsoft, Alphabet, or Cisco. Other firms operate in a digital space but may actually operate in industries other than the IT sector. According to the way we define IT firms, Amazon represents an IT firm due to its digital-based approach as a reseller. More recently, the growth in revenue from Amazon Web Services also increases Amazon's standing as an IT firm. However, according to its SIC (5961: catalog and mail-order houses), Amazon represents a "retail trade" business. Netflix relies heavily on technology as it provides entertainment content to its subscribers. According to its SIC (7374: computer processing and data preparation), Netflix represents an "information" business. Based on Netflix's SIC, we would consider it an IT firm. However, many firms, and particularly IT firms, are complex. As Netflix has started to create entertainment content, one could argue that it now belongs to a different industry sector, such as one related more to entertainment services. Thus, researchers who study IT firms should recognize that IT firms often have a blurry classification. However, researchers should not feel discouraged from studying IT firms due to the challenge in defining IT firms due to their changing nature; rather, the challenge demonstrates that we can still learn much about digital disruption from IT firms.

Researchers who want to more purposefully study IT firms should also consider what worthy topics they could study. Researchers should begin in areas in which they already have expertise and knowledge. Thus, if they have conducted organizational-level research, opportunities to study the same phenomenon in only IT firms or to perform comparisons between IT firms and non-IT firms may exist. Researchers could also conduct research at the group or individual levels in an IT firm context to see whether organizational- or industry-level differences in IT firms affect group- or individual-level phenomenon. To find interesting research questions, researchers can also consider the differences that may exist between

IT firms and non-IT firms in their existing research. Doing so may yield ideas for research that can offer new insights in their research area, IT firms, and/or digital disruption. Indeed, depending on their nature, existing theories may or may not extend to IT firms. Further, studying IT firms may help researchers to create new theory or extend or define the boundaries in existing theories.

## 6.2 Examples of Transferring Existing Research to the IT Firm Context

In this section, I provide example research questions that one could examine in the context of IT firms. While not exhaustive, the list offers some inspiration on how one may develop research agendas related to IT firms.

First, one could conduct research on IT project management in IT firms. Since IT firms often reside at the epicenter of digital disruption, the technology that they develop and use in creative ways creates digital disruption. What software-development and project-management methods do IT firms use for these types of projects? IT projects notoriously run over time, run over budget, and/or fail to meet the required specifications (Standish Group, 2016). IT firms that take risks to create digital disruption may accept failures to meet budget requirements to some degree; however, IT projects still need to meet time constraints and functionality needs. Can IT firms offer any insights that can serve as a benchmark for IT projects in other industries? IT firms that manage large numbers of IT projects for both internal needs and external stakeholders also tend to perform IT project management on a much larger scale than many non-IT firms. What lessons can we learn about project selection, project risk management, software-development methods, and project-management best practices that also apply to other industries? How does the push for newer, better, faster in IT firms create strains on other demands, such as cybersecurity, testing, and budgets? Researchers can examine a multitude of questions in the IT project-management context in IT firms.

Workforce development research in information systems considers issues about recruiting, retaining, and developing IT employees. Many senior executives struggle to find the talent that their firms need (Kappelman et al., 2017), and IT firms represent no exception. When trying to constantly adjust to a dynamic environment, IT firms face particular difficulty in finding, recruiting, retaining, and developing talent for new roles. The constant quest for digital disruption among many IT firms creates new challenges in workforce development. Other interesting topics for research concern IT firms' unique organizational culture. While many IT departments have their own subculture distinct from their enterprise, IT firms often have different organizational cultures than non-IT firms. These differences in organizational culture among IT firms and non-IT firms can affect the process of recruiting, hiring, developing, and retaining employees. Many IT firms, even large ones, operate in a start-up like environment that embrace creativity and collaboration and often offer "perks" for workers such as free lunches or other conveniences. However, some IT firms have struggled with ensuring that they have diverse and inclusive workplaces. Microsoft has received negative press for their patriarchal environment that struggles to recruit and retain women (Day, 2018). Many companies in Silicon Valley, such as Uber and Google as two notable examples, have consistently struggled with employing a diverse workforce and creating an inclusive culture for employees from different backgrounds (Steinmetz, 2017).

Many IT firms have become well known for their intrapreneurial practices in which the firm embraces entrepreneurial practices. Some IT firms give their employees time during their workweek to experiment with new ideas or develop new projects. Before Google became Alphabet, the company prided itself on various skunkworks projects and even created a corporate structure to support them called Google X. Many people know that Google X has produced a self-driving car, but it has also explored other wide-ranging technology projects, such as using kites to supply energy. Many IT firms have large-scale groups that seek out innovation, and other IT firms may provide smaller opportunities for all employees to develop side projects and innovation. This encouragement to foster innovation and creativity provides the foundation of many projects that end up disrupting industries. Studying how IT firms foster intrapreneurship or how firms identify where to devote resources based on the potential promise of various projects could offer interesting insights on issues that researchers in the IS discipline study that relate to creativity, value creation, and knowledge transfer and application.

Table 3 summarizes ideas for possible research topics that may vary when studied in a non-IT firm context versus an IT firm context. Researchers interested in IT firms and/or digital disruption may find these examples useful in developing research agendas in other study areas.

**Table 3. A Comparison of Research Topics in Non-IT Firms and IT Firms**

Topic	Non-IT firm-based research topic	IT firm-based research topic
IT project management	Methods used for IT project management and software development (in general).	Methods used for IT project management and software development to create innovative IT solutions developed for digital disruption.
	Mitigating risks affecting the ability for an IT project to be on time, on budget, and meet requirements.	Mitigating risks affecting the ability for an IT project to be on time, on budget, and meet requirements when the project creates disruption in an industry.
	Identifying critical success factors for IT projects in firms that often have limited numbers of IT projects.	Developing benchmarks and best practices for IT project management in firms that often pursue a large number of IT projects to transfer insights to other industries.
	Tensions between the desire for cost-effective product development (i.e., budget and functionality) and the need for testing, time constraints, and other needs in the firm.	Tensions between the desire for rapid and creative product development (i.e., time and functionality) and the need for testing, cybersecurity and other needs within the firm.
Workforce development	Challenges associated with finding, recruiting, retaining, and developing talent in IT departments.	Challenges associated with finding, recruiting, retaining, and developing talent for organizations in an ever-changing, hypercompetitive environment.
	Organizational culture of IT firms' impact on diversity, inclusion, and exclusion in IT departments.	Organizational culture of IT firms' impact on diversity, inclusion, and exclusion within the workforce across the organization.
Intrapreneurship	Encouraging creativity in the workplace and/or IT departments with technology as a tool to support creativity and innovation.	Creating a culture of creativity and intrapreneurship to develop innovative solutions with information technology.
	Identifying and selecting projects for further development to promote efficiency, effectiveness, or, as appropriate, disruption.	Identifying and selecting projects for further development to promote digital disruption of industries or firms.
	Knowledge transfer and application in reuse contexts OR knowledge transfer and application in limited innovation contexts.	Knowledge transfer and application in organizational settings that encourage innovation.

## 7 Conclusion (Templeton)

In this panel, we discussed how IT firms are unique and compete in distinctly different ways. For example, Sociabile focuses on creating value in uniquely different ways compared to Facebook. C Spire emphasizes co-creating value with loyal customers. These examples show that IT firms uniquely pursue, and take advantage of, digital disruption. A less innovative company may avoid disruption, whereas IT firms often seek to capitalize on such opportunities. It should be exciting and interesting to IS academics that IT firms differ not only from one another but also from non-IT firms.

Academic disciplines routinely study subjects as their research focus. Many journals focus on nurses, entrepreneurial and family business firms, and financial institutions. At present, no journals focus on information technology firms despite their enormous market valuations and influence in the contemporary economy.

Databases contained in the Wharton Research Data Service (WRDS) and Bloomberg Terminals contain a wealth of evidence on IT firms. For example, Compustat is a well-known database in WRDS. Whereas thousands of published scholarly papers have used Compustat as a data source, barely any have focused on IT firms. We searched the 11 highly ranked IS journals<sup>3</sup> and found only six papers on IT firms among 49,982 papers (.0001%). Expanding the search to practically any IS journal, we found only 16 papers on

<sup>3</sup> For this search, we designated the top IS journals to be: *Decision Support Systems*, *European Journal of Information Systems*, *Information & Management*, *Information Systems Journal*, *Information Systems Research*, *Journal of Information Systems*, *Journal of Information Technology*, *Journal of Management Information Systems*, *Journal of Strategic Information Systems*, *Journal of the Association for Information Systems*, and *MIS Quarterly*.

IT firms among 3,306,195 papers (.000005%). No published paper has used a substantial part of the sample frame that we show in Table 1.

Given the wealth creation potential that we know these firms can create, the available data, and the lack of existing research on the topic, we find the current situation ripe for research using this sample frame. Indeed, the vast white space on IT firms instigated the creation of this panel. For the above reasons, we call for greater research on this topic.

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**Ben Pace** is the Chief Financial Officer of C-Spire, headquartered in Ridgeland, MS. He brings extensive and broad practical experiences evaluating disruptive technologies to the panel. He evaluates information technology as part of a formal capital budgeting process for its impact on shareholder wealth in addition to customer satisfaction. He also studies the value propositions of information technologies his function uses to interact with other organizational stakeholders. Finally, C-Spire is the largest private wireless service provider (and sixth overall) in the United States (TELCOMA, 2015). The company is known as an innovation leader by using cloud-based analytics, metadata tagging, video-to-data (V2D), and other technologies in its 30-year history to create firm value.

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