Advances in Economics, Business and Management Research, volume 219

Proceedings of the 2022 2nd International Conference on Enterprise Management and Economic Development (ICEMED 2022)

Evaluating Digital Health Care Startups: Forecasts and Market Insights

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ABSTRACT

The digital health industry is one of the fastest-growing sectors in the global economy. Significant changes are expected to occur shortly due to the increasing use of artificial intelligence, technology and other industries. The fluctuation of Covid-2019 disease and the economic recession in early 2020 further exacerbated growth. In 2020 and early 2021, the growth rate of telemedicine and telemedicine was particularly impressive, followed by a mild reversal in the process of 2021. This is due to the global lifting of quarantine systems and related closures, so patients around the world prefer to visit their doctors in person. Nevertheless, we expect telemedicine to continue to be of great significance as the importance of online service delivery continues to grow. The industry is expected to be affected by the further digitization of patient records, maintenance and bills, as well as drug prescribing methods that minimize the risk of human error and improve efficiency. This paper suggest ways in which Digital Health Care would become a trend in the near future by using different methods.

Keywords: Digital health, Mobile health, Telehealth, Artificial intelligence, Remote care

1. INTRODUCTION

Digital health also referred to as digital healthcare (hereinafter, DH) is a relatively new term in contemporary studies about healthcare system transformation. In the absence of a formal academic definition, one can apply the definition proposed by the World Health Organization (WHO), according to which "Digital health is a broad umbrella term encompassing e-health, as well as developing areas such as the use of advanced computer sciences (for example, in the fields of "big data", genomics and artificial intelligence or AI" [1]. More broadly, DH is a point of intersection of the most recent advances in technology (including AI) and the global healthcare system. The paper attempts to explore business opportunities in the DH segment through performing a market study and developing a financial model to track its performance. It is challenging at the moment to track the performance of the DH-focused entities due to limited historical data. Therefore, there is insufficient research on the subject matter and the author attempts to cover the gaps in the underlying research to identify critical issues in the process of evaluating and forecasting the performance of the DH segment, its major challenges, opportunities, and threats.

The quantitative tools used in the research will be largely based on the study of Cichon et al. who provided a detailed analysis of the descriptive and analytical tools that can be applied in the digital healthcare industry [2]. According to the authors, descriptive tools primarily include the outcomes of financial reporting and related control procedures and are largely represented by financial accounting data and related historical statistics . Analytical tools allow the users to map the available financial and operational data to assess the DH entity's past performance. Based on the analytical tools applied to the "mapped" data it is possible to estimate the amounts of financial and other resources required to maintain adequate quality of the healthcare services provided to the patients. In addition, the analytical tools allow making accurate future projections of the performance metrics. Based on these projections, short – to medium-term estimates can be made for the required transfers (as applicable for the tax-based systems) or contributions from the patients (for the contribution-based healthcare systems). Finally, analytical tools allow performing simulations of the monetary effect of the changes in the input data to the existing operating and financial models. The simulations can be performed through the application of "what if" scenarios and projections.

The detailed analytical tools used in the derived model are largely based on the study conducted by Hitchner in 2017 whereby a general algorithm for the health care financial model input parameters and the underlying assumptions are provided in sufficient detail [3]. It is interesting to note that the author in his study provides a textbook example of the model from the point of view of estimating the enterprise value of the healthcare business unit, which is relevant for our study as ultimately, the improvements that are brought by digitalization and other technological advances should be reflected in improved valuation multiples. The author emphasizes the importance of familiarity with the applicable regulatory regime for the healthcare segment and highlights several industry-specific factors about revenue projections and pricing that need to incorporate into the model. As the digital healthcare business entities very often emerge in the form of technological start-up ventures, the authors of the study deliberately decided to apply the financial modelling approach developed by Sawyer in his 2009 work on the modelling for the technology start-ups. As the DH entity's revenues (and cash flows) that eventually drive the valuations substantially depend on the underlying technology and related intellectual rights, the author in his study emphasize the importance of adequately valuing the intellectual property (which n various shapes and forms including the patents, copyright and trademarks and trade secrets), which form a core of the prospective business model [4]. Identifying relevant intellectual property and exerting appropriate controls over these assets is critical in monetizing their value in the future. The author also introduces a relevant for the study concept of the value-based enterprise (VBE), which treats every significant process or milestone in the enterprise development as a relevant value-adding event. This allows to break down the value-building process into a series of stages. Reaching every stage successfully (with the predefined set of reasonable assumptions and criteria) accretes the value of the enterprise to the desired level. This paper will use the VBE approach in developing our model for the DH segment enterprise.

Evaluation of the performance of the DH entity cannot be based solely on the relevant entity's financial data review. To make the fundamental analysis relevant, system-wide operating performance statistics need to be thoroughly reviewed as well. The overall healthcare system operating KPIs relevant for our study are described in sufficient detail in the works of Aday et all in their 2004 study. Specifically, the authors introduce the concepts of Effectiveness, efficiency, and equity as the applicable criteria for evaluating the system performance [5]. According to the authors, the term effectiveness captures how the relevant healthcare system improves the health of the patients (or population), efficiency measures how these improvements are correlated with the monetary value of the resources that

are necessary to produce them, and, finally, the notion of equity sheds light on the existing health disparities among the patients' effectiveness of the applicable processes and procedures that address them.

The research aim is to develop a systematic process for analysing the historical financial performance of the DH sector entities, based on which a forecast for the future can be derived. The aim of the study will be attained through the development of a uniform financial model for a DH sector entity. The model will include a dashboard with the set of Key Performance Indicators, KPIs) that tracks the historical performance and provides insights for the future.

The study is comprised of five chapters. Chapter 1 includes the introduction of the research subject. Chapter 2 provides an existing literature review related to the DH sector performance review. This will include the analysis of the studies on current challenges faced by the global healthcare system. The challenges are centred around the scarcity of the resources (capital, human and other) and shortcomings of the applicable health insurance (lack of reach and affordability). The literature review also covers an analysis of the opportunities for DH and potential for further development. The review will also include the analysis of the impact of the COVID-19 virus outbreak on pharmaceutical and medical device markets, as well as the channels of the healthcare services delivery and advances on telehealth and telemedicine driven by the pandemic. In Chapter 3 Research methods used in the study will be discussed in detail. These will include qualitative and quantitative methods of research, based on which a comprehensive model will be developed. The model is required to analyse the current state and predict the future. A concept of ESG and sustainable development can also be written in the paper. Chapter 4 will highlight the results of the Data analysis and related discussion. The study will be concluded with Chapter 5 with the list of recommendations and conclusions based on the conducted research.

2. CONCEPT DESCRIPTION

2.1 DH evolution

According to the study conducted by White & Case in 2015 Digital healthcare technologies are expected to drive the development and application of innovative ways for the medical service delivery that will reshape the healthcare markets all globally [6]. The new advancements in technology will allow improved access to medical services. As the authors stated in the results of their study, over 90% of companies expect that digital health will have a profound impact on operating performance and business strategies applied by the DH entities globally. These entities surveyed in the respective study also expressed to scale up their existing capital expenditures in digital health.

It is worth noting the study conducted by Bauer in 2017. According to the results of the study and conclusions reached by the author, there are the following general trends in the segment of healthcare start-ups. First is the application of artificial intelligence, machine learning, telemedicine, and virtual reality (VR). The second trend is the involvement of data analytics, genomics/sequencing, digital medical devices, and healthcare management in a contemporary technological environment and the third is the application of big data, which has already become a buzzword in the modern DH.

2.2 COVID-19

It is worth reviewing the study of Peek, Sujan, and Scott, 2020 that was dedicated to the impact of COVID-19 on DH service delivery. The authors state that following the COVID-19 virus outbreak, substantial challenges for DH services globally emerged that triggered the largest economic and health crises in recent history. The pandemic situation and related volatility acted as a stress test for the contemporary digital health technologies across the full spectrum of healthcare services, from medical examination and evaluation to the development of new treatment methods and technologies. The authors also state that the COVID-19 pandemic greatly affected service delivery, artificial intelligence (AI) as well as data-sharing channels. The exact monetary value of the impact is yet to be determined. Nevertheless, the emergence of black swans like COVID-19 need to be factored in either in the applicable financial model assumptions or used as an adjustment factor for the input parameters.

2.3 DH effectiveness -a cautious stance

Despite the widespread views and general optimism regarding the positive impact of the application of DH, there are still contradictory views as reflected in the study conducted by Donnelly, 2020. In his research paper, the author implies that although the implementation of DH technologies has become a common trend within healthcare entities (due to perceived benefits of providing improved effectiveness and efficiency of the services to the patients and more personalized service, particularly in chronic diseases), nevertheless the recent reviews indicate that there is no substantial support obtained that would demonstrate that DH improves the management of certain illnesses, primarily, chronic diseases. The results of the study will be used to use more conservative assumptions in building the model to avoid overly optimistic projected performance metrics that would drive the valuation multiples unjustifiably high. [7].

2.4 ESG principles in DH

PWC paper provides a comprehensive review as to how the Environmental, Social, and Governance (ESG)

principles can be applied in healthcare [8]. According to PWC, there are distinct advantages in applying ESG that value accreting. Authors suggest that ESG principles should be followed and implemented via an actionable plan. ESG application also can lead to cost savings when sustainability measures are incorporated into the healthcare services delivery process. For the underlying research, S & P Global ESG rankings and related methodology will be applied to assess the ESG scores [9].

2.5 Chapter summary

Based on the literature review conducted, this study concludes that to evaluate the DH entity performance and make relevant and accurate projections for the future, the applied model needs to be based on a set of reasonable yet conservative assumptions to ensure that projections reflect realistic estimates of the effect of DH application. Based on some of the studies referred to above, not all DH applications resulted in service improvements. It should also be noted that the application of ESG leads to significant cost advantages and increases in valuation multiples.

3. MODEL

3.1 Financial model

3.1.1 Historical KPI

The research methods will include a detailed review of the sector entities' historical financial performance, based on the data available from their respective annual and interim reports. The review will include the analysis of the key financial and operational performance metrics that are most relevant for the study. The following key performance metrics will be reviewed in the study - Profitability ratios (including return on assets or ROA, gross margin, and net margins ratios). The aforementioned metrics will be calculated using the following equations:

$$ROA = \text{Net income after tax/Total assets} \qquad (1)$$

$$\text{Gross profit margin} = \frac{\text{Revenue from patients}-\text{cost of service}}{\text{revenue from patients}} \qquad (2)$$

$$\text{Net profit margin} = \frac{\text{Net profit after tax}}{\text{revenue from patients}} \qquad (3)$$

$$\text{EBITDA margin} = \text{EBITDA/Revenues} \qquad (4)$$

It is worth noting that the EBITDA – or earnings before interest, taxes, depreciation, and amortization is also a key metric that will be used in developing future cash flow projections. The metric is also used to derive the entity's enterprise value estimation based on the relevant multiples. EBITDA is useful to assess the

efficiency of the entity's investments in the digitization process.

In addition, a comprehensive set of operating performance metrics will be studied, including the average treatment charge or ATC, permanent employee wages or PEW, determined using the following equation:

ATC = Revenue from patients/
Number of patients during the period   (5)

PEW = Total salary expense of permanent employees   (6)

3.1.2 Future projections

Based on the historical performance review a future projection will be made. The projections are then used to estimate the enterprise value of the firm and equity valuation. The most common investment performance metrics will be applied, namely net present value (NPV) and profitability index (PI), which are determined using the following formulae:

$$NPV = \sum_{k=0}^{n} CF/(1 + i)\text{- II} \qquad (7)$$

Where CF- is the relevant cash flow for the period, I am the applicable discount rate, and II – initial investment (value of the capital expenditures in digitization process).

Profitability index = (NPV + II)/II   (8)

3.1.2 Data

The data for the model will be extracted from the relevant statistical databases like FRED, National centre for health statistics, OECD, and World Bank publications, as well as the relevant annual filings of the DH entities.

3.1.3 ESG score

S&P Global ESG Scores will be used as a benchmark for the sustainability analysis of the DH entities under review. S&P Global ESG Scores are determined by the globally recognized rating agency through a combination of qualitative and quantitative analysis. The review is based upon the verified company annual filings, media communications, stakeholder analysis, and other tools applied by the agency [10].

4. RESULTS

4.1 Trends in DH application

4.1.1 PDA

The data analysis comprises a review of the critical operating process of the digital health venture including the revenue cycle, which is responsible for capturing the company's sales origination, billing, and cash collection

transactions. To improve revenue recording and billing, many healthcare providers apply personal digital assistants (PDAs) to record and process changes. The PDAs are linked with the company's management information system designed to collect services rendered and insurance claims information, facilitate billing and collections and assist in timely reporting to the management. These systems minimize input and transaction errors and reduce improve process efficiency (reducing time required to record and process transactions).

4.1.2 EHR

Adequate billings and revenue collections should be based on a proper recording of relevant data about the patient data. The recording can be based on the so-called Electronic Health Records, which are, as the name suggests technology-based solutions responsible for collecting, maintaining, and analysing patient data during each service delivery. Electronic data processing allows avoiding some of the deficiencies of manual records, including excess time and other resources allocated, manual data storage problems, potential loss of manual data, and retrieval issues. Furthermore, manual and paper-based records do not allow for the efficient search for the data, retrieval, and analysis of patient medical, financial, and other relevant information.

Although electronic record systems were developed some time ago, the active use of these systems is still insufficient and is driven by the health reform efforts and applicable domestic legislation. Electronic health record systems come in a variety of forms with small, but important, differences.

4.1.3 Telemedicine and telehealth

Another notable trend especially after the COVID-19 pandemic is widespread Telemedicine and Telehealth. Telemedicine is the transfer of electronic medical data (high-resolution images, sounds, live video, and patient records) from one location to another by using

a variety of telecommunication technologies, including, but not limited to, ordinary phone lines, integrated services digital networks, the Internet, and satellites.

Telehealth is closely related to telemedicine and is used to describe the broader definition of remote healthcare that does not always involve clinical services, although the two terms are often used interchangeably. Using communication equipment to link healthcare practitioners and patients in different locations results in cost efficiency, reduced transportation expenses, improved patient access to specialists and mental health providers, improved quality of care, and better communication among providers.

4.1.4 Clinical Technology

In addition to increases in the development and utilization of health care management information technology, there have also been advances in the development of clinical technology, which have led to numerous treatment discoveries and innovations. Clinical technology encompasses any method or device used for patient treatment procedures, for example, pharmaceuticals, surgical devices, and minimally invasive techniques. Of note, in an effective and efficiently operated provider enterprise, management and clinical technologies will complement each other and may, in many cases, overlap.

4.2 Growth of DH market

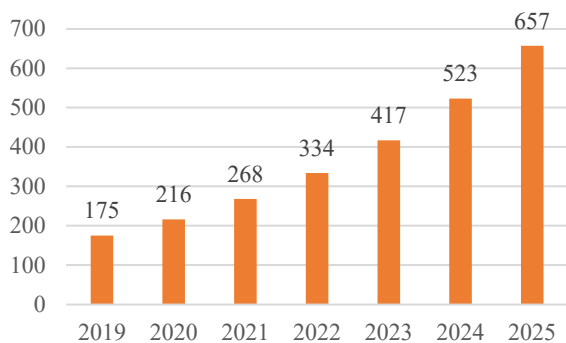The growth in the global digital health market is presented as follows [9]:

Figure 1 Projection of digital health market (USD billion, 2019-2025).

Based on the information above, the total projected DH segment growth from 2019 to 2025 is expected to be more than 275.4%, which translates to the geometric average growth rate of 24.7% per annum.

4.3 Increasing use of digital health

From 20revenues multiple to 2020, investments in the digital health industry grew substantially, from an estimated one billion U.S. dollars in 2010 to over 21 billion U.S. dollars in 2020. COVID-19 pandemic in 2020 stimulated a drastic increase in the digital health market as well as signalling its dominance in years to come. It is also expected that the biggest e-health trend in the coming years will be the use of patient-owned health data. In general, most healthcare workers thought e-health prospects in their country would improve in the coming year.

According to McKinsey 2021, the total size of the telemedicine market in the US alone is expected to exceed USD 250 by 2030. The revenues from the DH sector grow substantially in absolute terms. In addition, as a percentage of revenues, they also grow from 17% in 2017 to over 38% in 2020.

4.4 Largest Initial Public Offerings in 2021

In 2021, the largest digital health IPO transactions included Doximity ($606 million), Signify Health ($610 million), and Him & Hers ($280 million). These entities were selected for further analysis and an intrinsic value estimate will be performed for these issuers to compare with the current market prices per share.

4.5 ESG rankings of the issuers selected

The ESG ranking was compiled based on the data provided by Sustainability, 2021. As presented above, the rankings are yet to be assigned as most of the data is currently missing. However, as the environmental rankings are expected to be high, the entities need to comply with the best applicable social and governance standards that will ensure the highest ranking in the future.

4.6 Performance metrics of the largest issuers

Only one of the three issuers presented reported positive net income for 2020. This is due to substantial depreciation charges and high operating costs that affected their respective net loss values reported. As depreciation and interest are added back to arrive at the most important non-GAAP metric, EBITDA, the net operating cash flow and EBITDA were positive for Signify Health, while the same metrics were negative for Him & Hers again due to elevated operating expenses.

Doximity reports very healthy profitability, with its EBITDA and a net margin of 34.2% and 36.4%, respectively, while the company's net operating cash flow to total assets of over 45.2%, which may indicate that the investments in the company's assets may be recovered in near future. The other two entities reported inferior profitability and cash generation capacity.

P/revenues-price-to-revenues multiple calculated as the market capitalization (or share price) divided by the total revenues of the entity (or revenues per shares outstanding) [11]. The multiple captures how the company is valued by the investors relative to its revenues. High multiple values would indicate either overvaluation or growth expectations in future periods. A low ratio may indicate that the company may not be as profitable despite reported high company's sales revenue. P/B – price-to-book multiple, calculated as market capitalization (or share price) divided by the value of the company's shareholders equity (or book value per share). The multiple captures how the company is valued relative to its net worth. The multiple below one may imply undervaluation. Alternatively, it can mean that the company's financial performance is below the investor's expectations. P/E – price -to – earnings multiple, calculated as market capitalization (or share price) divided by the net income after tax for the period net of preferred shares dividend (or earnings per common share, EPS). The multiple captures how the entity is valued by

investors relative to its earnings capacity. Above industry average P/E multiples indicates that the issuer's share price may be overvalued. Alternatively, it may indicate that the investors in the company expect the share price to grow in the future (as in the case of the growth stocks), hence its valuation is high relative to its current earnings capacity.

4.7 Estimates of intrinsic value

Given existing profit margins, cash generation capacity, and projected growth rates for the industry an attempt will be made to estimate fair values for each of the stocks selected in the model using the discounted cash flow technique, or DCF (Damodaran, 2012). The DCF framework implies that investment in each of the stocks will be treated as a separate investment project. For each of the projects, and NPV metric will be derived using the following set of assumptions [12].

4.8 Major underlying assumptions

Market shares are determined as the ratio of the annual revenue reported to the total market size as per Figure 1 for the respective forecasted period.

A discount rate of 5.25% used across all issuers is taken from the study conducted by NYU Stern, 2021. The respective cost of capital calculation was not performed as the estimate of the beta coefficient is not meaningful at the moment as the trading data for the issuers is not sufficient since the trading commenced only in 2021.

Annual CAPEX across the selection was conservatory assessed at 25% of the current property, plant, and equipment (PPE) values. The high CAPEX ratio is required to maintain an adequate level of revenue and cash flow generation, which is highly dependent on the company's ability to invest in DH's latest technology, which is CAPEX intensive.

The perpetual growth rate is set at a conservative 1%. The input will be used to estimate the respective terminal values for the projects. Terminal value (TV) is used in the process of estimating the company's value in perpetuity past the original forecasted period (five years, in our case). This article applied discounted cash flow model (DCF) to calculate the final cash flow for the entity using perpetual growth.

4.9 Intrinsic value estimates

To estimate the intrinsic value of the company, a cash flow projection is prepared using the currently available information on operating cash flows, revenues, and a set of assumptions defined earlier. Estimated enterprise value for Doximity provides for an expected upside of 13%, which translates to 21% of the internal rate of return. The estimated enterprise value for Signify Health provides for an expected upside of 1948%, which translates to 98% of the internal rate of return. Estimated

enterprise value for Signify Health provides for an expected upside of negative 11%, which translates to 18% of the internal rate of return.

5. CONCLUSIONS

Based on the results of the study, this study concluded that the DH industry is one of the most rapidly developing segments of the global economy. Due to the increasing use of technology (AI, Big data and others) the healthcare industry overall is expected to undergo substantial changes in the near future. The growth was further stimulated by the volatility caused by the COVID-19 outbreak and related recession in early 2020. Telehealth and telemedicine growth rates were particularly impressive in 2020 and early 2021, followed by a moderate reversal later during 2021, which was caused by the global lifting of quarantine regimes and related lockdowns, thus the patients worldwide preferred to visit their doctors offline. Nevertheless, this paper expects that telehealth and telemedicine will continue to be significant going forward as the importance of online service delivery will continue to grow. The industry is expected to be impacted by further digitization of patient recording, maintenance and billing as well the way the medication is prescribed to minimize the risk of human error and improve efficiency. The sector is capital intensive but offers lucrative returns.

The DH sector requires considerable investments in tangible and intangible property which will affect the cash flow projections and valuations. The recoverability of the investments in long-term assets (including goodwill) is a critical issue as demonstrated by the examples of selected issuers in the study.

Current valuations require a rather extensive set of assumptions, which will be used on the applicable calculations. The assumptions used in the model are conservative enough to avoid overly optimistic estimates. It is worth noting that the assessments of the intrinsic value are highly dependent on the terminal value estimates, which are in turn driven by the perpetual growth rates and periodic cash flow estimates. The estimates are considered reasonable in the circumstances to come up with a conservative fair value assessment.

The results of the intrinsic value estimates imply substantial premiums in two cases, which reflect investor perceptions about the future performance of the issuers. Price to revenues and price to cash flows multiples are particularly high in certain cases. Based on derived values, one of the three issuers selected appears to be overvalued based on current financial and operating performance. It should be noted, however, that the estimates exhibit high sensitivity to changes in the discount rate, projected revenues, expected market share, implied capital expenditures and terminal values. ESG rankings and their impact on valuations are yet to be seen,

however, it is expected that DH entity's valuations are likely to be impacted by potentially high ratings due to their inherent environmental aspect. As the entities operate in an environment that does not involve excessively high CO_2 emissions and waste, the ESG scores are expected to be high if proper social and governance standards are adhered to. The entities need to ensure that there are no substantial gender and minority pay gaps and sufficient gender ratios are maintained at the companies' respective executive boards.

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