The Effects of the COVID-19 Pandemic on Mergers and Acquisitions, Goodwill, and Goodwill Impairment in the Technology Industry

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The Effects of the COVID-19 Pandemic on Mergers and Acquisitions, Goodwill, and Goodwill Impairment in the Technology Industry

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University of Connecticut School of Business
Department of Accounting
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The Effects of the COVID-19 Pandemic on Mergers and Acquisitions, Goodwill, and Goodwill Impairment in the Technology Industry

Abstract:

I explore associations between COVID-19 and changes in mergers and acquisitions (M&As), goodwill valuation, and goodwill impairments in the technology industry. Prior literature explores the pandemic’s effects on the dynamics of M&As, goodwill, and goodwill impairment, but are not specific to the pandemic’s impact on the technology industry. This study references prior literature to provide conceptual support as well as research findings to examine the overall changes in technology companies of interest in this study. First, I find that M&A activity before COVID-19 and during COVID-19 was not substantially different when averaged. Second, I find that there was a significant decrease in companies reporting goodwill, but the valuation of goodwill remained similar. Finally, I find that companies reporting goodwill impairment significantly declined in 2021, but the magnitude of goodwill impairment increased drastically in 2022. Overall, this study provides important insights into the effects of macroeconomic shocks and how the technology industry's stability might be affected by future pandemics and market uncertainty.
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1. Introduction

I explore if there are associated effects from COVID-19 on; the number of mergers and acquisitions (M&As), the valuation of goodwill as a proportion of total purchase price, and the valuation of pretax goodwill impairment. Specifically, I examine M&As, goodwill, and pretax goodwill impairment in the United States (US) for publicly-listed US technology (tech) companies on their consolidated financial statements from 2017 to 2019 (“Pre-COVID”) and 2020 to 2022 (“Current-COVID”). Prior literature examines characteristics of the M&A market and goodwill accounting during the pandemic but does not specifically focus on the tech industry which includes many high-profile and highly valued companies that countless investors are interested in such as Microsoft Corporation (“Microsoft”), Alphabet Inc. (“Alphabet”) which is the parent company of Google LLC (“Google”), Intel Corporation (“Intel”), and Apple Inc. (“Apple”).

The scarcity of existing literature can be attributed to the recency of the pandemic, its ongoing effects, and the lingering responses from the US government (Lafraniere and Weiland 2023).¹ Due to this recency and ongoing economic effect, prior literature focuses more on the implications of COVID-19 on financial reporting effects in the accounting profession, M&As, and the disruption of COVID-19 on business overall. This paper investigates if the pandemic has associations with a specific industry rather than business overall. As such, this study covers less in scope than what would be attainable if there were copious amounts of prior literature available, but strives to spark further research on different industries including the tech industry in association with the effects of COVID-19, future pandemics, and market uncertainty.

¹ The US plans to end the public health emergency on May 11. This is sourced from The Biden Administration as reported by The New York Times on January 30, 2023.
This study focuses on the tech industry because it is an incredibly large and growing industry that has a direct and indirect influence on financial markets as well as consumers. Many of the most impressive developments and innovations in this industry have been made within the past 30 years. This includes but is not limited to the commercial introductions of; smartphones (iPhone, Samsung Galaxy, Google Pixel), easily accessible mobile navigation (Apple Maps, Google Maps, Waze), digital assistants (Google Assistant, Amazon Alexa, Apple’s Siri), AI assistants/copilots/collaborators (ChatGPT, Google’s Bard, Microsoft’s Bing and Microsoft 365 Copilots), social media (Twitter, Facebook, Instagram), messaging applications and messaging forms (WhatsApp, Facebook Messenger, MMS, RCS), video and streaming platforms (YouTube, TikTok, Twitch), subscription video entertainment (Netflix, Disney+, Crunchyroll), autonomous advancements (cars, airplanes, mobile robots), storage innovations (SATA, M.2, NVMe, 2.5 and 3.5-inch SSD form factors) (Crucial 2023; ScienceDirect 2023), telecommunication applications (Skype, Discord, Zoom), and the list goes on.

This rapid progress continues in this industry, led by global tech giants, many of which have existed for less than 30 years. The tech industry has much younger companies and industry leaders than other industries, and in terms of major tech innovations, creations, and conglomerates, they started arriving and forming in the 1980s and 1990s. Many of these tech companies have a major focus on their online presence and capabilities more than other industries. The tech industry’s presence and capabilities come mainly from the internet and/or the use of technology which is engaged with by the lives of millions including companies and governments. This can be as a search engine (Google Search, Microsoft Bing, DuckDuckGo), cloud service provider

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2 See [https://www.britannica.com/technology/Skype](https://www.britannica.com/technology/Skype) for more information about Skype and the features of common telecommunication software available on the market.
(Amazon Web Services, Microsoft Azure, Google Cloud Platform), operating system publisher (Microsoft’s Windows, Google’s Android and ChromeOS, Apple’s iOS and macOS), artificial intelligence application (chatbots, algorithms, etc.), advertising service, music distributor, etc. The tech industry is also used within other industries and physical locations such as brick-and-mortar stores. Tech is a resource that serves to unlock untapped potential, higher productivity, greater data reach, improved controls, etc. The use of tech has only grown and become adopted at even faster rates than before (McGrath 2019).

Social media apps entertain billions of users, and users provide a massive amount of data that companies desire in exchange. TikTok, a user-submitted video hosting and live-streaming platform amassed over 100 million users in about nine months (Cerullo 2023). ChatGPT, a chatbot created by OpenAI which is 49 percent owned by Microsoft (Bass 2023), amassed 100 million users in two months (Cerullo 2023). People clearly care and value tech in the many different forms it can take. Companies themselves benefit from these same tech forms as ordinary citizens. This could be, using social media to make announcements, such as Apple streaming an Apple event to unveil the latest iPhone on YouTube, game companies making Twitter posts announcing the delay of a game release, or a company/personality in a recent controversy making a statement and/or apologizing directly to their customers/audience. Tech can also empower ordinary people to become something bigger such as massive influencers like Bella Poarch (Singer and Social Media Personality), Marques Brownlee (Tech YouTuber/Content Creator), Linus Tech Tips (Tech YouTuber/Content Creator and Business [Linus Media Group Inc.]), Charli D’Amelio (Social Media Personality), Kim Kardashian (Social Media Personality), MrBeast (YouTuber and

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3 This information was taken from reported numbers by the journalism website Bloomberg on January 23, 2023, when Microsoft invested $10 billion in OpenAI.
Philanthropist), and xQc (Twitch Streamer).\textsuperscript{4} Therefore, there is power, influence, and reach that is achieved from using tech and possibly can only be achieved through tech. However, there is even greater power in being the company that provides this tech. Whether that be Google, Amazon, Microsoft, Alibaba Group Holding Limited (“Alibaba”), ByteDance Ltd. (“ByteDance”), Meta Platforms, Inc. (“Meta”), or an individual such as Elon Musk.

This immense power over politics, economics, sociocultural factors, and technology has led governments, regulators, politicians, competitors, etc., to try and stop and/or hinder the perceived unfair power some tech companies have. Often related to antitrust, companies like Google and Apple face constant pressure from regulators and companies trying to change their policies, power (monopoly, oligopoly), company structure, etc. Major recent antitrust inquiries are focused on Google’s monopoly over search (Lovejoy 2022), Apple’s app store monopoly on iPhones, and Google and Apple’s 30 percent revenue split from revenues made on/using their app stores and Application Programming Interfaces (APIs) for Android and iOS respectively.\textsuperscript{5} This fighting is not limited to the biggest tech companies. Airbnb was experiencing immense popularity and the hotel industry lobbied for regulations that limited Airbnb’s profitability which occurred in the form of a bill passed in New York (Benner 2017). This bill introduced high fees for rentals of less than 30 days.\textsuperscript{6} Major supporters of the bill claimed that there were rising housing costs because of short-term rentals, a greater chance of disruptive residents in neighborhoods, inspection

\textsuperscript{4} Some names presented here are the online names used by these personalities and are not necessarily their legal names.

\textsuperscript{5} This is the general percentage applicable to most developers, publishers, and companies who provide their products and services on the Google Play Store and Apple App Store. There are specific scenarios in which companies can receive lower rates such as earning less than $1M USD in revenue per year and/or qualifying as a small business. See https://support.google.com/googleplay/android-developer/answer/10632485, https://support.google.com/googleplay/android-developer/answer/112622, and https://developer.apple.com/app-store/small-business-program for more information.

\textsuperscript{6} There are also regulations already in place in some states which have restrictions around short-term rentals. States such as Connecticut do not have these same restrictions or regulations on short-term rentals.
concerns, etc. The government, specifically The Biden Administration, has vocally said they plan to “crackdown” on big tech including limiting their ability to collect data, especially on children. This lobbying by politicians and competitors is not a one-way attack. The receiving end companies like Google, Apple, and Airbnb, fight back using their own monies to avoid litigation or regulations which would harm their profitability and set new precedents. For reference, in the Airbnb case mentioned earlier, Airbnb responded by filing a lawsuit. Another case of companies fighting back was in 2021 when Epic Games, Inc. (“Epic Games”) (“Epic”) started the long process of suing Apple for forcing people to pay for apps and in-app items through the App Store.7 Apple fought back as losing this lawsuit would have a major effect on Apple’s revenues, control over its ecosystem, and set a new precedent. In Europe (EU), Apple and Google also face major scrutiny from regulators which means they must fight companies and regulators globally to maintain their market dominance and revenues.

Today, these tech companies can be found everywhere in society because of their major involvement in how the world operates and their reach online. Tech is used by all ages, and children are growing up with tech already being a core component of their aging. Therefore, it is not only interesting but also important to research the resilience of this industry that includes these relatively new global tech giants. Especially considering that the tech industry is also home to the biggest valuation companies in the world such as Apple which has a market capitalization of over 2.51 trillion.8 Checking major stock exchanges such as the NASDAQ, the NYSE, or the S&P 100, you will find many of these large global tech companies within the top 100. Some are even included in the Dow Jones Industrial Average and referred to as “Blue Chip” companies. In other

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7 Epic sued Google as well, but the specifics are different as Android is not restricted in the same way that iOS is.
words, the tech industry is massive in value and will be much more valuable in the future. This all has occurred in a much shorter period of time than other industries such as the airline industry and automobile industry (Rothaermel 2020).9

Identifying if tech companies suffer greatly from pandemics such as COVID-19 or suffer less than other industries can explain and help predict future trends in the tech industry. The conclusion could make a connection to the tech industry’s online presence and capabilities allowing them a better outcome than industries that are primarily physical, have high fixed costs, do not provide many services, and/or lack significant intangible assets (intellectual properties [IPs], trademarks, copyrights, etc.). Suppose tech companies can have positive or at least neutral momentum during a pandemic. In that case, it could mean investing in the tech industry could be a safer investment during uncertainty in the market from future pandemics and/or related market uncertainty. There are also concerns about how funds will be impacted. Industries such as the automobile industry suffered greatly from COVID-19. There was a massive decrease in sales, use of vehicles, and interest. This is likely connected to the nature of most car companies selling vehicles as their main source of revenue. Tech companies often have hardware, a tangible product they sell as well as services that generate consistent revenues. This suggests that a pandemic would shake an industry that focuses primarily on product sales or expensive product sales. This means risk-averse investors would likely want to avoid these types of industries. The financial statements during COVID-19 from major tech companies showed majorly increased total revenues such as with Google versus the decrease in total revenues reported by Ford Motor Company (“Ford”).10

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9 This information is sourced from publicly available information and a chart provided by Rothaermel on page 235 of Strategic Management, 5th Edition.
10 This statement was manually verified by checking Alphabet’s 2022 10-K filing (page 59) and Ford’s 2022 and 2023 10-K filings (page 110).
Other factors to account for that differ in the tech industry are fixed costs, tangible assets (i.e., cash, PP&E, building, land), and intangible assets (i.e., patents, IPs, copyrights, trademark, licensing).

Tech companies having the ability to make revenues from services they provide along with hardware grants them the capability to make more money from services than products. This provides them safety around their revenues even if product sales drop. For example, iPhone sales dropped during COVID-19 (Albergotti 2020), but it did not significantly impact Apple or other tech companies because they provide their services on many different devices, often interconnected. Consumers of tech usually have many ways to interact with services, this could include but is not limited to, smartphones, smart fridges, desktop PCs, laptops, smart watches, smart speakers, and smart TVs. This is a strength of tech; it can be changed for different industries and purposes because tech is flexible. Other industries such as the automotive industry generally sell their main product with no further services that complement the product while the tech industry often sells products with the intention of having their services be used even without the product or they provide their services everywhere without selling a product. An example of this is the iPhone and Apple Music versus Ford which sells their Ford Escape with SiriusXM®Radio\(^\text{11}\) which is a separate subscription from a separate company, Sirius XM Holdings Inc. Drivers are not forced to use SiriusXM®Radio, instead, they can utilize their phone ecosystem in their vehicles through Android Auto/Android Automotive and Apple CarPlay in modern vehicles. This ironically can make it seem that a vehicle is complementary to an Android or iPhone in some ways. Also, it is likely that drivers will use their own preferred music services (Spotify, YouTube Music, Apple

\(^{11}\) This information was taken from Ford’s website on March 25, 2023. See https://shop.ford.com/configure/escape/model/customize/base for confirmation.
Music) through Android Auto/Android Automotive and Apple CarPlay rather than using SiriusXM®Radio.

This study seeks to address the following three questions related to M&As, goodwill, and goodwill impairment reporting before COVID-19 and during COVID-19: 1) Did the number of mergers and acquisitions during COVID-19 change when compared to prior periods? 2) Did goodwill as a proportion of total purchase price allocation change? 3) Did subsequent incidents of goodwill impairment change?

These questions are interesting as they observe how much a pandemic can hurt or help the tech industry. Due to the ever-growing nature of the industry and the companies, a lot of companies in the tech industry use M&As to grow. If M&As during COVID-19 significantly decrease, it could show stifled growth in the tech industry. If M&As in the tech industry continue strong or increase, it could show potential for the tech industry to benefit and operate better during an uncertain market compared to other industries such as retail. It will also show if goodwill impairment in the tech industry is significantly altered due to pandemics and/or market uncertainty. If tech companies with an M&A before the pandemic suffer increased goodwill impairment during COVID-19, it is likely that investors will be worried. Large acquisitions compared to the parent company's worth would mean that the company has a debenture, a deficiency of funds and/or assets during market uncertainty and may have financial troubles.

As tech is the life, and the backbone of companies, troubles for the tech industry at any point in time could have implications for innovations and new technologies. The future of the economy, commerce (e-commerce), and other industries rely on tech companies for their own progress. Therefore, other parties such as researchers, investors, regulators, the FASB, and SEC may be interested in these research questions. This study serves as knowledge for the future and
provides insight into how the tech industry's stability might be affected by pandemics in the future. If the tech industry struggles, other industries would be affected as well. This research can help corporations, stakeholders, and shareholders prepare for the effects of future pandemics and/or related market uncertainty on tech M&As, goodwill, and pretax goodwill impairment.

2. Background & Prior Literature

2.1 Background on COVID-19 and the Economy

Coronavirus is an unprecedented pandemic that has affected over 750 million individuals worldwide¹² (World Health Organization) since its first major reporting appearance back in 2019. The coronavirus 2019 (COVID-19) pandemic is a disease that many know of, not just because of news coverage and information given by the government, but also likely from first and/or second-hand experience. Due to COVID-19’s infectious nature (World Health Organization), it has the ability to spread quickly. After months of exposure to people, COVID-19 quickly infected many countries, cities, and towns. Due to the rapid and concerning influx of the disease, the government in various countries ordered lockdowns such as the US, EU, and China. US citizens reacted to the news with concern and panic by going to stores such as Amazon, Walmart, and Target to purchase massive amounts of supplies to keep during the panic and lockdown. These items include but are not limited to, canned goods, nonperishable items, and toilet paper. This massive influx of purchases being made by consumers caused stores to be unable to meet the demand. This led to stores having barren isles which remained empty for days or weeks before being resupplied to then immediately be depleted again. This fast depletion was mostly caused by customers buying much

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¹² This number is of cumulative cases as of March 25, 2023, reported by the World Health Organization on their Coronavirus (COVID-19) Dashboard which is publicly available and updated regularly.
more of each item than they usually would. A shopper who usually purchased one 18 mega roll pack of Charmin toilet paper may have taken five packs. This type of spending caused many citizens to be without supplies. Some cities in the US had altercations among customers who were trying to purchase items that other customers were hoarding. Stores enacted policies around purchases, limiting the number of items a shopper could buy to one or two depending on the item to avoid customer conflicts and handle the demand.

These lockdowns affected businesses as many employees were unable to work at on-site locations and many employers were not capable of converting their work methods to an off-site form quickly. Companies were then scrambling to find a way to keep their businesses going to avoid hurting their profits while keeping public scrutiny down and avoiding legal troubles. This caused many companies to have to build a method by which they could conduct work off-site if possible. This gave rise to telecommunications software such as Zoom. They were a method to conduct meetings virtually while still being productive. Some places always employed some employees on-site but with massively lower staff such as supermarkets.13 Provisions mandated masks and respirators with preferences of well-fitted disposable surgical masks, KN95, and N95 respirators (Centers for Disease Control and Prevention).

As the lockdown continued, it negatively affected and positively affected some companies. Tech companies that had a focus on markets that used consumer watch time such as YouTube, TikTok (Ceci 2022), and Twitch saw new highs of active users due to the influx of people unable to work or working less time. Some companies and industries such as brick-and-mortar stores, the automobile industry, and the retail industry suffered greatly from COVID-19 due to their major

13 Medical services, first responders, and other vital job positions and job locations such as hospitals were still significantly staffed.
on-site focus and physical presence. As the panic from citizens and consumers continued, demand was still too great for supply and it started affecting other suppliers down the chain who needed more supplies and needed them faster. For example, a retailer would demand more supplies from their wholesaler, who would then demand more from their distributor, who would then demand more from their manufacturer. This strain on the supply chain led to a global supply chain shortage which affected many industries including the tech industry. One of the biggest ways the supply chain shortage affected the tech industry was as a global chip shortage. Many companies use semiconductor chips for automobiles, graphics cards (GPUs), appliances, computers, video game consoles (i.e., PlayStation 5, Xbox Series X), etc.\textsuperscript{14} This chip shortage had an even greater effect on smaller companies as in some instances, larger companies received higher priority. Companies like Apple purchase a greater magnitude of chips than a company like Sony Group Corporation (“Sony”) for their PlayStation division.

To begin the technical analysis, it is important to understand what goodwill is, its calculation, and how it is and can be impaired.\textsuperscript{15} Goodwill is an intangible asset that has its value derived from the difference, known as the differential, between the net fair value of the target company's net assets and the final purchase price of the acquirer.\textsuperscript{16} This excess the acquirer pays over the net fair value is an asset the acquirer believes is recognizable, but not easily identifiable. Example items of such goodwill include proprietary property and company brand. Goodwill obtained from acquiring another company has an indefinite life but is tested for impairment at least once per year. The impairment process is where a company reviews its goodwill and evaluates if

\textsuperscript{14} See https://www.wsj.com/articles/tsmc-warns-of-tight-production-capacity-prolonging-chip-shortage-11649935181 for more information.

\textsuperscript{15} See https://www.investopedia.com/terms/g/goodwill.asp for more information.

\textsuperscript{16} See the FASB Codification 805-30-30-1 for the specifics on measurements of goodwill.
the value has decreased over the course of the year. Goodwill cannot be increased post-
acquisition for the same acquired company and goodwill is only recorded by corporations for
acquisition purposes. The methods that can be used to acquire another company are either an
asset acquisition or stock acquisition. An asset acquisition is when the acquirer purchases only the
net assets of a company but not the company itself. The result is that the company that sells its
assets usually liquidates. A stock acquisition is when a company purchases at least 50 percent of
another company’s stock to have control over the acquired company. In instances where an
acquired company or subsidiary is not wholly owned, a portion of sales and losses are allocated to
non-controlling interests (NCI). There have also been numerous updates and amendments to
goodwill over the years. In May 2019, the FASB amended “Intangibles—Goodwill and Other
(Topic 350), Business Combinations (Topic 805), and Not-for-Profit Entities (Topic 958)” which
simplified the test for goodwill impairment along with other changes.

2.2 Prior Literature

2.2.a Impact of COVID-19 on Mergers, Acquisitions & Corporate Restructurings

The impact of COVID-19 on M&As is the start of what this study is set out to investigate.
Prior literature by Kooli and Lock Son (2021) states that globally the M&A market slowed down,
and that deal volume was substantially lower during the lockdown than in Pre-COVID-19 and Post
Lockdown. Deal volume rose to over 1.4 trillion around July 1st, 2020. They also discovered that
the historical average of total deal volume was much higher in the tech industry than in any other

17 https://www.pwc.com/us/en/services/consulting/deals/library/goodwill-impairment.html provides further insight
and examples of goodwill impairment.
18 This study is specific to companies but depending on the type of business this rule may apply differently such as
for partnerships.
19 The specifics of ownership requirements are not black and white in all instances. See the FASB Codification for
further guidance on how a company obtains control and allocates to NCI.
industry. It was up around 10 percent while other industries had smaller percentages like the healthcare industry with about 2 percent. The industrials and energy/utilities industry suffered incredibly which is consistent with the expectation of this study. Industrials and energy/utilities were down about 5 percent and 8 percent, respectively. Kooli and Lock Son (2021) identified a decrease in the number of transactions and valuation of transactions from 2019 to 2020 which was greater than in 2016 to 2018. They also mention opportunistic companies like Accenture\(^\text{21}\) that utilized their cash to obtain low-interest rates and cheaper valuations on companies they wanted to acquire. This made COVID-19 an opportunity to acquire proprietary technologies and/or acquire talent which the company could use now and, in the future when COVID-19 is transitioned out of a public health emergency.

2.2.b COVID-19 and Corporate Performance in the Energy Industry

Prior literature in relation to goodwill impairment and factors related to COVID-19 are examined by Fu and Shen (2020) for the Energy Industry in China. They found that the energy industry was significantly impacted by COVID-19. They cite that the large number of fixed assets in this industry creates high fixed costs for daily operations (Fu and Shen 2020). However, due to the need for energy such as electricity and thermal energy by people and companies, stability in this industry was imperative. They found that the pandemic had a severe negative impact on goodwill impairment. They believe that under the double pressure of decreasing revenues and increasing costs, the uncertainty of enterprise operations was greatly enhanced. Due to these uncertainties associated with COVID-19, investors, especially creditors such as banks, were more risk-averse (Fu and Shen 2020). Importantly, they mention that operational cash flows were tighter

\(^\text{21}\) Accenture acquired or planned to acquire over 70 entities in 2021 and 35 entities in 2022. See https://newsroom.accenture.com/subjects/acquisitions/.
as a result. I expect their findings to be comparable in concept to what would occur in the US. My expectation is that due to the differences in the tech industry, the overall valuation of goodwill and goodwill impairment will not significantly change. Unlike other industries, tech companies usually do not have fixed costs unless they are a tech company within another industry that heavily relies on economies of scale such as Tesla, Inc. (“Tesla”) when it purchases and creates factories like the Gigafactory Nevada.\textsuperscript{22} The common major areas of expenses for tech companies are research and development (R&D), marketing, fines, etc.

2.2.c Coronavirus Pandemic and Business Disruption

The tech industry targets both people and companies as customers, and those people and companies rely on tech companies. Not in the same way they rely on the energy industry, but many people view tech companies, tech products, and tech services as a necessity. Without working tech, people and companies would run incredibly inefficiently or may not run at all. Prior literature by Alao and Lukman G (2020), mentions that because of COVID-19, businesses had to close to prevent the transmission of COVID-19. This temporary business closure raised concerns about forecasted cash flows, debt covenants, hedging and financing, the impairment of assets, onerous contracts, and recognition of revenues. This disruption of usual business operations caused underperformance. Alao and Lukman G mention ways companies can mitigate the challenges of COVID-19. Going concern is raised in times of uncertainty, therefore, a company should strive for six to 12 months of cash to meet obligations. This is an area of decreased ability in many industries such as the tourism industry, automotive industry, airline industry, retail industry, etc. Many of these industries do not have the means to do that or if they do, they make a large amount

\textsuperscript{22} See \url{https://www.tesla.com/giga-nevada} for more information.
of revenue in a way that is not easily accessible. For example, consider a vehicle priced at $30,000 dollars. During uncertain and tough economic times, people, including companies, do not desire to make large purchases or capital expenditures. For this reason, larger-priced items are not purchased. This leads to no revenues from that available vehicle sale. A tech company may offer a music subscription and/or video streaming subscription which are around $9.99 dollars each. This purchase would come off as a much lower commitment and worry customers less. This low-cost subscription model allows tech companies to have relatively consistent revenues in comparison to companies that sell products that are high-priced and/or non-recurring.

The tech industry benefits from people’s increased time online which is what the pandemic is associated with. More potential clicks and viewers allowed for more traction and could have long-term benefits. There is a chance the benefits of the pandemic to the tech industry also were neutralized or countered by other industries which use tech company services, such as a decrease in advertising. These platforms and back-end servers and equipment are often scalable which could allow for lower costs when demand is not as high. In this new era of working from home, access to social media, and the ability to create a myriad of things with so few barriers is an advantage for tech companies. A common thing on TikTok is for TikTokers to post themselves in their work attire such as fast-food employees, nurses, and athletes. This culture of posting and using social media and platforms during working hours is greater now than ever before and benefits tech companies as well. Even in other occupations, working from home reduces accountability if privacy is not forgone. The current virtual working environment allows employees to be more easily distracted by their smartphones which means there is a higher potential for people to view content and use tech while working for entertainment purposes. More content viewed, more people
(users) active, and more content created often relates to more revenues for tech companies depending on the products and services they are offering.

3. Hypothesis

3.1 The Effects of COVID-19 on Mergers and Acquisitions in the Technology Industry

My first hypothesis seeks to reproduce similarities to prior literature but focuses on the tech industry. Specifically, prior literature indicates that M&As during the pandemic were lower than in previous periods. Due to the nature of M&As, the increased risk undertaken by a company during a weaker market would discourage companies from making large purchases and capital expenditures. I expect this will be consistent with the tech industry as market uncertainty affects all industries. Therefore, I hypothesize my findings will be similar to prior literature in concept:

**H1:** The pandemic is associated with a decrease in mergers and acquisitions in the technology industry.

3.2 The Effects of COVID-19 on Goodwill in the Technology Industry

My second hypothesis seeks to find if goodwill allocation was lower during COVID-19. Prior literature corroborates my expectation that goodwill from acquired companies during COVID-19 is on average, lower than goodwill reported from acquisitions during normal or peak market times before COVID-19. I expect goodwill to be lower because while tech companies have the potential to be strong financially during COVID-19, they likely do not want to take the risk. I believe the market uncertainty will negatively affect goodwill as a proportion of total purchase price allocation.

**H2:** The pandemic is associated with lower goodwill valuation in the technology
3.3 The Effects of COVID-19 on Goodwill Impairment in the Technology Industry

My last hypothesis seeks to discover if the tech industry suffers from large goodwill impairment during COVID-19. In prior literature, which does not specifically target the tech industry, the energy industry experienced large amounts of goodwill impairment during the pandemic. In contrast, I expect that very few major tech companies suffered from the pandemic. The entire industry is a different story but based on those large companies affecting the average change, I believe the pretax goodwill impairment loss during COVID-19 will not be significant.

**H3:** The pandemic is not associated with a significant increase in goodwill impairment valuation in the technology industry.

4. Data Collection & Research

To test all hypotheses, I collect data on M&As, goodwill allocation, and goodwill impairment from companies in the tech industry using automatic data collection and manual data collection. M&A data is gathered from Audit Analytics and addresses H1. M&A data was sampled from close dates January 1, 2017 to December 31st, 2019 for the Pre-COVID period. Close dates from January 1st, 2020 to December 31st, 2022 represent the Current-COVID period. Audit Analytics data used specific parameters such as party type; “Acquirer” and “Target.” Transaction descriptions used “Acquisition Agreement” and “Merger Agreement”. M&A data distributed by Audit Analytics that had target companies listed without a Central Index Key (CIK) were manually

23 Other parameters such as "Business Combination Agreement", "Purchase Agreement", "Purchase and Sale Agreement", "Share Purchase Agreement", and "Stock Exchange Agreement" were deemed immaterial and excluded due to an insignificant portion of agreements when compared to "Merger Agreement" and "Acquisition Agreement".
removed. The data was then combined as well as averaged to show the individual and average changes in M&As year over year (YoY) as a percentage based on the first year of concern, 2017, to the last period of concern, 2022. The data was also aggregated to show the number of M&As in each year, modified to exclude companies without a CIK. Raw (unmodified) data is still included in the Appendix but as a separate metric called “Blank”.

For H2 and H3, data collection of goodwill and pretax goodwill impairments were gathered from Compustat. As the tech industry is not an applicable parameter on Compustat, I manually inputted Standard Industrial Classification (SIC) codes for each industry I believed qualified as a tech industry. I determined SIC codes to be representative by using Field and Hanka’s classification from *The Expiration of IPO Share Lockups* as the foundation and then validating that specific companies were included as discussed in the results section of this study. Selected and manually validated specific SIC codes include; 3571, 3572, 3575, 3577, 3578, 3579, 3661, 3663, 3669, 3671, 3672, 3674, 3675, 3676, 3677, 3678, 3679, 3691, 3692, 3694, 3695, 3699, 3711, 3721, 3724, 3728, 3821, 3822, 3823, 3824, 3825, 3826, 3827, 3829, 3841, 3842, 3843, 3844, 3845, 4888, 5961, 5962, 5963, 7370, 7371, 7372, 7373, 7374, 7375, 7376, 7377, 7378, and 7379. For query data, I used the consolidated level, industry formats INDL and FS, STD data format, population source D, currency USD, and company status active. The variables I selected were Goodwill (GDWL) and Impairments of Goodwill Pretax (GDWLIP). For any needed information which was not obtained through either database, I manually corroborated select information with 8-Ks and 10-Ks from the SEC Edgar website or company-specific websites that provide their filings.

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5. Results

5.1 M&A Changes

The amount of M&As in the tech industry from 2017 to 2019 were as follows: 2017, 787; 2018, 1011; 2019, 939. Compared to the expectations in my hypothesis (H1), the volatility of M&As during Pre-COVID was relatively higher than expected based on percentages. M&As went up 28.46 percent in 2018 and then down 7.12 percent in 2019. In comparison to Current-COVID, the amount of M&As from 2020 to 2022 were: 2020, 854; 2021, 1254; 2022, 833. M&As were down 9 percent in 2020, up 46.83 percent in 2021, and then down 33.57 percent in 2022. The volatility of M&As during COVID-19 was higher than in Pre-COVID and may be associated with COVID-19. In regards to averaging, the amount of M&As during COVID-19 remained relatively consistent in the three years before COVID-19. The average amount of M&As from 2017 to 2019 was 912 and 980 from 2020 to 2022. This delta of 68 M&As is not large but is economically significant. It implies that COVID-19 did not significantly decrease M&As and that M&As in the tech industry interestingly had a higher average amount of M&As during COVID-19. I provide visualizations of this data in the Appendix in Figure 1A and 1B. Figure 1A shows the M&A data of Pre-COVID and Current-COVID in a graph using a YoY format. Figure 1B focuses on showing the numbers of M&As during Pre-COVID and Current-COVID combined. Column “Filled” is the total number of companies with an M&A in a respective year with a CIK code. The “Blank” column is the total number of companies with an M&A in a respective year without a CIK code. The “Total” column is the “Filled” and “Blank” columns combined.
5.2 *Goodwill and Goodwill Impairment Changes*

Next, Figure 2A and 2B provide a trend graph for companies reporting goodwill and a trend graph for the valuation of goodwill, respectively. Figure 3A and 3B provide a trend graph for the companies that reported goodwill impairment and a trend graph for the valuation of goodwill impairment, respectively. Table 1 shows the numerical values of goodwill and goodwill impairment for the Pre-COVID period and the Current-COVID period in billions. In addition, Table 2 and Table 3 show a regression results table for testing the association between COVID-19 and both goodwill and goodwill impairment, respectively. Table 2 and Table 3 contain Pre-COVID (Intercept), Current-COVID (COVID-19), the number of observations (N), and the adjusted R\(^2\). The regression table’s dependent variable in Table 2 is the average amount of goodwill during Pre-COVID. In both Table 2 and Table 3, the COVID-19 coefficient is an increase or decrease in the average goodwill amount during Current-COVID. In Table 2, the change in the coefficient’s intercept (goodwill amount) is a statistically significant increase during COVID-19. In Table 3, the change in the coefficient’s intercept (goodwill impairment amount) is a statistically significant increase during COVID-19.

Goodwill valuation saw a substantial increase YoY during Pre-COVID while goodwill impairment valuation saw a relatively small decrease YoY during Pre-COVID. All numbers provided below are in billions except for the number of companies reporting goodwill and goodwill impairment, which is as stated. The increase in companies reporting goodwill was economically significant with 979 companies in 2017, 1,040 in 2018, and 1,163 in 2019. The number of companies that reported goodwill impairment was 71 in 2017, 76 in 2018, and 87 in 2019. The increase between 2018 and 2019 is interesting as it is likely associated with something besides COVID-19, possibly other economic concerns that were identified by companies. The
aggregate amount of goodwill in 2017 was around $1,137,038, $1,230,982 in 2018, and $1,477,628 in 2019. Goodwill impairment, rounded, was $9,356 in 2017, $8,434 in 2018, and $8,646 in 2019.

During COVID-19 there was an increase in the number of companies reporting goodwill with a relatively similar YoY increase until 2022 which had a substantial decrease. The amount of companies reporting goodwill in 2020 was 1,273, 1,320 in 2021, and 781 in 2022. This substantial decrease in companies reporting goodwill in 2022 might suggest that companies no longer had goodwill to report after 2021 because it had been impaired, there were fewer M&As in 2022, and/or business combinations did not produce goodwill in 2022 which affected goodwill data. After 2020, which has a goodwill impairment of 104 companies, goodwill impairment was significantly lower. The number of companies that reported goodwill impairment was 65 in 2021 and 66 in 2022. In terms of the overall value of goodwill, in 2020 it was over $1,573,562, over $1,727,073 in 2021, and over $1,706,477 in 2022. 2022 is an interesting year as the number of companies reporting goodwill dropped by over 59 percent, but goodwill valuation only decreased by around 1 percent. This implies that many of the companies that no longer reported goodwill must have been small in size and/or had a small allocation to goodwill at the time. Companies reporting goodwill impairment from 2021 to 2022 only increased by a single company yet the difference in the total valuation of goodwill impairment was significantly different. 2020 had a goodwill impairment of $26,605, around $4,132 in 2021, and a significant increase to about $47,453 in 2022. This interesting increase is attributable to specific companies who reported major goodwill impairment in 2022 such as Illumina, Inc. (“Illumina”), Global Payments Inc. (“Global Payments”), and more importantly, Fidelity National Information Services, Inc. (“Fidelity”) which had over $17,588 in goodwill impairment that year.
Automatic data was manually sampled for correctness. Due to the size of the data, I chose 10 companies and validated that they were included in the data and calculations. I selected these companies due to their relevance to this study and the US. The chosen companies are Alphabet, Amazon, Apple, Electronic Arts Inc. (“EA”), Meta, Microsoft, Netflix, Inc. (“Netflix”), Tesla, The Boeing Company (“Boeing”), and The Walt Disney Company (“Disney”). Company CIKs were cross-referenced with the SEC Edgar website to validate CIK affiliation. Significant companies present in the data such as Fidelity, Illumina, EA, and Global Payments were also confirmed to have the same reported numbers from the dataset in their 10-K filings.

6. Conclusion

I examined the effects of COVID-19 on M&As, goodwill, and pretax goodwill impairment in the tech industry. Although prior literature does not examine all these aspects of this specific industry, they provide conceptual understandings that are consistent across all studies. This consensus is likely due to the nature of the tech industry and the various factors at play that differ in this industry. To provide greater insight and knowledge on this ever evolving and growing industry, I set out to identify prior literature that addresses these topics even if related to other industries or countries. First, M&A data from this study and prior literature identifies that overall M&As were down, but tech-specific M&As were not significantly negatively affected by the pandemic. Interestingly, there was an increase in M&As, which is believed to be related to opportunistic companies using economic conditions to capitalize on struggling companies that are losing leverage and valuation. Companies that were in the R&D phase of their development would be susceptible to cash flow deficiencies making an M&A agreement likely. This is consistent with the tech industry’s nature of often acquiring start-ups and smaller companies that have valuable
ideas, patents, proprietary technologies, etc. Second, goodwill data was suspected to be insignificantly affected, but there was an observed difference in goodwill reported. There continued to be an increase in goodwill reported and companies reported until 2022. There is a possibility that this difference is related to companies no longer having goodwill to report after 2021 because it had been impaired, there were fewer M&As in 2022, and/or business combinations did not produce goodwill in 2022. This data is consistent with the observation that there were substantially fewer M&As in 2022. Finally, companies reporting goodwill impairment grew consistently until 2021 when there was a major drop in reported goodwill impairment and then a major increase in goodwill impairment in both 2020 and 2022. The amount of goodwill impairment in 2022 was greatly affected by major companies such as Fidelity and Global Payments reporting major impairments. Overall, my study contributes to the field of research on tech companies and their stability during uncertainty.

In addition, 2023 has been an interesting year for tech companies, with major tech companies Amazon, Microsoft, and Meta laying off thousands of workers. There is a chance that based on my research, 2023 might have a large goodwill impairment similar to 2022. Tech companies may have over-capitalized on COVID-19 and/or other factors and are now attempting to cut costs. The reason these tech companies are laying off employees is claimed to be because of the economy, or efficiency. From this perspective, it is possible that the prolonged effects of COVID-19 are taking place from 2022 onward. If this is the case, this may indicate that the tech industry has resilience to pandemics in the beginning but may still be affected by them in the end.

Tech companies, however, may recover faster than other industries if this is the case. Future research by other researchers could spread light on this question and lead to a greater understanding of this industry. Especially considering future major M&As such as Microsoft acquiring Activision Blizzard which will significantly affect the industry and goodwill valuation along with other reporting.
References


Lovejoy, B. (2022, September 9). DOJ antitrust action against Google could see Apple lose billions of dollars a year. 9to5Mac. Retrieved February 12, 2023, from https://9to5mac.com/2022/09/09/doj-antitrust-action/


### Figure 1A: Mergers and Acquisitions

![Bar chart showing percentage change YoY for mergers and acquisitions from 2017 to 2022.](chart.png)

### Figure 1B: Mergers and Acquisitions

<table>
<thead>
<tr>
<th>Year</th>
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<th>Blank</th>
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</tr>
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<td>2017</td>
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<td>2018</td>
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</tr>
<tr>
<td>2020</td>
<td>854</td>
<td>164</td>
<td>1018</td>
</tr>
<tr>
<td>2021</td>
<td>1254</td>
<td>179</td>
<td>1433</td>
</tr>
<tr>
<td>2022</td>
<td>833</td>
<td>149</td>
<td>982</td>
</tr>
</tbody>
</table>
This table reports the results of testing the association between Pre-COVID goodwill amount and Current-COVID goodwill amount. The sample includes the three-year periods before 2020 and 2020 onward. The dependent variable in column 1 is an indicator variable that equals one if the amount of goodwill is on or after 2020, and zero when before 2020. Column 2 showcases the t-statics amounts. Variables with a *** denote two-tailed statistical significance at 1 percent.
Table 3
Testing the Association of Goodwill Impairment Amount and COVID-19

<table>
<thead>
<tr>
<th>Variables</th>
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<tr>
<td></td>
<td>Coefficients</td>
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<tr>
<td>Intercept</td>
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<td>-1.74</td>
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<tr>
<td>COVID-19</td>
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<td>-2.39</td>
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<tr>
<td>N</td>
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<tr>
<td>Adjusted R²</td>
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</table>

This table reports the results of testing the association between Pre-COVID goodwill impairment pre-tax amount and Current-COVID goodwill impairment pre-tax amount. The sample includes the three-year periods before 2020 and 2020 onward. The dependent variable in column 1 is an indicator variable that equals one if the amount of goodwill impairment pre-tax is on or after 2020, and zero when before 2020. Column 2 showcases the t-statics amounts. Variables with an ** denote two-tailed statistical significance at 5 percent.