



Mergers and Acquisitions in Tech Companies

How has technology changed in the past 20 years?
Will giant M&A affect the company's stock price?

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INTRODUCTION

Problem Statement

The world is embracing an era of technological innovation. High technology has transformed our lives greatly. There are new technological products launched every day. Technological advancements usually come with many mergers and acquisitions inside the industry. It has been admitted that finance plays an important role in promoting those innovations.

Traditionally, companies that acquire others or merge are designed to drive synergies and to acquire targets that are similar to their own organizations. However, the digital deals undertaken by tech giants are different. In digital deals, tech giant companies are pursuing technologies or capabilities that they do not possess. Over the past two decades, they are steadfastly pursuing these capabilities because technological innovation enables new business growth. With this assumption in mind, our first research objective was to see how technology has changed in the past 20 years through Tech Companies' Merger and Acquisitions(M & A) Dataset.

A corporate merger or acquisition can have a profound impact on a company's growth prospects and long-term outlook. Moreover, predicting mergers and acquisitions helps executives and investors design their companies' strategies and decide on their investments. We believe mergers and acquisitions can affect the company in many ways, including its capital structure and future growth prospects. What about the stock price? The second research goal of this report is whether large mergers and acquisitions will affect the company's stock price.

In this report, we want to investigate these two research objectives further. There are five main tasks we intend to tackle:

Subtask-1: To give an overview of acquisitions in terms of region and time:

- Where are the acquisitions of companies concentrated?
- Which month has the highest number of acquisitions?
- Which year has the highest number of acquisitions?

Subtask-2: To gain insights into M&A patterns based on parent companies:

- Which company has the highest number of acquisitions?
- What is the average cost of each parent company during its acquisitions?

Subtask-3: Which products were derived from the 10 highest number of company acquisitions and what are their average acquisition price? For each product, find the acquisition with the largest acquisition price.

Subtask-4: What have the popular businesses in M&A changed in the last 20 years?

Subtask-5: Will big acquisitions influence the stock prices of the acquired company?

We are interested in utilizing these 5 tasks to uncover the details of acquisition of these technology companies. We hope this dataset enables us to find out which month and region the acquisitions are concentrated on and the general trend of acquisitions. In addition, we hope to summarize the profiles of companies' acquisitions behavior patterns, such as which companies have the highest number of M & A, what is the average overhead spent on M & A by these companies, what is the highest unit price acquisition, etc. With the above descriptive statistics in mind, we could further explore the dataset. To answer the question of technology innovation, we will analyze the products which are derived from the highest number of company acquisitions and most popular M & A business from 2010 to 2021, in comparison to that from 2000 to 2009. As students with a background in finance, we were also curious whether these acquisitions would theoretically affect investors and the stock market, and if yes, how they affect the stock market and investors.

This report is targeted at people who are interested in investments in technology. They can have a basic overview of how technology evolves since the past century and how finance boosts technological advancements.

Structure of Report

We will provide our motivations and background for why we are interested in examining this topic.

We will also provide details on the dataset we are using for this analysis.

Following that, we will answer each of the 5 data-driven questions listed above as sub- tasks.

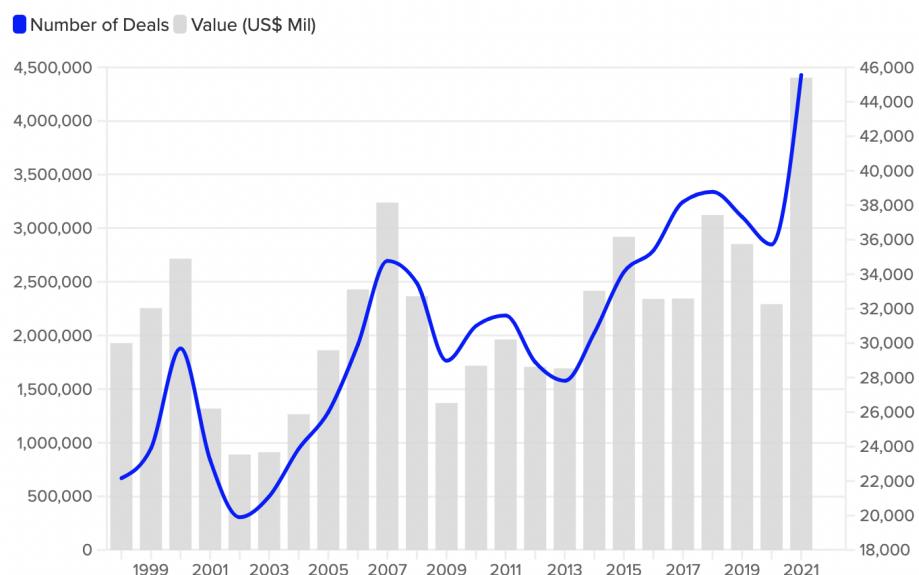
Then, we will conclude with recommendations and a discussion on the results of our analysis.

MOTIVATION AND BACKGROUND

According to Global M&A Market Report 2021 released by Bain & Company recently, there are 28,500 M&A agreements signed worldwide in 2020, worth \$2.8 trillion deals in total, benefiting from fast-growing sectors such as high-tech, telecom, and digital media("Global M&A Report 2021 | Bain.com", 2021). It is arguably safe to say that M&A momentum will remain strong globally in 2021, fueled and driven by high-tech companies. For example, in the first five months of 2021, Alphabet, Amazon (Amazon), Apple (Apple), Facebook and Microsoft (Microsoft) have announced 19 deals, the highest number of M & A in the same period since 2015, according to data released by Refinitiv(Toole, 2021). What's more, in the U.S. alone, target M&A has surged 139 percent to US\$2trn(Toole, 2021). As we can see from the chart, from 1999 to 2021, the overall trend for worldwide announced M & A, despite exhibiting persistent volatility, has been climbing, even breaking records in 2021

Worldwide Announced M&A

First 3 Quarters Volumes



source: Refinitiv Deals Intelligence

Other than that, in terms of sectors, technology continues to 'run the world', with an astonishing 133 percent increase in global M & A so far this year, to reach \$888.2bn of announced deals, and an all-time high(Toole, 2021). This staggering data is so intriguing that our research for this report was driven by the desire to find out what's behind this trend:

does it indicate the continued advancement of technology? What kind of impact has this had on the business as technology giant companies continue to make M&A? Does it show a correlation with stock prices?

DATASET

We will be using the Dataset of Merger and Acquisitions made by tech companies that is available through Kaggle:

<https://www.kaggle.com/shivamb/company-acquisitions-7-top-companies>.

This dataset contains the list of acquisitions made by the following companies: Microsoft, Google, IBM, Hp, Apple, Amazon, Facebook, Twitter, eBay, Adobe, Citrix, Redhat, Blackberry, Disney. The dataset has 10 columns and 1455 rows, and includes variables such as the date, year, month of the acquisition, name of the company acquired, value or the cost of acquisition, business use-case of the acquisition, and the country from which the acquisition was made. Since the dataset is not that complicated, We only clean the dataset by changing the dtype of two variables and changing the all “-” value into “NAN” for further analysis.

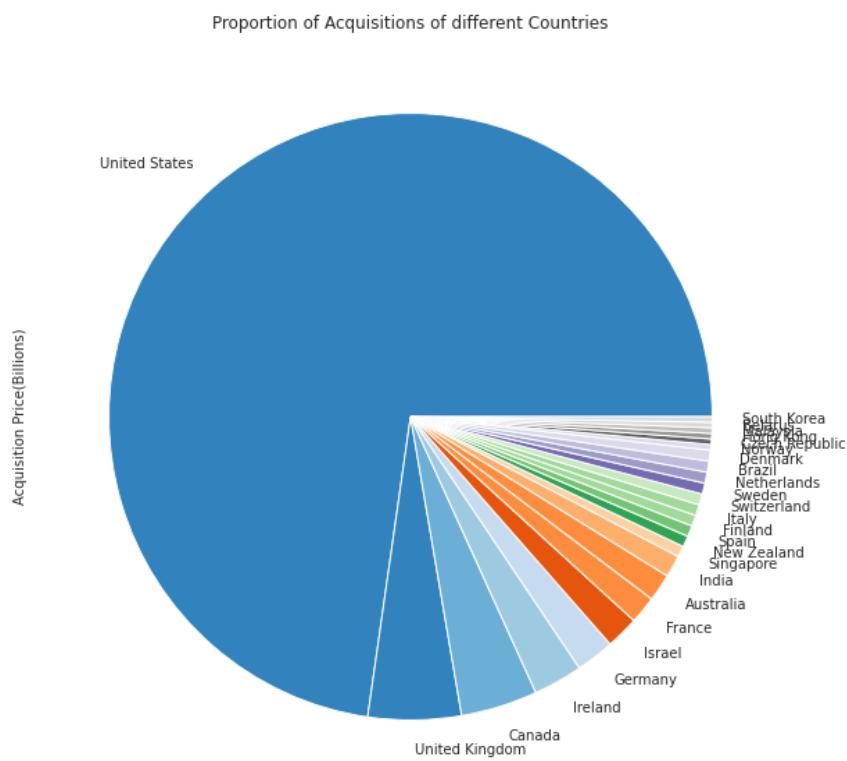
We also used stock data which we accessed through the alpha vantage API to obtain stock prices in the month when the acquisitions happened.

ANALYSIS

SUB-TASK 1: To give an overview of acquisitions in terms of region and time

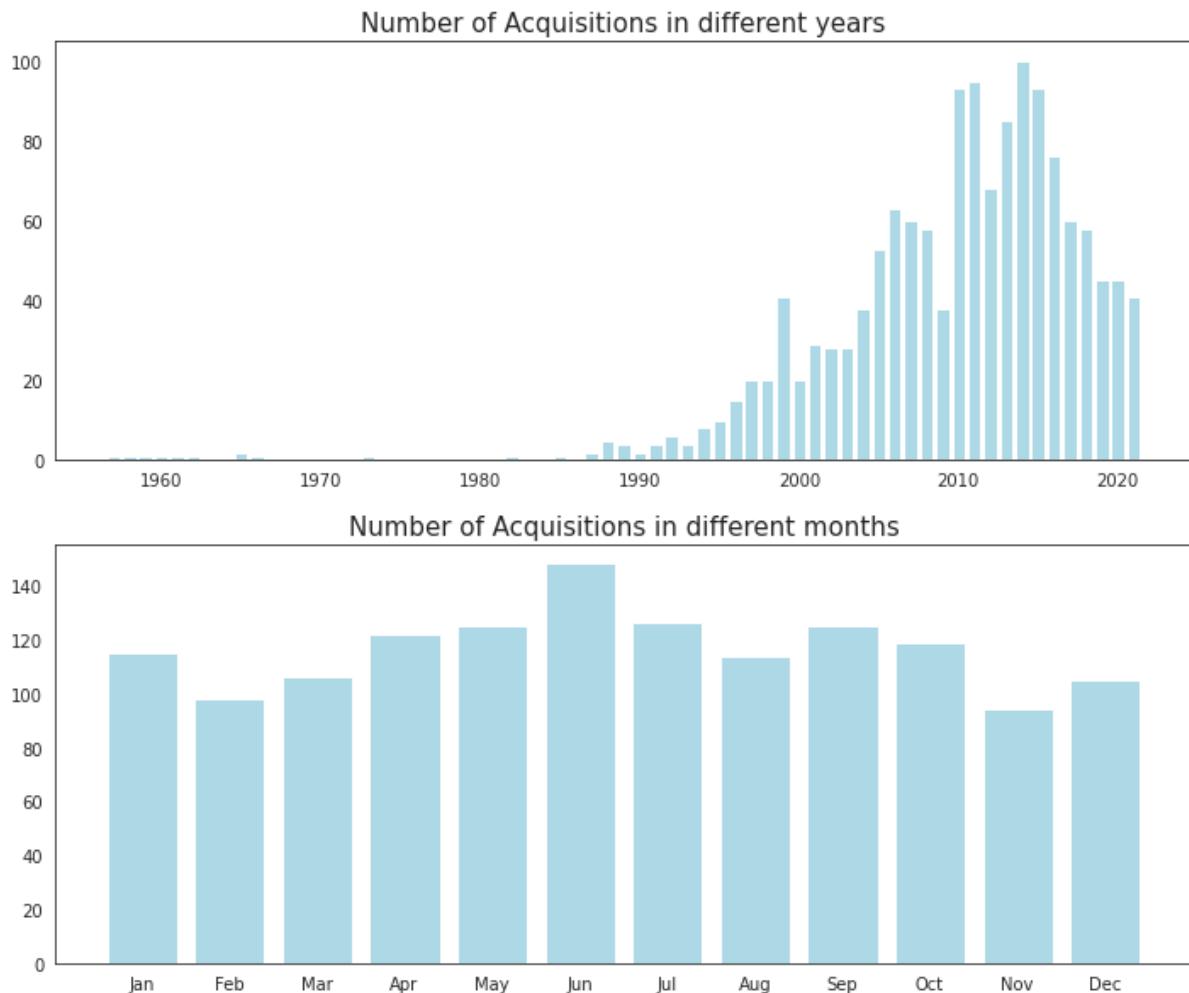
- Where are the acquisitions of companies concentrated?
- Which month has the highest number of acquisitions?
- Which year has the highest number of acquisitions?

M&A in tech sectors is distributed unevenly across the world. It appears that nearly seventy five percent of the acquisitions have taken place in the United States, followed by the United Kingdom, Canada and Ireland. The rest of the world only makes up a minor proportion of all acquisitions. The fact that the United States presents a high percentage of acquisitions is in line with its high level of technology development.



Based on the plot below, before 1992, there were only few acquisitions in tech sectors, which can be interpreted as the budding period of some major market giants. The acquisitions started booming in 2010 and reached its peak in 2014, where there were nearly 100 acquisitions. However, the market experienced a sharp decline after 2015. In this graph, the

number of acquisitions in 2021 is not as high as it was stated in our background session. The underlying reason is that the date this dataset is based on the close day of acquisitions. While in the previous case, it is summarized in terms of announcement date. It usually takes one year for companies to officially complete the acquisitions. Therefore, the booming of acquisition deals in 2021 cannot be exhibited in this graph.

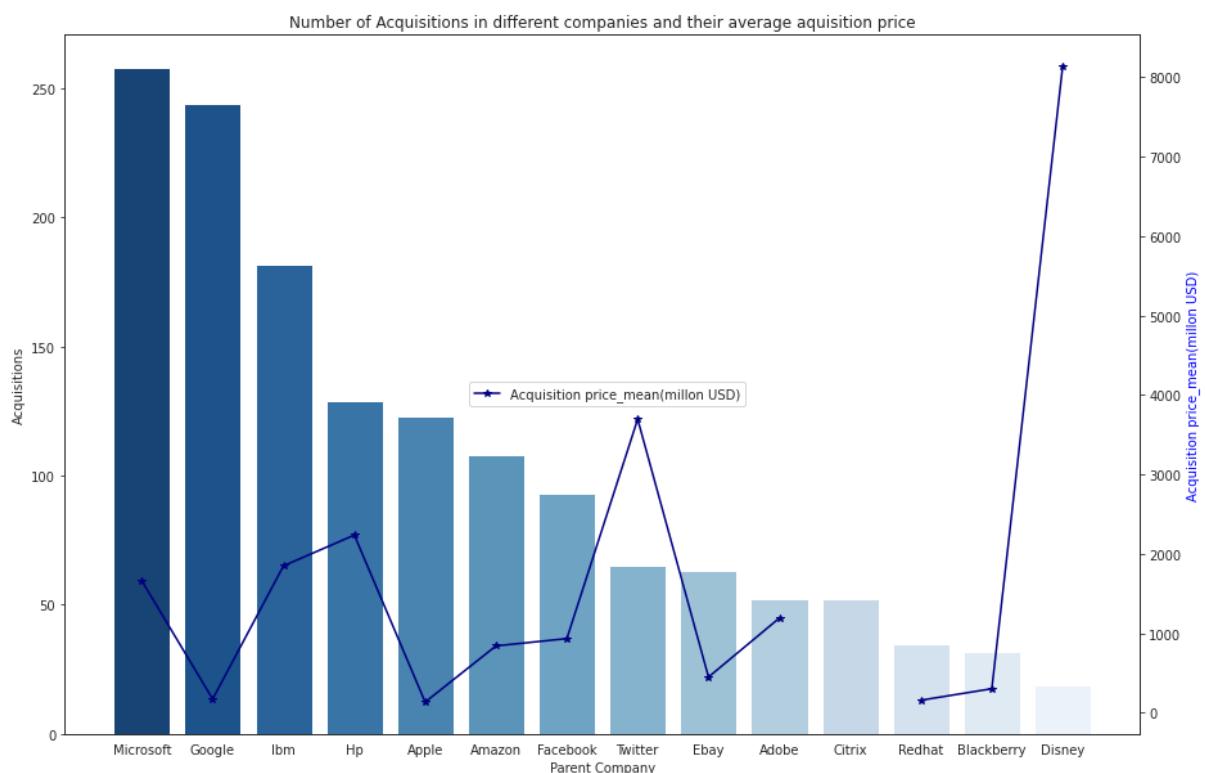


In terms of months, it seems that most acquisitions take place during the summer months, specifically June, July and May. The possible reason behind this is that these technology companies decide to bargain during the months when sales of the acquired companies are low.

SUB-TASK 2: To gain insight into acquisition and merger patterns based on different companies

- Which company has the highest number of acquisitions?
- What is the average cost of each parent company during its acquisitions?

Based on the plot below, it appears that Microsoft and Google are the leading acquirers, with over 200 acquisitions. It seems that companies more focused on computer software are more likely to make higher acquisitions. The possible reason is that companies that specialize in computer software generate more revenue to support these acquisitions.



As for the average cost of acquisitions, we could observe that Disney, which has made the fewest acquisitions of any technology company, has a way higher average spending than all the other tech companies. Disney's average cost on acquisitions is around \$8,000 million, almost twice as Twitter's. We presume that companies like Disney and Twitter do not tend to cast their nets around to complete multiple acquisitions, but prefer to take a selection of high bid products. The top two parent companies with the highest number of acquisitions (Microsoft and Google) appear to have lower average spending than some other companies. Since Citrix did not disclose the prices of its acquisitions, the value here is missing.

SUB-TASK 3: Which products were derived from the highest number of company acquisitions and what are their average acquisition prices? For each product, find the acquisition with the largest acquisition price.

I wanted to find out the products which were derived from multiple company acquisitions and get their average acquisition price.

The table below shows the top ten products which are derived from highest number of acquisition and their average acquisition prices:

	Derived Products	Parent Company	number of Acquisition	Acquisitions which disclose price	Average acquisition price (million USD)
0	Google Cloud Platform	Google	22	3	368.33
1	Android	Google	19	4	37
2	Amazon Web Services	Amazon	17	5	79
3	YouTube	Google	12	1	15
4	X	Google	9	0	NaN
5	Google Maps	Google	9	4	60.25
6	Google+	Google	7	1	100
7	Google Docs	Google	7	1	25
8	Oculus Studio	Facebook	5	0	NaN
9	Nest Labs	Google	5	1	555

It seems that Google products were derived from the highest number of acquired companies, among which Google Cloud Platform has experienced 22 numbers of acquisitions. This is representative of the earlier information - that Google tends to acquire a lot of companies. Amazon also conducted 17 acquisitions for Amazon Web Services.

As for the acquisition prices, some of them are not available since the companies did not disclose the prices. According to the disclosed price, the average acquisition price of Google Cloud Platform is 368.33 million dollars. The average acquisition price of Android is 37 million dollars. Average acquisition prices of X of Google and Oculus Studio of Facebook are not available. The average acquisition price of Nest Labs is 555 million dollars.

Furthermore, I want to find out the specific information of the acquisition of each product that cost the most. The information is as shown below:

	Derived Products	Parent Company	Acquisition Year	Month	Acquired Company	Acquisition price(million USD)	Business
0	Google Cloud Platform	Google	2016	Sep	Apigee	625	API management and predictive analytics
1	Nest Labs	Google	2014	Jun	Dropcam	555	Home monitoring
2	Amazon Web Services	Amazon	2019	Jan	CloudEndure	250	NaN
3	Google Maps	Google	2020	Jan	Pointy	163	Local retail inventory feeds
4	Google+	Google	2012	Jun	Meebo	100	Social networking
5	Android	Google	2005	Aug	Android	50	Mobile operating system
6	Google Docs	Google	2010	Mar	DocVerse	25	Microsoft Office files sharing site
7	YouTube	Google	2008	Jul	Omnisio	15	Online video

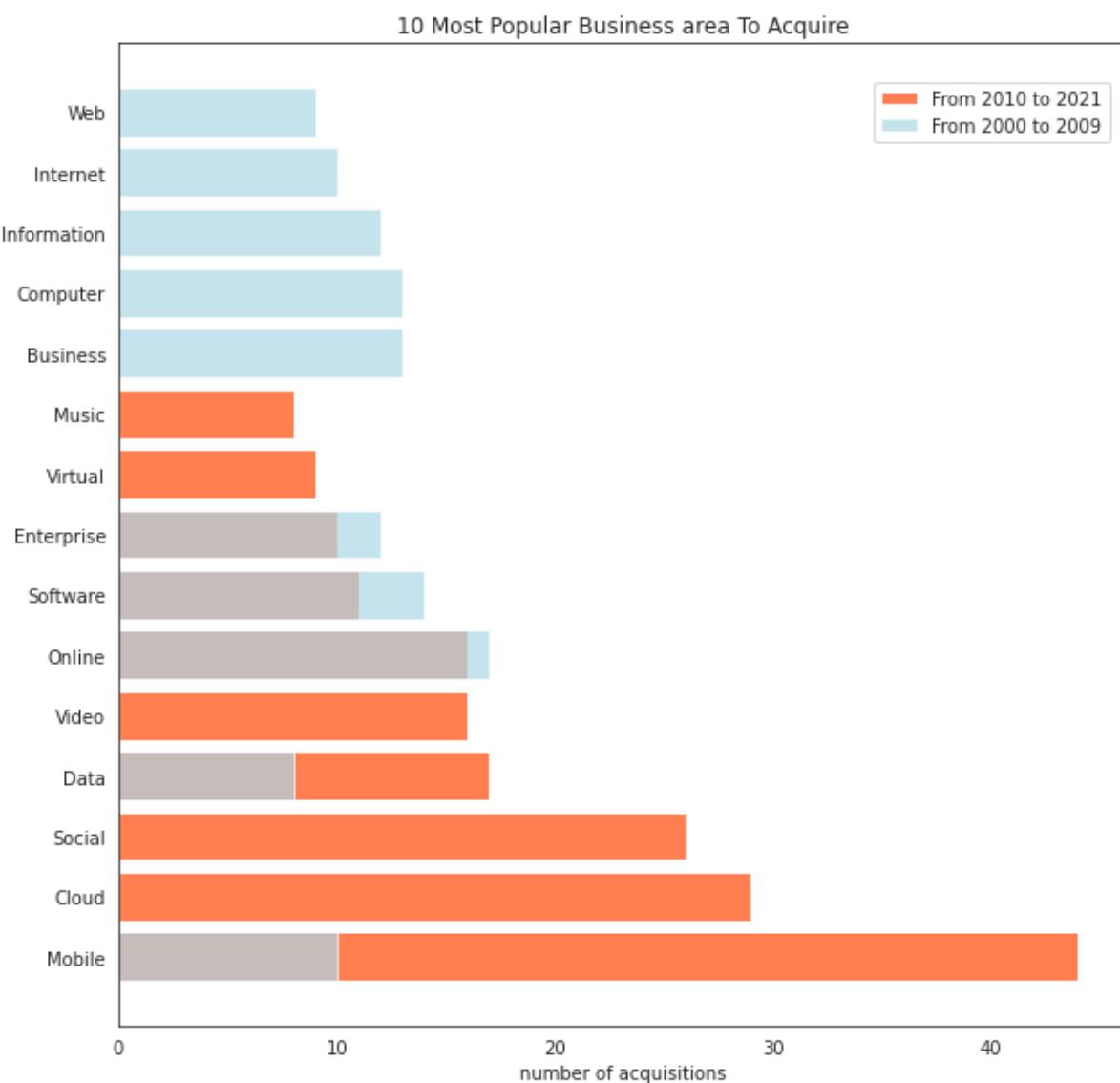
The acquisition with the largest price among the products happened in Sep, 2016, when Google spent \$625 million to acquire Apigee, whose business was API management and predictive analytics, to develop Google Cloud Platform.

The largest acquisitions of the products derived from most acquisition numbers are among diversified tech areas. The business of acquired companies are totally different. This implies that the giant technology companies are quite monopolies in specific tech areas. Through multiple acquisitions, by merging all other potential competitors in the market, the parent company derived products that could dominate the market.

SUB-TASK 4: What have the popular businesses in M&A changed in the last 20 years?

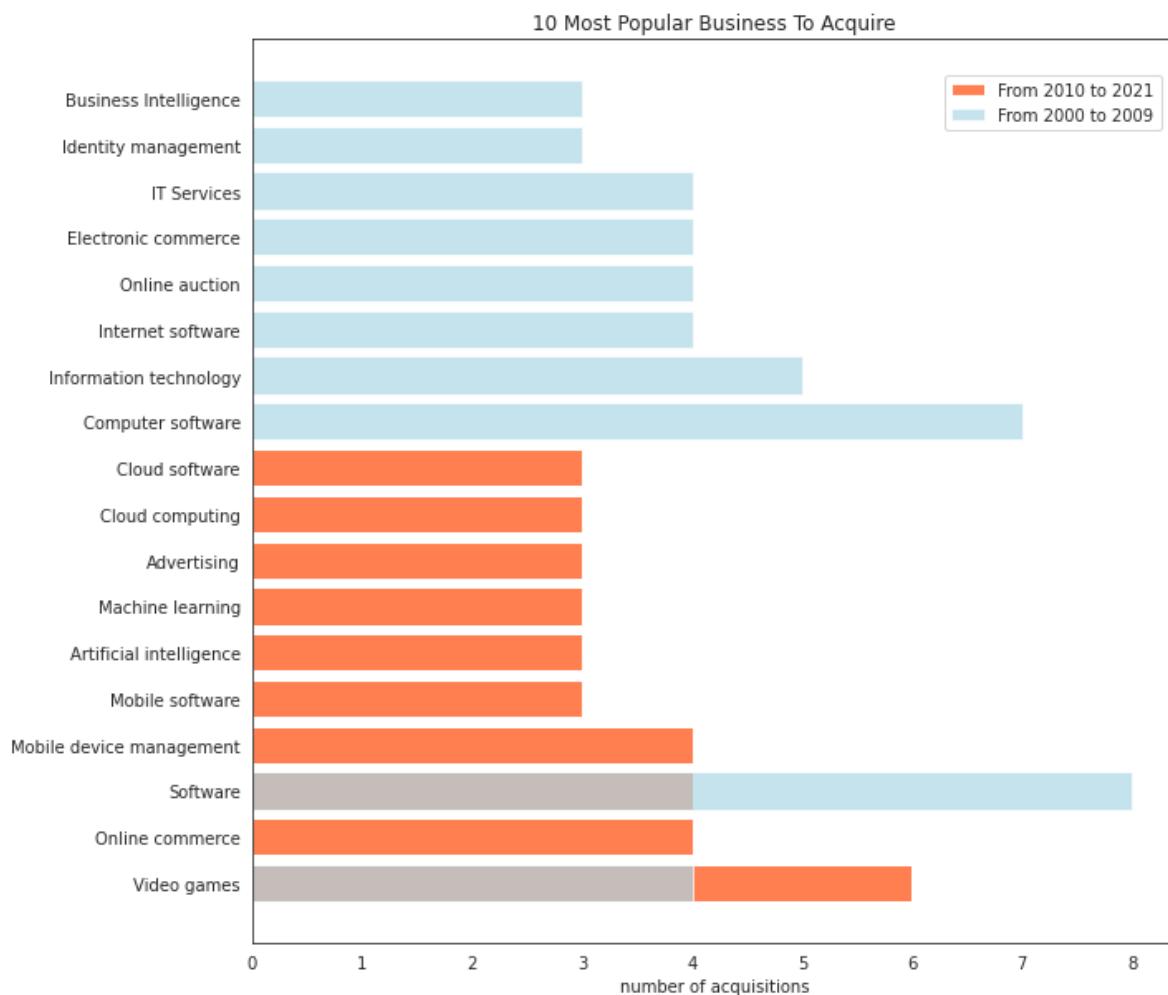
I wanted to find out how technologies have changed in the last twenty years. This question could be answered by analyzing the popular M & A business in tech companies from 2010 to 2021, in comparison to that from 2000 to 2009.

Since the variable of “business” in the original dataset is too specific, there may be many values meaning the same while expressed differently. To reduce the bias, I generated a new column named “business area”, which extracted the first word of the values in “business”. Through this variable, I could get a basic understanding of which area the business is in. The graph below shows the ten most popular business areas to acquire in two different periods.



As we can see from the above graph, the business of M & A has experienced a dramatic change in the 2010s compared with in the 2000s. Mobile technology has become the most popular one in the past ten years. There have been more than forty acquisitions within the Mobile area. Other new popular tech areas are related to "Social". "Video", "Virtual" and "Music". This significant shift comes with the age of 4G networks. The widespread use of 4G technology enables people away from their desktops and get access to the internet on their smart devices. Therefore, the tech giants were powered to focus their investments in the development of mobile applications and services. Other related areas such as streaming music, videos, e-commerce, social media which could satisfy people's daily entertainment on their phones thus also attracted great attention. Cloud technology is also a new booming area. There were nearly thirty acquisitions related to Cloud tech in the 2010s. Cloud-storage technology emerged as datasets grew more complex and faster network connections facilitated the rapid transfer of data over the internet.

To further analyze the technological advancements in specific areas, I also draw the graph below.



In the 2000s, the tech M & A was concentrated on software business. Back then, software was the foundational technology for computers. The 2010s saw the rise of everyday technology. The 2010s have ushered in an unparalleled era of video games, online commerce, mobile devices and applications, cloud computing and artificial intelligence. In an era when there are new technologies launched every day, the business of tech M&A has become more diversified.

SUB-TASK 5: Will big acquisitions influence the stock prices of the acquired company?

I wanted to find out if the big acquisitions will pose some effects on the stock market.

Therefore, I filtered out the ten largest acquisitions in history of tech sectors.

Acquisition	Parent Company	Year	Month	Acquired Company	Business	Acquisition price (\$Million)
0	Disney	2019	Mar	21st Century Fox		71300
1	Twitter	2015	Mar	Periscope	Live-video streaming	50100
2	Ibm	2019	Jul	Red Hat	Provider of open source software and solutions	34000
3	Microsoft	2016	Dec	LinkedIn	Professional social network	26200
4	Hp	2002	May	Compaq	Personal computer	25000
5	Microsoft	2021	Apr	Nuance Communications	Speech synthesis and speech recognition	19700
6	Facebook	2014	Feb	WhatsApp		19000
7	Disney	1996	Feb	Capital Cities/ABC Inc.		19000
8	Hp	2008	Aug	Electronic Data Systems	Information technology consulting	13900
9	Amazon	2017	Jun	Whole Foods Market		13700

According to the table above, Disney has the largest acquisition in this industry. Disney finished its acquisition on 21st Century Fox in March, 2019, with a final price of \$71,300 million. The second largest acquisition happened when Twitter acquired Periscope, a live-video streaming platform in Mar, 2019 with \$50,100 million. It is also noticed that the business of the acquired companies were quite widespread.

Among the acquired companies in the ten largest acquisitions, only LinkedIn, Nuance Communications and Whole Foods Market were listed companies before the giant M & A.

Therefore, I will only focus on the three companies' stock price change in the month when they made an announcement of the M & A. According to the effective market hypothesis, the stock price will change on the days of the announcement. There has also been research (M.M & H. 1992) indicating that the stockholders of target firms have earned significant excess return not only around the announcement period, but also in the weeks after the announcement. While the date in the original dataset is when the acquisitions had closed. Therefore, I need to get the exact dates when the companies announced their acquisition. Microsoft announced its agreement with LinkedIn and Nuance Communications on Jun 13, 2016¹ and April 12, 2021² separately. On Jun 16, 2017³, Amazon announced that it was buying organic grocery chain Whole Foods (WFM) for 13.7 billion dollars in cash.

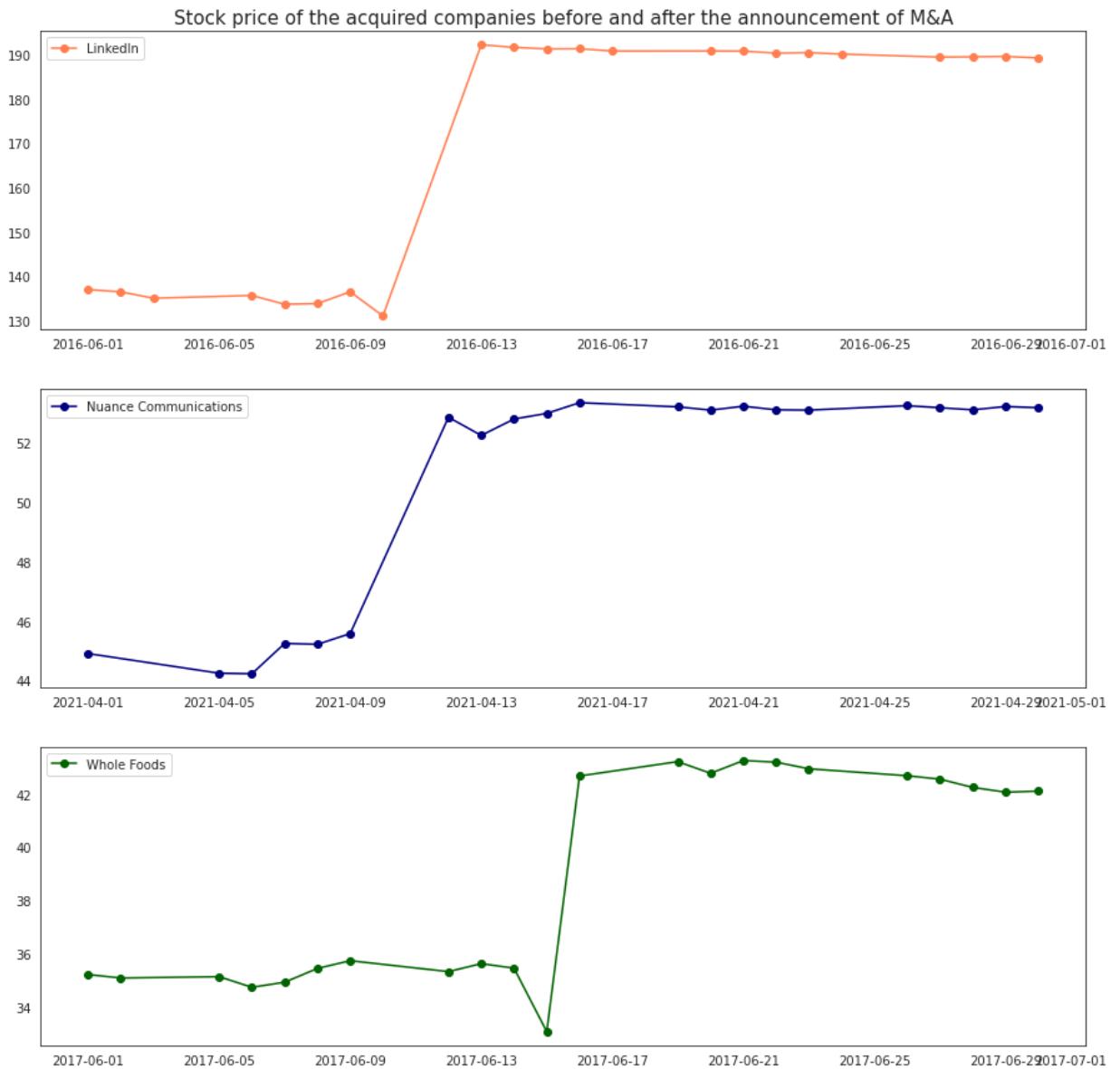
To find out the stock price of the acquired companies, I used a financial API to scrape stock price historical data and obtained the daily stock prices for the symbol: 'LNKD', 'NUAN', 'WFM'. I filtered the data for these three stock symbols in their own announcement month.

This is a plot displaying how stock prices of the three acquired companies changed before and after the announcement of M&A:

¹ <https://blogs.microsoft.com/blog/2016/06/13/microsoft-to-acquire-linkedin/>

²<https://news.microsoft.com/2021/04/12/microsoft-accelerates-industry-cloud-strategy-for-healthcare-with-the-acquisition-of-nuance/>

³ <https://media.wholefoodsmarket.com/amazon-to-acquire-whole-foods-market>



Stock price increased significantly on the day when the announcement was made. The stock price almost increased by thirty percent and remained afterwards. Therefore, it can be said that the big acquisitions will have a positive influence on the stock price of acquired companies. This aligns with the effective market hypothesis.

CONCLUSION

Final Result

Our analysis has revealed that M & A in the tech sector could reflect technological advancements in terms of regions, years and specific business areas. The majority of acquisitions happened in the US, aligning with the fact that the US is leading the world in high technology. The dramatic growth in tech acquisitions since the 1990s also reflected how the internet had accelerated the development of modern technologies. Microsoft and Google, the two tech giants, are taking the leads in the acquisitions. Google's core product, Google Cloud Platform, was derived from twenty-two acquisitions, with an average price of \$368.33 million. The tech companies are increasing their competitiveness through multiple acquisitions. By merging all other potential competitors in the market, the parent company derived products that could dominate the market.

The analysis also allowed us to see how technology has evolved over the last 20 years. Unlike the 2000s when acquisitions focused on software, in the 2010s, acquisitions started branching out into different areas such as video games, online commerce, mobile devices and applications, cloud computing and artificial intelligence. Acquisitions have witnessed significant changes in the digital age. What's more, by scraping the stock prices of three acquired companies of the largest M & A deals, we could see a dramatic increase in the stock prices on the day when the news of acquisitions was announced. It matches with previous research that acquisitions will generate more enthusiasm of investors, and thus drives up the stock price.

Discussion

Throughout the development of capital markets around the world, corporate mergers and acquisitions and restructuring remain a popular topic. By writing this report, we have gained a deeper knowledge of how M & A restructuring of technology giant companies.

We believe this report is intriguing because it answers questions about how technology has changed over the past few decades and how acquisitions have impacted stock prices. We capture the inflection points of the change curve and combine them with the stock market dynamics of the time to find the reasons behind the changes, which is a reflection of the

practicality of our report, to analyze the data rather than just describe it in the context of real-world industry dynamics that are actually happening. The code we use is able to summarize data from worldwide acquisition cases over the past decades, adjusting them to the x-values y-values we need and visualizing them to make it easier for readers to understand what we do.

However, our report also has some limitations. Firstly, limited by the small size of the dataset, we cannot yet make predictions about future M & A, including when they will occur, what companies will lead them, etc. In addition, there are many null-values in our dataset, meaning that we do not yet have data on many companies to support effective forecasting. Secondly, the essence of our logic is that the research process focuses on whether the announcement of a company's M&A event causes a time-series price change for the listed company. In other words, when applying the event study approach, a particular corporate M&A transaction is treated as a single event to examine the price volatility effect of that M&A event announcement on the stock market. In practice, there are so many uncertain external factors involved in the research process that we may make some omissions in the process of retracing the events. For example, a company's stock price may fluctuate as a result of that company's M & A announcement, but other external factors, such as new product launches and changes in executive officers, may have a greater or lesser impact on the stock price, and thus we cannot judge them independently. What's more, we only use three companies' stock data, which is apparently insufficient.

Overall, Despite the methodological shortcomings of our study, we believe this is a useful report for examining M & A restructuring of technology giants using publicly available data.

Citation

[1]Toole, M. (2021). Global M&A in 2021 set to be biggest ever year | Refinitiv Perspectives. Retrieved 14 December 2021, from

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[3]Global M&A Report 2021 | Bain.com. (2021). Retrieved 16 December 2021, from
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