

The Impact of Telemedicine and Virtual Software on the Healthcare Industry during COVID-19 Based on SWOT, PEST & BCG Matrix Analysis

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Abstract—Contemporarily, telehealth and online healthcare software are concerned by the public since COVID-19 epidemic is still raging. To evaluate the development of telehealth and online healthcare software and its impact, financial data, analysis models, and some other factors are employed. For the overall analysis of the telehealth industry, PEST analysis is carried out, and the variation of policies, economies, society, and technology is included to analyze. For the leading company- Teladoc Health, Inc., the financial data are derived and different financial ratios, including risk ratios, profitability ratios, and market ratios are calculated and employed. Additionally, the SWOT analysis model is also employed to display the comprehensive condition of Teladoc Health, Inc. For other companies of the telehealth industry (e.g., Doximity, Inc., American Well Corporation), financial ratios are calculated and utilized in BCG Matrix to analyze. Besides, some smaller companies are also analyzed based on their action versus the time and the pandemic. Finally, an overall analysis based on different perspectives also reveals a future prediction. According to the results, the telehealth industry would expand significantly, and it might change the future approaches of the healthcare industry. These results shed light on the future trend of variation of healthcare industry with the co-existence of human being and the pandemic.

Keywords-healthcare industry; online medical service; telemedicine; COVID-19

1. INTRODUCTION

The outbreak of COVID-19 changes the entire human race since 2019. Due to its strong capability of spread [1], plenty of countries have imposed social-distancing, closing of offline business. Besides, many universities moved their courses online to reduce the possibility that students were infected by COVID-19 [2]. Despite these policies, there are still thousands of new

cases emerging every day. Therefore, online software became more and more popular, i.e., more people choose to shop online and work online [3, 4]. Some online meeting programs, e.g., ZOOM and Skype, had got significantly increased access. Moreover, another very important industry- healthcare- also moved online, solving the problems of seeking medical advice during the pandemic and social-isolation period.

Telehealth and software of online medical care, in fact, are not present recently. From a practical perspective, founded in 2002, Teladoc Health, Inc., the current leading company of the telehealth industry, has been offering various healthcare services online for decades. From a theoretical perspective, telehealth and remote medical service were proved by some researchers. Some researchers operated scenario-based experiments and testified to the effectiveness of voice therapy [5]. Other scholars proved that telemedicine would be an excellent medical approach for the developing world [6]. In addition, some practical suggestions and approaches about virtual healthcare utilization are provided [7].

However, these research achievements are not very relevant to the recent world. Firstly, most of them were conceptual and did not include practical utilization. Secondly, most of them did not fit the condition of the pandemic, which is an undeniable factor now. They also did not employ financial analysis and business models to focus on the business and service of healthcare itself and its development.

Regarding the issues above, current financial data are collected and some financial ratios are calculated. Meanwhile, the overall developments of the telehealth industry are analyzed associated with the outbreak of the pandemic. In addition, analysis models, e.g., PEST, SWOT, and BCG Matrix, are used based on current and practical policy around and after the pandemic. Finally, it can be concluded that the pandemic is a great opportunity for the development of the entire telehealth industry and online software for healthcare. This is not only for big and leading corporations but also small companies and businesses of telemedicine.

The rest part of the paper is organized as follows. The second section of the paper introduces the methods and financial ratios utilized. A PEST analysis is provided in the third section. The following section is financial ratios and SWOT analysis of the leading company- Teladoc Health, Inc. The fourth section offers the variation of the financial ratio versus time of other companies fitting in BCG Matrix and an overview of some small businesses based on their action and time node of the pandemic. In the fifth section, the future trend is predicted. Eventually, the overall work is summarized and concluded.

2. METHODOLOGY

2.1 PEST analysis

To explore the macro environment and future development potential of Telehealth, an emerging industry, the PEST analysis method is used in this paper. PEST stands for politics, economy, social culture, and technology, respectively. This analytical approach is often used for the strategic macro analysis of the market. Its role is to understand the impact of current political factors, economic trends, public opinion, and technological updates on the potential opportunities or threats to specific industries and markets.

When discussing the influence of political factors on the Telehealth Industry, this paper takes the US government as an example to discuss the relevant regulations issued by the US government to encourage and promote online medical services and protect the rights and interests of medical care and patients. For instance, the requirements of doctors' licenses, interstate medical licensing agreements, Telemedicine Parity, and access to health insurance, subsidies, etc.

To analyze the economic trend, this paper first analyzed market size changes in the global and North American regions before and after the epidemic from a macro perspective. Then, from a micro perspective, taking Well Health as an example, its revenue change before and after the epidemic was compared. Meanwhile, through a brief overview of the rest of Well Health's business activities during the epidemic, the Telehealth industry as a whole made a forward-looking forecast.

Social factors are also discussed from multiple perspectives. This paper compares the public's acceptance of online medical services before and after the epidemic. Besides, the unresolved issues, concerns, and potential solutions are displayed.

As for the technology factor, this paper shows the introduction and upgrade of IT technology in the online medical platform, which connects various departments within the entire medical system to form a safe community. Efficiency and diagnostic accuracy are thus improved. Moreover, the development of new technology has promoted communication between medical institutions and improved the traditional doctor-patient relationship. If information and communication technologies continue to advance, e-health may revolutionize the traditional medical industry.

2.2 SWOT and Ratio analysis

SWOT Analysis was first introduced in the 1960s by Albert Humphrey at Stanford University, which is widely used nowadays in a strategic planning process to effectively evaluate the situation of a company. The S stands for strengths, which describes the things that a company does particularly good at and ways that distinguish it from other competitors, e.g., a strong brand, unique technology, big market shares, etc. The W denotes weaknesses, which are the inherent drawbacks of a company compared to its competitors and should be improved, e.g., negative net income, higher prices and lack of market research. The O represents opportunities, which refers to favorable external factors that could offer an organization a competitive advantage. For example, the outbreak of COVID-19 gives telemedicine firms chances to expand because people switch their demand to online healthcare services. The T means threats, which refers to factors that have potential risks and harms to the firm. For example, the introduction of vaccines of COVID-19 may stop the development of telehealth industry against traditional healthcare. The framework can help a business to make wise decisions knowing its best advantage and future opportunities. The probability of failure may also be reduced by understanding what the company lacks and predicting hazards that would otherwise catch its unawares.

The four components consider both internal factors which are the superiority and inferiority of the company itself and external factors which are the potential chances and risks. There are many benefits for this framework, such as its flexibility to be applied to any company in any situation, low cost, and simplicity. However, the limitations are significant. The model lacks

prioritization, and the analysis can be subjective. Additionally, it may provide too much information which are not all useful without a final solution.

To analyze the financial performance of Teladoc, several ratios are calculated by using the company's income statement and balance sheet. There are three main types of ratios, which are risk ratios, profitability ratios and market ratios.

2.2.1 Risk ratios

Current ratio and quick ratio are liquidity ratios, and they are used to determine a company's ability to pay its short-term debt obligations. The quick ratio excludes inventory and other current assets that are more difficult to liquidate, i.e., it provides a more rigorous measure of liquidity. As for total debt ratio and debt-to-equity ratio, they are used to determine a company's ability to meet its long-term financial obligations. The calculation formulae are listed in Table. I.

2.2.2 Profitability ratios

Profitability ratios include Profit margin, Return on asset, and Return on equity, and whose calculation formulae are given in Table. I. They assess a company's ability to generate profits given the investments made in assets or equity.

2.2.3 Market ratios

As for Market ratios, P/B ratio, PEG ratio and P/E ratio are collected on Yahoo Finance official website. They are used to suggest the preference of different investors.

TABLE I. THE FORMULAE OF RISK RATIOS AND PROFITABILITY RATIOS

CURRENT RATO	CURRENT ASSETS / CURRENT LIABILITIES
QUICK RATIO	CURRENT ASSETS-INVENTORY / CURRENT LIABILITIES
TOTAL DEBT RATIO	TOTAL ASSETS-TOTAL EQUITY / TOTAL ASSETS
DEBT-TO-EQUITY RATIO	TOTAL DEBT / TOTAL EQUITY
PROFIT MARGIN	NET INCOME / REVENUE
RETURN ON ASSETS	NET INCOME / TOTAL ASSETS
RETURN ON EQUITY	NET INCOME / TOTAL EQUITY

2.3 BCG matrix

For those companies which had got significant development among other competitors, to unwind their development over time and the pandemic's variation, financial ratios were calculated and the information derived from both ratios and other resources was employed to fit the product of these companies into Boston Consulting Group (BCG) Matrix to locate the position of the development. Designed by Bruce Henderson for Boston Consulting Group in 1970, BCG Matrix is a graph with a 2 times 2 matrix. BCG Matrix could effectively help corporations analyze their product to help adjust their strategies.

TABLE II. BCG MATRIX

	High Market Share	Low Market Share
High Market Growth	Stars	Question Marks
Low Market Growth	Cash Cows	Dogs

As shown in Table II, horizontal coordinate refers to the market share of one certain product, and vertical coordinate refers to the market growth. Based on the different combinations, there are four quadrants: Cash Cows, Dogs, Question Marks, and Stars. Cash Cows usually refer to products that have a very mature market and consumer basis. Because the market is very mature, Cash Cows products confront very low, or almost no market growth but a very high market share. In this way, Cash Cows products could become a very stable income source for the company. The company does not need to spend a lot of money but profit numerously. Usually, Cash Cows products are the leading products in certain industries. Dogs refer to products with low market share and low market growth. Even though these products might assist other products, they could decrease return on assets and negatively influence the opinions of investors. Question Marks refers to the products with high market growth and low market share. These products usually require the corporations spend lots of money to promote to become the Stars and Cash Cows. These products mean potential, but without proper organization, they would fall to the quadrant of Dogs, which is not an uncommon condition. Stars refers to products with high market share and high market growth. These products have the trend to become the future Cash Cows by keeping investing until the market is mature, or it would move to the area of Dogs.

To analyze the trend of the industry, the trend of financial ratios versus time is fit into the BCG Matrix. Fitting the information, the position of the companies' products is located. Meanwhile, based on the position or the companies' products, the condition of development of the entire industry is discovered.

3. PEST ANALYSIS

The COVID-19 has been a topic of great concern since 2019. It increases the difficulty of epidemic prevention due to its widespread characteristics and susceptibility to infection and mutation. Innovative online services (e.g., Telehealth) have been prompted to prevent the more vigorous spread of the virus effectively. Telehealth's potential value is worth analyzing as an emerging industry, and its promising prospect could be proved through PEST analysis.

3.1 Political

With the spread of the epidemic, governments worldwide have introduced various effective policies to prevent the further spread of the virus, e.g., travel bans and stay-at-home orders. While these policies have indeed been effective in reducing the movement of people across regions to contain the outbreak, they have inevitably made it more challenging for a particular group of people to seek essential emergency services (e. g, medical care). Therefore, Telehealth emerged and was promoted as a new medical form, aiming to create a convenient way to provide a real-time online diagnosis for patients. It includes various functions, including virtual

visits, remote patient monitoring, and mobile health care [8]. Compared to traditional forms of medicine, it improves diagnostic accuracy and efficiency, patient satisfaction, and connection between doctors and healthcare organizations [9]. Based on the benefits brought by Telehealth and the imperfection of the existing legal system, the government has issued new policies aimed at supervising, encouraging, and strengthening the development of Telehealth. For instance, to ensure the accuracy and professionalism of telemedicine diagnostics, several safeguards, including federal, state, and local regulatory laws and licensing requirements, must be met by physicians before providing telemedicine services [8]. All physicians who provide telemedicine services must have state-specific licenses. When Telehealth first launched its push, most states require doctors to be licensed in a patient's state, making it difficult for some doctors to offer telemedicine across state lines. As a result, the government created the Interstate medical licensing Compact, allowing qualified doctors to obtain licenses to serve patients in other states [8]. There is also a policy on Telemedicine Parity, which concerns the cost and wastage of online medical platforms. Telemedicine Parity refers to equal health insurance reimbursement for telehealth services and face-to-face visits. By 2018, 35 states had enacted telemedicine parity laws in The U.S. In states that do not have equality laws, various types of Medicaid are paid to groups of doctors, patients, and related personnel to ensure adequate reimbursement for necessary medical services [8]. Therefore, to sum up, it can be seen that the government has played a promoting role in the development of Telehealth. Thus, from a political point of view, the Telehealth industry is undoubtedly secure.

3.2 Economic

Economic factors are one of the core criteria to determine the prospect of an industry. By predicting the market size and growth trend and analyzing the financial performances of enterprises in the Telehealth industry before and after COVID-19, the sector's potential growth could be predicted.

If the Telehealth industry is analyzed from a macro perspective, the gradual increasing Market Size can be regarded as one of the proofs of its promising future. According to the statistics, the market size of the Telehealth industry in 2020 the globe is 144.38 billion USD, which is 135.2% higher than the average year-on-year growth from 2017 to 2019 [10]. Besides, this growth trend is expected to continue. By the end of 2028, it is expected that the Market Size of the global Telehealth industry will increase to 636.38 billion USD [10].

As for North America, considering that many Telehealth companies, and as acceptance of Telehealth increased during the pandemic, companies continued to fund their technology departments to launch novel software and programs. As a result, the size of the Telehealth market in North America also shows a trend of continuous increase. It is revealed in Figure 1 that the growth comparison of market size between 2019 and 2020 grew from 26.13 billion USD to 62.72 billion USD [10]. Although the Telehealth Industry may indeed experience a bottleneck in the future with the improvement of the epidemic, online diagnosis, as a more advanced diagnosis method, is bound to have its unique breakthroughs and innovations.

Secondly, if the prospect of Telehealth is analyzed from a micro perspective, the analysis of enterprises can be helpful to predict the industry's overall trend. For example, the decision of Well Health shifting to Telehealth let it successfully drive record revenue and gross profit in the second quarter of 2020 [11]. Currently, it is an online platform for doctor-patient

communication. It provides multiple channels, e.g., SMS, email, phone, and live chat, enabling convenient two-way conversations between doctors and patients to ensure that patients can get timely help when they need it. Well Health's telemedicine business accelerated during the pandemic. Since its launch in early March, Well's virtual clinic + remote health service has hired more than 1,000 healthcare practitioners, with more than 1,000 virtual patients and repeat customers making multiple appointments every day [11]. This marks a new milestone in Well Health's bottom line and revenue. According to Well Health's financial statements for the second quarter of 2020 (seen from Figure 1), it achieved a record quarterly revenue of \$10,578,144 and gross profit of \$4,226,831 for the three months ended June 30, 2020. Compared with the 3 months ended June 30, 2019, the data showed a year-on-year increase of 43% and 88%, respectively [11]. Based on the excellent business conditions and forward-looking corporate development strategy, Well Health has also acquired or invested in many companies, as well as all the company's outstanding shares. For instance, Indivica Inc., Phelix. Ai Inc., MedBASE Software Inc., etc. [11]. Its purpose is to acquire or invest in technology companies to have a higher level of technology to provide more advanced services and maintain the current business status. Therefore, from the perspective of the economy, the development prospect of Telehealth is worth looking forward to no matter from the macro or micro perspective.

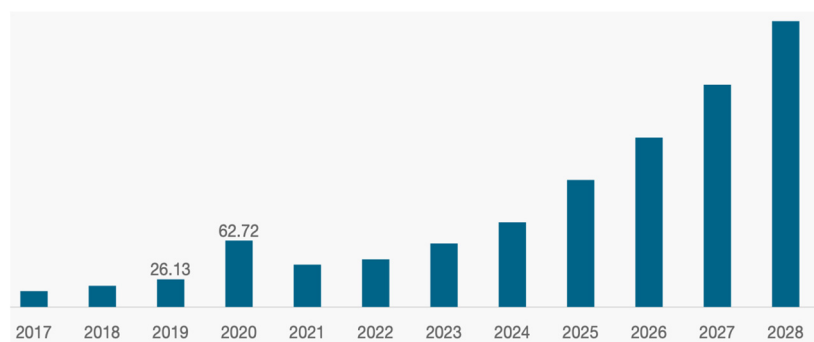


Figure 1. North America Telehealth Market Size from 2017 to 2028 (predicted). Collected from Ref. [10]

TABLE III. WELL HEALTH'S CONDENSED FINANCIAL STATEMENT FOR THE THREE MONTHS ENDED JUNE.30, 2020 [11].

	Three months ended June 30, 2020 \$	Three months ended June 30, 2019 \$	Six months ended June 30, 2020 \$	Six months ended June 30, 2019 \$
Revenue	10,578,144	7,402, 271	20,805,144	14,790,314
Cost of clinical and digital services	6,351,313	5,151,372	12,636,358	10,271,922
Gross Profit	4,226,831	2,250,899	8,168,786	4,518,392
Gross Margin	40.0%	30.4%	39.3%	30.5%

Adjusted EBITA	543,015	556,255	788,947	894,720
Net loss and total comprehensive loss	3,387,579	1,726,51	5,401,954	3,176,765
Net loss per share -for the period	0.03	0.02	0.04	0.04

3.3 Social

Public opinion, support, and opposition have always been essential factors to determine the rise and fall of industry. As for Telehealth, an emerging Industry, people did not have a deep understanding of it before the epidemic. However, in 2019, with the outbreak of COVID-19, the government's demand for social distancing and various policies to restrict the movement of people made face-to-face services difficult and hindered the delivery of some much-needed services [11]. For example, sometimes, patients can receive instant help in the first place. In such cases, teleconsultation and remote Monitoring services are one of the best solutions. As Telehealth has become more common, its acceptance has increased. For instance, according to the data provided by Teladoc, a well-known company in the Telehealth industry, the number of online consultations provided by Teladoc in 2020 was between 8 million and 9 million [10]. In 2019, the number of online consultations was around 4.1 million [10]. That shows twice as many visits in 2020 as in 2019, which is undoubtedly considerable.

Although the public well receives Telehealth, the concerns that arise should not be ignored. For example, the cost of providing online medical services is enormous, which is mainly due to development and investment in new technologies, equipment maintenance wear, and tear, communication, and data storage between organizations to ensure accuracy and convenience of diagnosis. It is unknown whether patients and companies can afford the long-term costs and funding, or whether the state is willing to pay for it. Besides, as Beland et al. have noted, the fragmentation of financing during a pandemic is particularly acute [12]. In the United States, in particular, during the economic downturn caused by the pandemic, a sharp decline in consumption, income, and asset values led to a sharp decline in state revenues, resulting in inadequate Medicaid and rising demand. In addition, tens of millions of unemployed people lost their Medicaid and unemployment benefits as unemployment soared during the pandemic. As a result, states are expected to suffer hundreds of billions of dollars in lost revenue between 2020 and 2022 [12]. The U.S. government is now actively looking for ways to reduce Healthcare costs. As mentioned above, the development of Telehealth was suppressed and questioned by some people under the condition that the country was already living beyond its means.

Therefore, a topic that has aroused public discussion has arisen, which is the path to achieve an evolving balance between technology, Economics, and policy within the Telehealth industry to maximize the reduction of healthcare costs. Kern et al. discussed such a loaded question, arguing that the effective way to control the growth of health spending is to assess the actual cost reductions and compare them with the long-term benefits they produce [13]. In addition, several new medical programs or blueprints prove that rising costs in the short term are not necessarily a bad thing in themselves. When the long-term health of the public is assured and disease prevention is undertaken correctly to avoid the outbreak of any further major clinical problems, all efforts will be worthwhile because the quality of life and productivity of the whole

society can be improved. There is indeed a need for constant efforts to achieve an evolving balance between technology, economics, and policy in the present situation. Bioengineers, economists, technology investors, insurance insurers, and government lawmakers need further ongoing collaboration and investigation [13]. Even in the current pandemic, there are many different voices in the discussion of Tele Health's development. However, from the perspective of development and human relations, the development of the Telehealth industry can still be said to have room for further improvement.

3.4 Technology

In the Telehealth industry, technology is always the core. Online healthcare platforms have existed since before the COVID-19 outbreak, but they are relatively crude. With the development of the epidemic, more factors have been considered, and all functions of the online medical platform have been gradually improved and become more advanced with the progress of science and technology. For example, integrating IT applications into healthcare, hospitals, doctors, healthcare providers, pharmacies, drones, automated robotic delivery, information sampling departments, and other departments can be connected in a one-stop way to achieve information synchronization [14]. This effectively reduces costs for patients and service providers due to duplicate diagnoses, medical errors, misplacement of records, unnecessary storage, and time-wasting activities [9]. Infection from direct contact is also avoided.

In addition, e-health helps enhance communication and networking between patients, physicians, and healthcare organizations. It enables patients to gain insights and immediate help and stimulates informed discussions among professionals in organizations about better treatments and techniques. It also changes the traditional doctor-patient relationship. In the original offline services, it was generally the case that the doctor customized the patient's complete treatment plan. Patients themselves don't have much control, which may make them feel insecure or apprehensive [9]. Such concerns are being addressed. For example, Prof. Joseph Andrade and Colleagues from the University of Utah demonstrated and discussed the new technological development of a new bio-sensor to help detect the broad spectrum of metabolic conditions [13]. Its function is to quickly measure a variety of analytes from a single physiological sample, such as urine, blood, saliva, and tears, to detect a wide range of clinical conditions, and to enable both the patient and the physician to have a detailed understanding of the patient's condition [13]. This is beneficial because patients can also understand their own condition and cooperate with doctors to make further treatment or suggest corresponding, more appropriate treatment.

Another example is when patients start using smart monitor provided by online healthcare platforms. The monitor can send regular reminders to the patient to take medicine or take a physical test and notify the patient and the doctor in charge when the patient's body appears abnormal (e.g., a sharp change in heart rate) [9]. In addition, a free medical knowledge website credible is also in the works. These sites aim to enable patients to search online for information, judge the reliability of online advice and participate in the development of their care [9]. These developments have made telemedicine both more convenient and more trustworthy. If it continues to improve, e-health can be considered a great and promising tool for enhancing previous versions of healthcare services.

4. RATIO & SWOT ANALYSIS

4.1 Descriptions of the target and ratio analysis

Teladoc Health Inc. is the first and largest telemedicine and virtual healthcare company in the U.S., offering various services including platform and program services, guidance and support, expert medical services, mental health services, telehealth devices, and AI and analytics. The company was founded in 2002 in Dallas, Texas, U.S., which mainly provides remote medical care consultation services through telephone and video conference [15]. It has acquired companies, e.g., BetterHelp, Best Doctors, Livongo, Advance Medical and HealthiestYou. The company is initially called Teladoc Inc. and changes its name to Teladoc Health Inc. in 2018 [16]. In 2015, it goes public in New York Stock Exchange and continues growing [17]. By July 2020, Teladoc's reported revenue is 241 million, increases by 85% compared to 2019 [18]. The company provides the access of more than 40 million users in 2021 [19].

To analyze the financial performance of Teladoc Health Inc., three types of ratios are utilized, namely risk ratios, profitability ratios and market ratios. According to the Table IV, Teladoc health has relatively high current ratio and quick ratio, which are both greater than 3, and this value is desirable compared to an average current ratio of 1.66 and an average quick ratio of 1.25 for healthcare industry in the U.S [20]. They measure the ability of a business to meet its current debt obligations, and higher ratios mean that the company has more ability to pay for its current liabilities. Total debt ratio is 10.5%, meaning that the total debt of the company only takes 10.5% of the company's total asset, is considerably low compared to the average total debt ratio of 51% of the industry. Similarly, a debt/equity ratio of 9.3% is also much lower than that of the entire industry (74%) [20]. For the value of beta, 0.24 is an extremely small number, indicating the company is less volatile than the whole market. Therefore, Teladoc is very cautious in avoiding the risk of defaulting debts, it has risk advantages in both the aspect of firm specific risk and market risk. However, there are always risks to keep in mind for investors.

TABLE IV. FINANCIAL PERFORMANCE OF TELADOC HEALTH INC. IN 2020

Indicators	Teladoc health, Inc.	
Beta (5Y Monthly)	0.24	
Current Ratios	3.19	
Quick Ratios	3.02	Risk Ratios
Total Debt Ratios	10.5%	
Debt/Equity Ratios	9.3%	
Profit Margin	-44.30%	
Return On Assets	-2.73%	
Return On Equity	-3.05%	Profitability Ratios
Net Earnings	-763,319	
P/E Ratios	N/A	
P/B Ratios	1.44	
Forward Dividend Yield	N/A	
PEG Ratios	N/A	
50-Day Moving Average	154.23	Market Ratios

200-Day Moving Average	182.93
Insider Purchases (Last 6 Months)	897,426
3-Year Share Buyback ratio	N/A
Numbers of Institutions Holding Shares	1,166

For profitability ratios, since Teladoc health has a negative net income, Profit margin, ROA and ROE are all negative. These ratios are all bigger than the average profitability ratios of the industry [20]. However, this seems to be a normalcy for many technology companies. Similar to Tesla and Amazon in the beginning years, net income of Teladoc is negative despite significant growth in revenue. The explanation is that the company aims at expanding its size to capture more market share. It may spend more money in growing the number of users and stuff and developing new technology to promote the efficiency and accuracy of the online platform. If the rapid growth rate continues, Teladoc may benefit from Economies of scale, which is the reduction in long run average cost as the scale of production increases. This concept will be more detailed in part three. Due to the special feature of the company, the investors are also not normal investor, they regard Teladoc's sales growth as a more important factor than its loss in profit. They are comfortable with the growth instead of short run profit loss, i.e., they will hold most of their stocks even if the market falls. That is the reason why the beta for this stock is quite low. Investors are seeking for a long-term bet, they can bear more risks in the short run. This is similar to the idea of venture capital investment.

For market ratios, since Teladoc health is a listed stock in the recent years, it doesn't have PE and PEG ratios. Therefore, it is hard to deduce whether growth investors will buy it or not. Due to its own features, normally value investors will not be interested in it. Its price of 500-day moving average is smaller than that of 200-day, i.e., momentum investors may not buy it as well. Nevertheless, the company has significantly high in sider purchases, and there are more than one thousand institutions holding its stocks currently. Confidence from the public really exist for the company and its CEO, new opportunities may appear in the future as the rapid development of telemedicine.

4.2 SWOT analysis

TABLE V. SWOT ANALYSIS MATRIX OF TELADOC HEALTH

Strengths	Weaknesses
1.The largest telemedicine firm to benefit Economies of scale 2.Acquisition of applied health signals company Livongo Health 3.Diversification of services 4.Rapid growth rate and potential	1.Negative net income 2.High SG&A cost
Opportunities	Threats
1.The development of telemedicine industry due to the pandemic 2.Acquisition and merger in the future 3.Global expansion	1.Other competitors e.g.: American Well 2.Vaccination may lead to a fall in demand for telemedicine services

Teladoc Health Inc. is a typical example of telemedicine firms. This paper will analyze the inherent strengths and weaknesses and the future opportunities and potential threats of the company by using the technique of SWOT Analysis. The matrix in Table V arranges a summary of the four components of SWOT Analysis. Each statement will be further explained afterwards.

4.2.1 Strengths

4.2.1.1 The largest telemedicine firm to benefit Economies of scale.

As the largest telemedicine firm in the U.S, Teladoc health owns the largest market share (13%) in 2021, which is significantly large compared to its opponents, Doctor on demand (3.2%), American Well (3.0%) and MDLive (1.5%) [21]. Therefore, the company is likely to benefit from Economies of scale, which is the reduction in long run average cost as the sale of production increases. For example., Technical economies which means large companies may be able to fund their own research and development departments to improve the efficiency of production process and boost innovation for new products and services. For Teladoc, its expense spent on research and development increases significant in the recent years. The maximum expense is 92.70 million on December 31, 2020 [22].

4.2.1.2 Acquisition of applied health signals company Livongo Health

In 2020, Teladoc health acquired leading chronic care provider Livongo Health, which is a significant step for Teladoc. Livongo owns a large number of patients with chronic diseases. At the end of June 2021, it has 715,000 users [23]. The number of users continues increasing since the company intends to massively grow its services for patients who suffer from diabetes, together with severe obesity and weight management problems. This suggests that a considerable percentage of adult population will use this service. Therefore, the members of Teladoc may rise rapidly in the future. The acquisition is expected to lower the synergies cost by 60 million between two firm [21].

4.2.1.3 Diversification of service

As a large company, Teladoc health provides various services and has acquired many firms to take their services and members. For example, in 2015, the takeover of BetterHelp, a company focusing on mental, behavioral, and counseling service online, leads to a 500% surge in demand of mental health services for Teladoc [23]. The diversification of services can also attract more consumers against competitors and lower risks of losing demand.

4.2.1.4 Rapid growth rate and potential

Teladoc health is experiencing significant grow rate with the spread of the pandemic. In 2020, the company has 10.59 million visits. The number doubled compared to a number 4.14 million in 2019 [24]. Now, the company includes Teladoc, Advance Medical, Best Doctors, BetterHelp, HealthiestYou, Advance Medical, InTouch Health and Livongo Health, accounting for 13% of the total market share for telehealth industry. The company's compound annual growth rate (CAGR) in 2020 is 33% [21]. According to the prediction of Khaveen Investment, the forecasted market CAGR for 2022 and 2023 is 33%. This huge grow rate and growing potential can strengthen the dominating position of Teladoc Health in the industry.

4.2.2 Weaknesses

4.2.2.1 Negative net income

Like many fast-growing technology firms, Teladoc health has negative profit. Although the profit margin is improving in the recent years, the loss of profit is still a significant inferiority of the company. This indicates that the company should issue new debts or shares of stock to collect funds. The rise in debt and stocks may cause a fall in the confidence of shareholders and investors.

4.2.2.2 High SG&A cost

Due to the high cost in selling, general and administrative expenses (SG&A cost), Teladoc health has difficulties in making profit. The acquisition of Livongo causes the SG&A costs in 2020 to increase by more than 100% in 2020 compared to that in 2019. The huge rise in costs inevitably worsened the company's negative profitability and its balance sheet.

4.2.3 Opportunities

4.2.3.1 The development of telemedicine industry due to the pandemic

The outbreak of pandemic has increased the demand for virtual software healthcare. Telemedicine has the advantage of low cost and high conveniency. Because of technological advances and the need of social distancing, telemedicine industry, as an emerging industry, will continue to grow to provide consumers more qualified services, offering opportunities for its companies.

4.2.3.2 Acquisition and merger in the future

Teladoc will also follow the trend of the industry to grow and increase its competitiveness. It will continue growing by mergers and acquisitions to gain larger market share and monopolistic power.

4.2.3.3 Global expansion

Teladoc health is planning to acquire more telehealth companies and expanding its service in more countries in the world.

4.2.4 Threats

4.2.4.1 Other competitors e.g.: American Well

Although Teladoc is the largest telemedicine company in the U.S, it still has severe competitors such as American Well, the biggest competitor, which is founded in 2006 and goes public in 2020 [25]. Amazon may a potential competitor since it takes over Pillpack in 2018 and starts Amazon Pharmacy. It is a company that has strong balance sheet to store ample funds used to buy other firms and step into the market of telemedicine in the future [25].

4.2.4.2 Vaccination may lead to a fall in demand for telemedicine services

The vaccination campaign may reduce of risk of face-to-face healthcare services. Some consumers may come back to hospital and sanatoriums. This may slow down the growth of

telemedicine industry.

5. COMPETITORS ANALYSIS

Except Teladoc Health, Inc., there are other companies offering virtual software and operating the business of telemedicine or telehealth. Unlike Teladoc Health, Inc., they are not the leading enterprise, but they also play an important role in the development of telehealth industry undeniably.

There are mainly two different types of telehealth companies. The companies of Type One have been founded for a period of time and have developed for several years before the pandemic, e.g., Doximity, Inc. and American Well Corporation. Founded in 2010, Doximity, Inc. offers the service that physicians could contact the patients, and now 80% of American doctors and 50% of all NPs and physician assistants are verified members [26]. Founded in 2006, American Well Corporation has covered 80 million members and 71 thousand providers, who have Amwell as a benefit [27]. Besides, Doximity, Inc. and American Well Corporation were floated on the stock market. In contrast, the companies of the other type benefited from the opportunity to develop their small-scale telehealth business, e.g., iCliniq, MDlive. These companies are mostly funded during the pandemic.

5.1 Analysis of Companies of Type One

For the companies of first type, Doximity, Inc. and American Well Corporation are chosen. In order to find out the development during and after the pandemic, financial data are adopted, and some ratios are calculated [28]. Then, the information derived from the data would be fit into the BCG Matrix to locate the position.

5.1.1 Analysis of Companies of Type One

According to the figure 2-3, net income of Doximity, Inc. soars. Besides, Total debt ratio and debt equity ratio's variation shows that before the pandemic, Doximity, Inc. owed enormous money, which was a very significant dangerous factor. However, during the pandemic, both ratios decreased to less than one. For profitability Ratios, total asset turnover and return on asset were approximately the same. Profit margin soared before the pandemic, but it had a subtle decrease during the pandemic. Additionally, return on Equity decreases significantly during the period of epidemic situation.

Fitting the data into BCG Matrix, Doximity, Inc.'s service is in the area between Stars and Cash Cows. When the pandemic began, Doximity, Inc.'s product had relative high growth rate and high profitability. During and after the pandemic, the growth rate decreased, but compared with the scale of the company, the profitability did not reach the standard of Cash Cows. In addition, based on the status of telehealth industry, Doximity, Inc. is also not the leading enterprise. Meanwhile, there is the possibility that after the competition in the industry of telehealth getting more and more intense, some clients might abandon Doximity, Inc.'s service and take other companies' services [29]. If this possibility comes true, Doximity, Inc.'s service might even move to Dogs, even though the trend is not visible now. Nevertheless, this also means a growth in the entire telehealth industry during and after the pandemic.

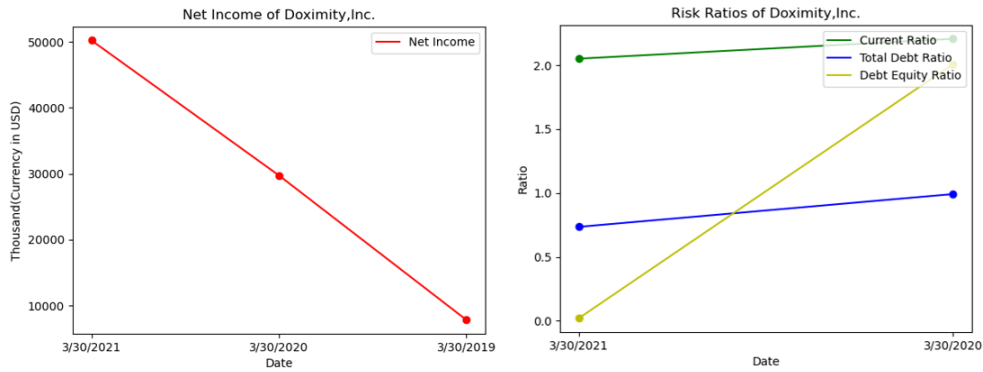


Figure 2. Net Income and Risk Ratios of Doximity, Inc. versus Time

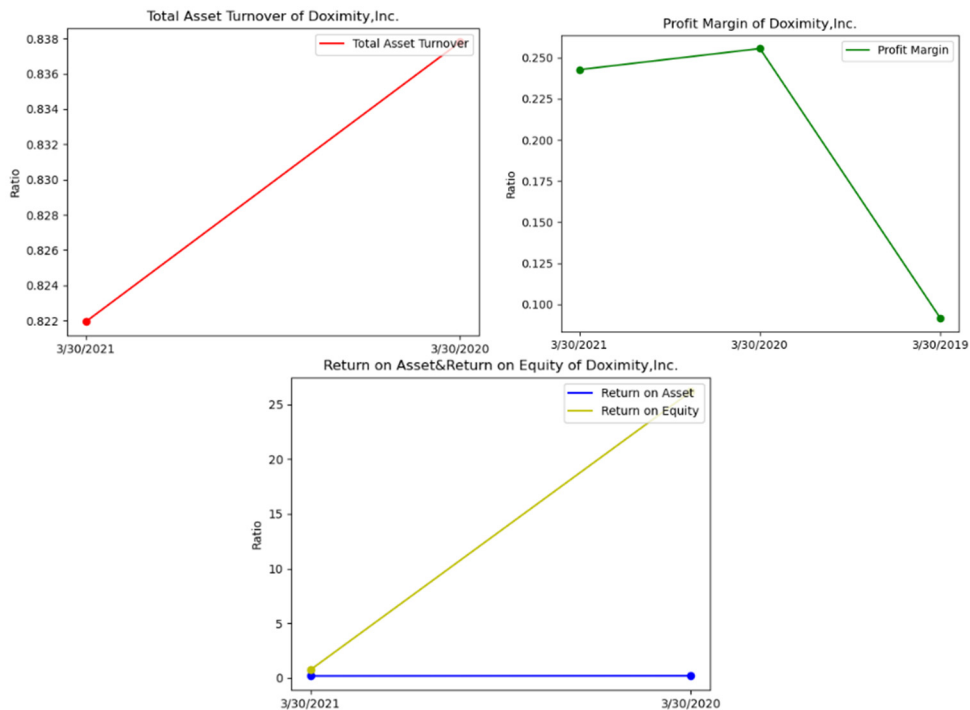


Figure 3. Profitability Ratios of Doximity, Inc. versus Time.

5.1.2 American Well Corporation

For American Well Corporation, current ratio and quick ratio both soared during the pandemic, especially during the most serious period in United States [30]. Total debt ratio and debt equity ratio also decreased, and both ratios now are really low. Total asset turnover reduced by half, but it is not very significant because the ratio itself was very low originally. Because the net income

of American Well is negative, profit margin, return on equity, and return on asset are all negative, but all of them are approaching to zero (shown in Figure 4-5).

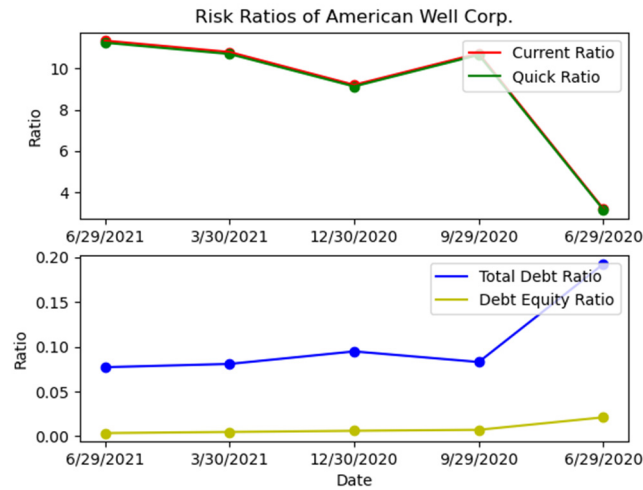


Figure 4. Risk Ratios of American Well Corporation versus Time

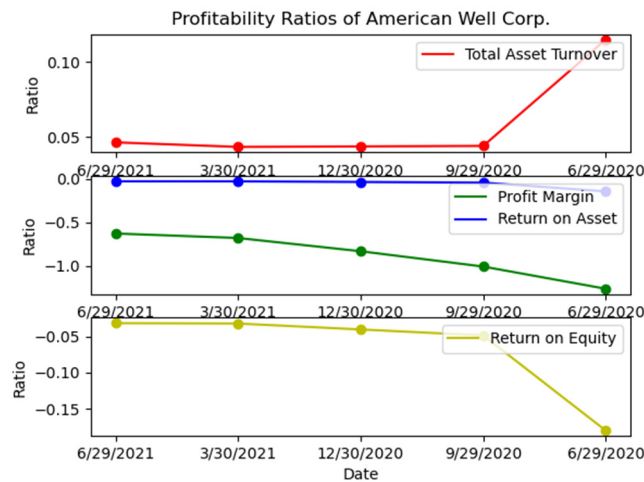


Figure 5. Profitability Ratios of American Well Corporation versus Time

Fitting in BCG Matrix, American Well Corporation is in the area of Question Marks. It is true that American Well Corporation does not have enormous market share, but the growth rate is very significant. These features fit the standard of Question Marks. Because of the potential in the future, it is worth to invest more money. Besides, American Well Corporation also bought other company's product to enhance the market [31]. Nevertheless, these actions also have

possible dangerous factors. Net income of American Well Corporation is always negative, and the stock price is decreasing also. Even though the current ratio is very high, and American Well Corporation has very strong liquidity, it could also cause sudden bankrupt without entering the area of Dogs or Stars in BCG Matrix.

TABLE VI. MONTHLY STOCK PRICE OF AMWL

Date	Open	High	Low	Close	Adj Close	Volume
2020/10/1	30.60	41.90	25.17	25.81	25.81	64494200
2020/11/1	26.18	31.55	21.34	26.54	26.54	77671000
2020/12/1	26.64	33.75	24.51	25.33	25.33	72236000
2021/1/1	25.48	43.75	24.4	35.41	35.41	79724100
2021/2/1	35.79	37.60	23.6	24.47	24.47	35709300
2021/3/1	25.46	26.42	15.53	17.37	17.37	106108400
2021/4/1	17.98	19.21	15.26	15.39	15.39	62537000
2021/5/1	15.38	15.38	9.69	12.45	12.45	87822700
2021/6/1	12.54	14.76	12.28	12.58	12.58	105783900
2021/7/1	12.55	12.76	10.55	11.65	11.65	42952000
2021/8/1	11.71	11.73	9.43	10.71	10.71	53562200
2021/9/1	10.75	11.02	10.04	10.77	10.77	10861300

5.2 Other Companies of Type Two- an Overview

While these companies do not have a huge market share, their performance could also imply the entire industry because they do not have original competitiveness before the pandemic like Doximity, Inc. and American Well Corporation. Among these corporations, many of them have got the latest funding during the pandemic, like MDlive, PlushCare, and Doctor On Demand. Besides, MeMD was acquired by Walmart in May, 2021 [32]. These signals imply the opportunity brought by the pandemic for the development of entire telehealth industry in United States.

6. FUTURE DIRECTION

6.1 Brief History of Telehealth

Phone and video medical consultations have already been used for decades as a means to diagnose or treat patients at different locations, typically in rural areas. In 1959, a hospital in Montreal pioneered teleradiology, allowing images to be sent for review over long distances. In the early 1970's NASA partnered with Papago Nation of southern Arizona to establish the STARPAHC, a project to deliver health care to rural areas. Mobile healthcare units (customized ambulances) would be connected to larger, better equipped medical institutions over microwave, VHS radio and telephone connections. The similarity between treating patients in rustic areas and astronauts have led NASA to invest and experiment with Telemedicine's potential. According to Ronald C. Merrell, the director of MedITAC (a partner of NASA), as space travel becomes more relevant, telemedicine will become crucial for astronauts [33]. In 2004, doctors from VCU were invited to fly aboard NASA's KC 135 aircraft, where they simulated performing medical procedures such as surgery in zero gravity conditions.

Telemedicine accelerated dramatically in the 1990s, when more efficient and inexpensive technologies allowed information to bypass expensive satellites and fiber optic lines. As these technologies developed, newer telemedicine applications shifted their focus towards transferring and storing data, telemonitoring, response prioritization and automation. Whitten et al. points out that telemedicine has the potential to both decrease and increase the cost of healthcare by affecting the supply and demand balance of doctors and patients [34]. A study conducted by Statista highlights the increasing relevance of telemedicine in the past 8 years. Analysts predict that the telehealth market is projected to reach between a low of 46 million visits to a high of 81 million visits by 2022 (See Figure 6) [35].

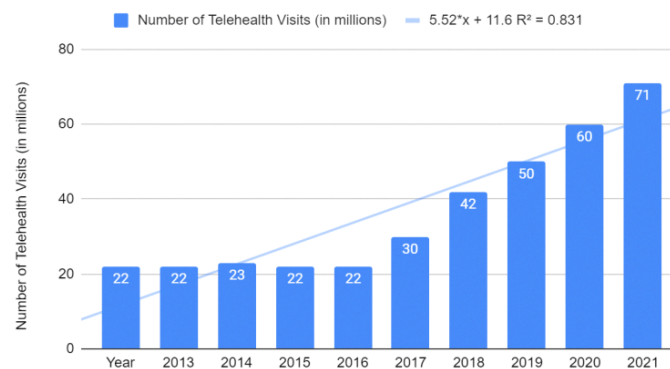


Figure 6. Number of Telehealth visits (in million) from 2013 where the data is collected from [35]

6.2 Integration of Telemedicine

The COVID-19 pandemic heavily restricted in-person visits to clinics and hospitals. According to Bestsenny et al., telehealth utilization for office and outpatient visits in April 2020 increased by 32%. After peaking in April, telemedicine usage has stabilized to a 13 to 17% increase across all specialties [36].

Telemedicine has helped provide secure medical consultations for people with greater risk of severe illness and death from the COVID-19 virus. Specifically, telemedicine has allowed women to access safe abortion and contraception. This implies that telemedicine has the potential to prevent the thousands of pregnancy related deaths and the millions of unsafe abortions that befell during the pandemic. The service has helped reduce the strain of abortion providers and doctors, but also provide women peace of mind during period of anxiety and loneliness.

Additionally, telemedicine is able to provide healthcare to isolated human populations. Aboriginal isolation has been a prominent issue in North America, telemedicine can help treat reserve-based Indigenous peoples without intruding on their land and privacy.

Serving sentences of human beings in correctional facilities are also able to receive medical consultations and treatment without risking the safety of the doctor and the facility. The US incarceration rate has been steadily increasing for the past few decades, only declining in the 21st century. This implies that in the future, telemedicine will become the primary form of medical assistance provided in prison. Furthermore, Laurie Hess et al. suggests that

telemedicine services currently used in human treatment will soon make their way to veterinary practice. Some veterinarians are already offering virtual examinations and consultations for pet owners who aren't able to travel to a veterinary hospital. As stated by Dr. Drivers, a veterinary practitioner, virtual consultations can provide the customer with valuable case input and recommendations from veterinarians [37]. These consultations can include previous photographs, lab results, and diagnostic imagery that can help the veterinarian make a decision as to whether or not the owner needs an in-person visit or a referral. Dr. Graham et al. are largely in agreement with the fact that telemedicine will become a significant portion of their jobs [37]. However, hands-on physical examination will always be preferred and superior in terms of accurate diagnostics.

6.3 Investor Activity

Rock Health's venture funding database shows that venture capital investing in telemedicine skyrocketed in the first half of 2021, totaling to 14.7 billion USD. This doubled the amount of investment of 2019 and was more than the entire year of 2021. Since then, more and more healthcare companies are adapting their business models to a hybrid of virtual and in-person consultations and treatments. One can reasonably infer that the increase in investment in telemedicine connotes a confidence in the effectiveness of telemedicine and its future

6.4 Implications for the Future

Previously, telemedicine has always developed alongside technology, expanding its efficiency with every new piece of technology invented and improved. One can reasonably infer that as more innovations are made, telemedicine will only become more effective at providing healthcare services. Moreover, increasing high risk venture capital investments in telemedicine signals confidence in the future of the telemedicine industry. The integration of telemedicine into the business models of health care providers has already begun. Additionally, based on physician and consumer feedback, it can be reasonably inferred that the majority of future healthcare providers will have a hybrid model between in-person and virtual services. Until telemedicine further improves its capabilities and establishes its credibility with physicians and consumers, in-person visits will always be preferred and more effective.

7. CONCLUSION

In order to investigate the development of telemedicine and virtual software during and after COVID-19 and its impact on the healthcare industry, we use various data from different companies to calculate the financial ratios, e.g., risk ratios, profitability ratios, and market ratios and unwind the further meaning. Additionally, analytical models (e.g., PEST analysis, SWOT analysis, and BCG Matrix) are employed, incorporated with the financial ratios to analyze the condition of the entire telehealth industry and predict the trend in the future. Involving the political factors, economical factors, and social factors which are affected by the pandemic, assisted with mature technology, PEST analysis indicates the promotion from different resources. Even though there are some concerns, compared with the promotion, the concerns are more subtle. Then, the leading company of the telehealth industry, Teladoc Health, Inc., is analyzed via financial ratios and SWOT analysis model. Teladoc Health, Inc. performs well from the perspective of risk ratios and market ratios. Even though the profitability ratios are

negative because of the negative income, it is also reasonable. Besides, the disadvantages of Teladoc Health, Inc. are related to other companies in the same industry, implying that the entire industry is developing significantly. This is also verified by the analysis based on BCG Matrix and ratios of other competitors. Overall, the entire industry encounters a very significant opportunity according to the analysis for these companies of the telehealth industry. Finally, a comprehensive analysis displays that from various perspectives, remote healthcare and telehealth would be more popular, and the industry would expand significantly, which is coincident with the other analyses. Simultaneously, the development of telehealth might dramatically change the future approaches of the healthcare industry. These results offer a guideline for future trend of the variation of healthcare industry while humans co-exist with the COVID-19.

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