THE VALUATION OF E-HEALTH AND TELEMEDICINE STARTUPS

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Abstract

E-Health is a healthcare practice supported by electronic processes and communication that covers everything related to medicine and computers. Complementary telemedicine is the distribution of health-related services and information via electronic information and telecommunication technologies. This industry is relatively young and rapidly evolving. It is so unsurprising that many innovative firms are still in their infancy, belonging to a startup phase.

Cutting-edge telemedicine applications aim to achieve optimal patient care and outcomes. They offer indispensable tools for home healthcare, remote patient monitoring, and disease management. A patient-centric vision orientates the strategies and the corporate governance patterns of the composite stakeholders.

The analysis of the innovative business model of an e-Health startup is a pre-requisite for its appraisal and embeds scalability options. The evaluation depends on the prioritizing identification of the crucial value drivers. The evaluation metrics is mainly based on expected cash flow and market comparisons.

Keywords: Health informatics; MedTech; Digital Platforms; Blockchains; Big Data; Artificial Intelligence; patient-centric vision; Discounted Cash Flows.

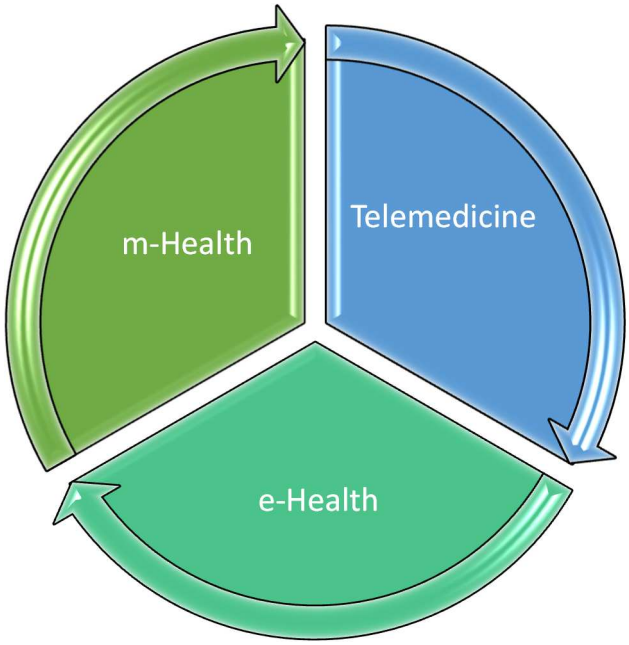
1. Introduction

E-Health is a healthcare practice supported by electronic processes and communication that covers everything related to medicine and computers.

This industry is relatively young and rapidly evolving. It is so unsurprising that many innovative firms are still in their infancy, belonging to a startup phase. Telemedicine has become an increasingly popular option for long-distance/virtual medical care and education, but many telemedicine ventures fail to grow beyond the initial pilot stage (Chen et al., 2013).

E-Health is often described as telemedicine or m-Health. These concepts, although overlapping, remain distinct.
Telehealth is the distribution of health-related services and information via electronic information and telecommunication technologies. It allows long-distance patient and clinician contact, care, advice, reminders, education, intervention, monitoring, and remote admissions. Telemedicine is sometimes used as a synonym or is used in a more limited sense to describe remote clinical services, such as diagnosis and monitoring. These applications broadly refer to digital technologies that capture, analyze and use data.

Figure 1. – *The link between e-Health, m-Health, and Telemedicine*



Telemedicine is also broadly linked to MedTech – technology that can be used in a care setting, to solve a health problem and improve quality of lives.
According to Prescient & Strategic Intelligence (2020), mHealth is the practice of delivering healthcare services with the help of mobile devices, such as cell phones, laptops, tablets, and personal digital assistants (PDAs), through wireless networks. The factors fueling the popularity of mHealth technologies include the increasing prevalence of chronic diseases, rising geriatric population, growing popularity of at-home services, rising healthcare costs, and supportive healthcare regulatory norms. Moreover, several mHealth applications are available for disease and wellness management, which has increased their adoption rate.
The main megatrends are represented by:

- Increasing penetration of smartphones and tablets;
- The growing need for remote patient monitoring services;
- Innovative and advanced applications of m-Health technologies;
- Government support for digital health solutions;
- Increasing demand for advanced healthcare information systems.

2. Digital Platforms and Scalability

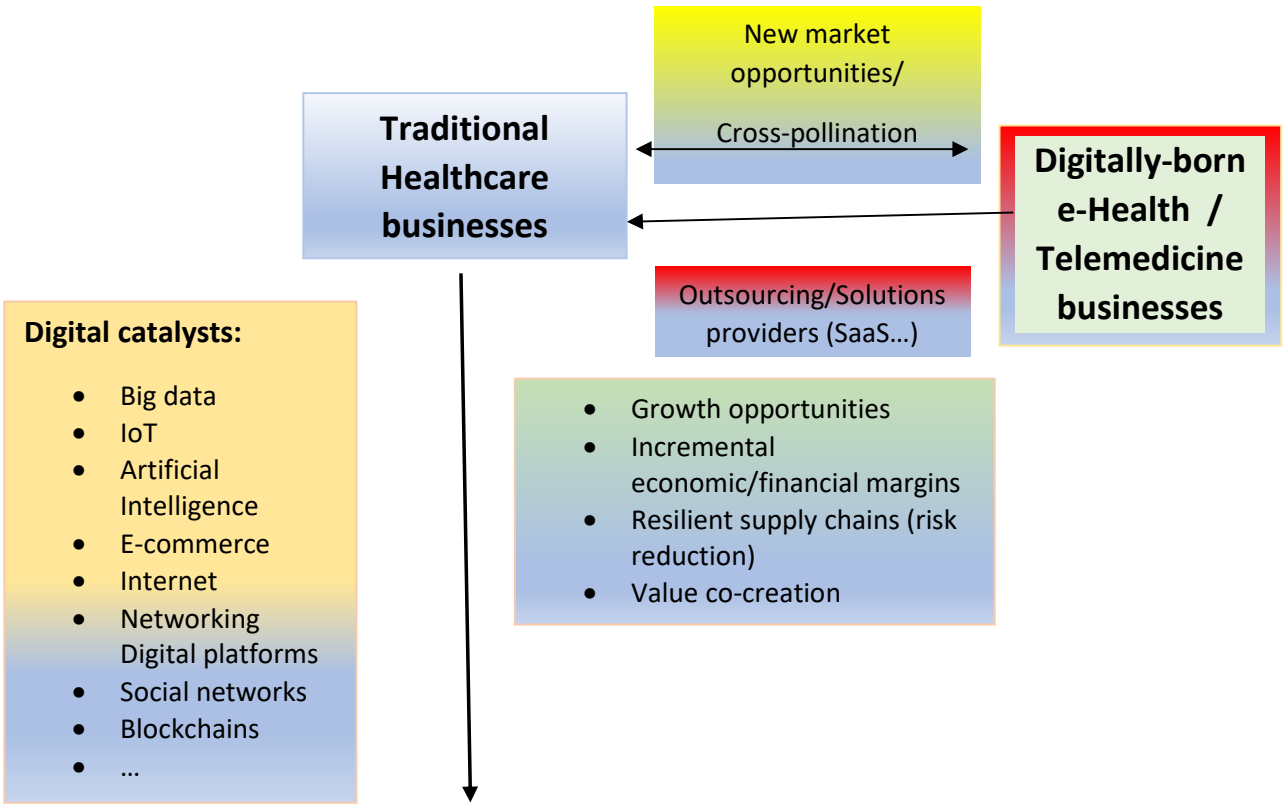
Digital platforms are at the basis of technology-enabled business models that facilitate exchanges between multiple groups – such as end-users and producers – who do not necessarily know each other.
The continuous upgrade of the technological environment creates new possibilities and reshapes the value and supply chain of financial intermediation, disrupting the existing business models.
Whereas traditional firms create value within the boundaries of a company or a supply chain, digital

platforms utilize an ecosystem of autonomous agents to co-create value (Hein et al., 2019).
Digital platforms can be represented by e-health devices and startups, and they act as a bridging node that connects digital clients to traditional or innovative producers. Whenever platforms connect different layers (each representing a network sub-system), they can increase the overall systemic value. Digital platforms are multisided digital frameworks that shape the terms on which participants interact.
Digitalization is defined as the concept of "going paperless", namely as the technical process of transforming analog information or physical products into digital form. The term 'digital transformation' refers, therefore, to the application of digital technology as an alternative to solve traditional problems. As a result of digital solutions, new forms of innovation and creativity are conceived, while conventional methods are revised and enhanced.
Digitally born startups or similar tech-businesses are not the only ones interested in adopting digital processes. Traditional businesses may be digitalized as well (e.g., a simple farmer willing to increase exponentially his/her production of tomatoes may digitalize the production activities through new systems or machines). In practice, with digitalization, traditional firms improve their crucial economic and financial parameters, as the EBITDA, which increases, while the WACC reduces, so improving the DCF and the overall enterprise value (EV):

$$\frac{O_{CF}\uparrow}{WACC\downarrow} \cong Enterprise\ Value\ \uparrow\uparrow \qquad [1]$$

In synthesis, digitalization brings speed and quality at low cost, thus representing a crucial driver for scalability itself. Digitalization enables a business process reengineering of traditional firms, which may presuppose an incremental growth in production.
Technologies can exist and be "hibernated" for years before a (fortuitous) external event triggers the shift towards a pathbreaking business model that capitalizes on those inventions. For e-health, the trigger is represented by the Covid-19 pandemics. Figure 2. (adapted from Moro Visconti, 2020, chapter 3) shows the link between digital transformation and scalability.

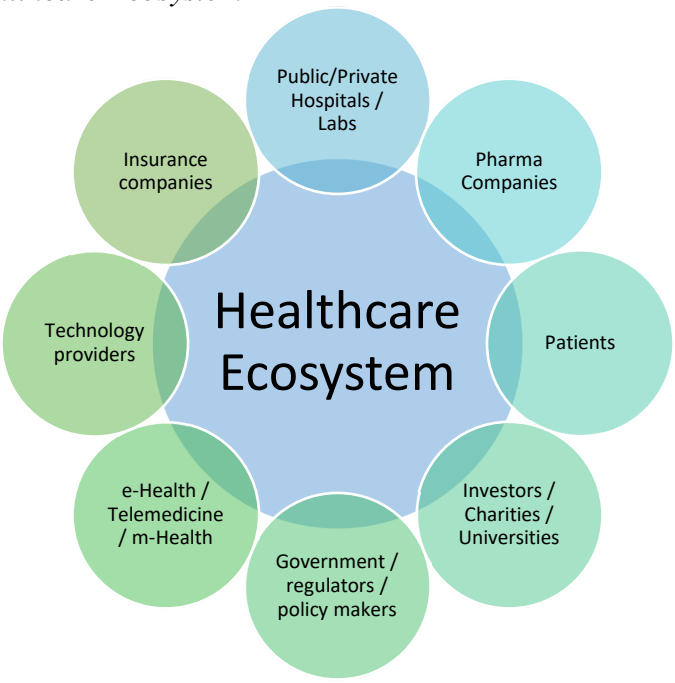
Figure 2. – *The link between digital transformation and scalability*



Digital Scalability

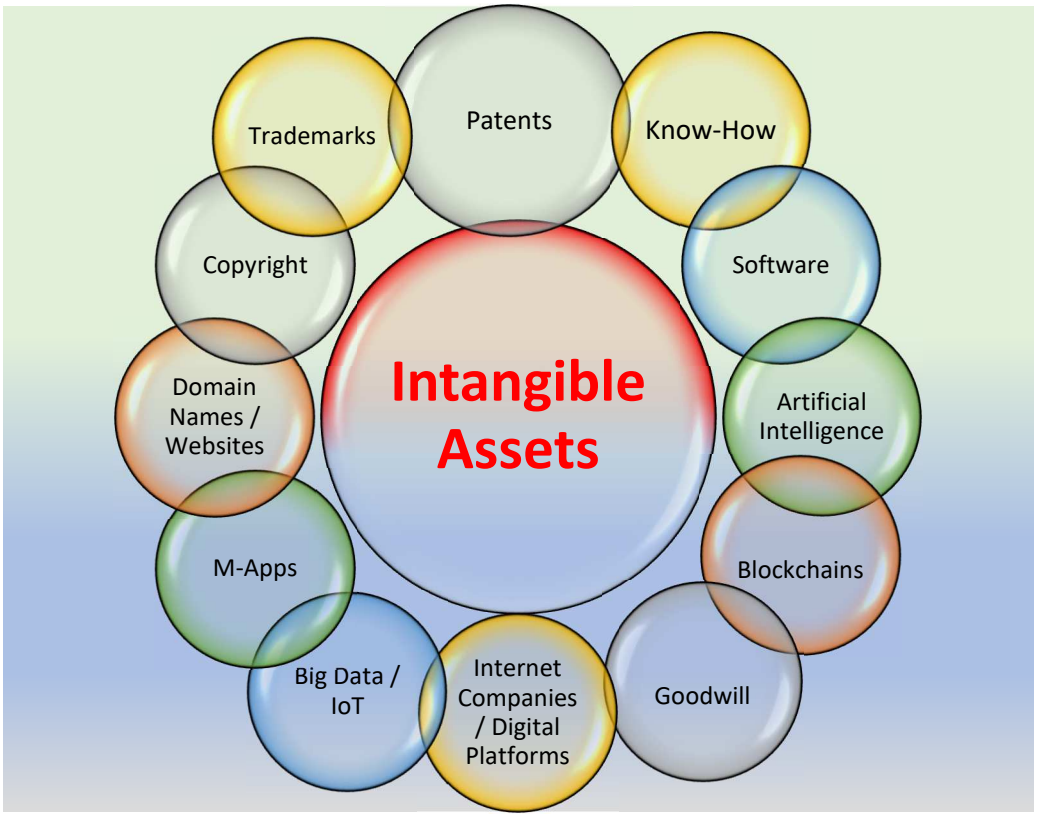
Digital platforms can be interpreted in terms of network theory (see Barabási (2016), the study of graphs as a representation of either symmetric or asymmetric relations between discrete objects. In computer science and network science, network theory is a part of graph theory: a network can be defined as a graph in which nodes and/or edges have attributes (e.g., names).
Digital platforms are intrinsically networked, and within networks, they represent a bridging node that connects users (stakeholders). Due to their digital features, eHealth startups operate within a networked digital ecosystem.
Digital health has become a real buzz word in recent discussions about transforming the healthcare system. One driver for the digitization of healthcare is represented by startups. Startups are newly emerging companies with a new business model that identifies a certain problem and tries to fix it (Rinsche, 2017). The properties of networked platforms are intrinsically consistent with the healthcare ecosystem, depicted in Figure 3.

Figure 3 – *The Healthcare Ecosystem*



A portfolio of intangibles embeds synergistic interactions, as illustrated in Figure 4, and triggers levered scalability upside.

Figure 4 – *Interactions of Intangibles*



3. Business Models

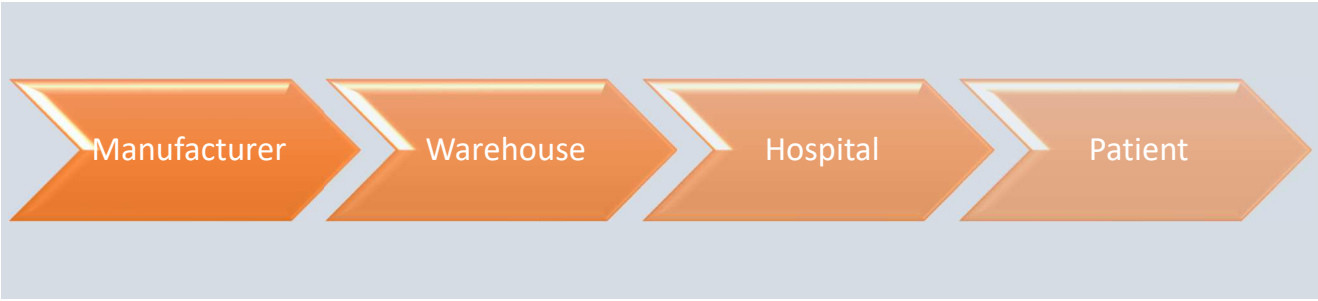
E-Health business models are characterized by remarkable scalability properties that make them geographically adaptable to various countries. There are, however, differences between developed and developing nations that are still important, albeit decreasing thanks to globalization.
Healthcare ecosystems are increasingly interconnected, as the Covid-19 pandemics show, and they need shared platforms and responses to joint challenges.
The business model is a pre-requisite for the value proposition (social and economic value, to be appraised with a cost-benefit analysis).
The most challenging estimate is probably represented, as it happens in most industries, by the revenue streams. Mighty contacts need to be monetized and transformed into … contracts.
The Digital Healthcare Market may be segmented by Technology, Application, Delivery Mode, Components, and End User. Chen et al., 2013, introduce an interesting grid to describe the telemedicine business models. Table 2 summarizes the main business model propositions, linked to value chain patterns.

Table 1 – *e-Health and Telemedicine Business Models and Value Chain Issues*

Issue	Description
Value Proposition	Business Target – Market opportunities – Support from Government, NGOs, Health Insurance companies, Patients, TLC operators, Big Pharma, and other Stakeholders
Customer Segments – End users	Healthcare providers - Hospitals (public and/or private) – Outpatient Clinics – Home Care Settings– healthcare payers - (segmented) patients - big Pharma – NGOs – charities – healthcare technology incubators/accelerators
Market Outlook	Streamline access to healthcare services - Wireless health - Mobile health – EHR – Telehealth - Global Healthcare Information Software Market by geography (Asia-Pacific, Europe, Middle East - Africa , North America, and South America), deployment (on-premises and cloud-based), and application (HIS and PIS)
Medical Application	Cardiology, Diabetes, Neurology, Dermatology, Sleep Apnea, Oncology, Orphan pathologies, and others. Non-communicable diseases that do not require hospitalization (unless for acute treatment) are particularly fit for remote telemedicine applications.
Technology	Digital Health Systems (Electronic Health/Medical Records, Tele-healthcare (Activity Monitoring; Remote Medication Management; LTC Monitoring; Video Consultation), mHealth (wearables: Glucose Meters; Neurological Monitors; Sleep Apnea Monitors; Pulse Oximeters; BP Monitors, etc.; m-health apps: fitness / medical apps), Healthcare Analytics – ePrescribing System
Delivery mode	On-Premise - Cloud-Based
Component	Software; services; hardware
Key Resources	Unique expertise – Management team – Innovation – Patented Inventions – Sales team
Key Partners	Trusted partnerships – Investment team – Advisory team - stakeholders
Key Activities	Business purpose – see vertical medical applications, market outlook, and customer segmentation
Revenue Streams	Customer relationships - B2B / B2C solutions - Revenues from licensing and service fees - sales of m-apps - in-app purchases – Big Data collection and (anonymous) resale
Cost Structure	R&D – Marketing & Advertising
Startup Funding	Inventor – Family & friends – Crowdfunding – Venture Capital – Private Equity – Bridge financing
Social Impact	Goals -Metrics – Sustainability (economic, social, and environmental)

Table 1 can be used as a starting point to describe the supply chain that is basically represented in Figure 5.

Figure 5 – *Healthcare Supply Chain*



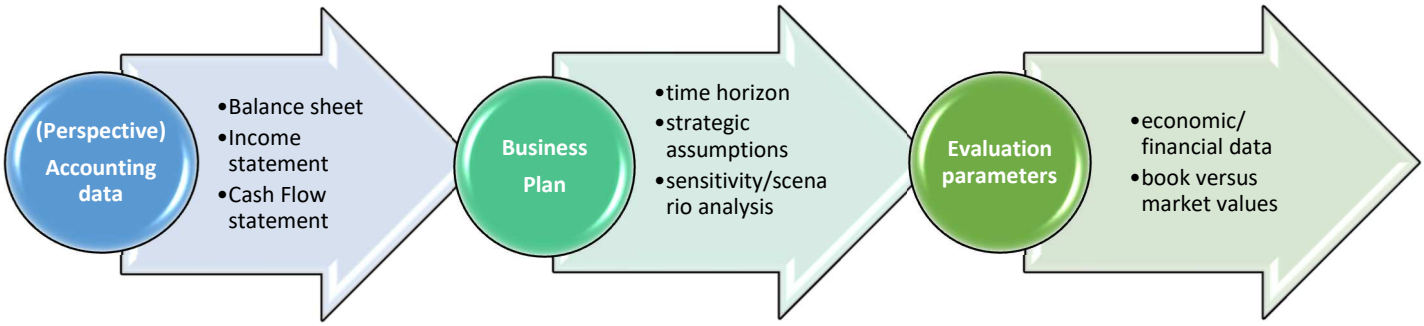
4. Investors and Market Players

Investors in e-Health startups are represented by classic shareholders, like founders (that are also … funders), family & friends, crowdfunded equity-holders, etc. There are, however, some peculiar shareholders and strategic partners like insurance companies, (big) pharma, etc.
The revenue model is often peculiar, and some key customers like National Health Services may guarantee long-term payments, linked to proof-of-concept or other milestones. This may severely impair the survival capability of cash-absorbing startups that are constantly in need of bridge financing or other financial facilities to overcome the Death Valley period.

5. The Accounting Background for Valuation

The evaluation is sensitive to forward-looking data that can be used to build up a sound business plan with a time horizon coherent with the average life cycle of the products and services of the e-Health industry.
A business plan is a formal accounting statement that numerically describes a set of business goals, the reasons why they are believed attainable, and the strategic plan and managerial steps for reaching those goals. Hypotheses and visionary ideas of game-changers must be transformed into numbers and need to be backed by reasonable and verifiable assumptions about future events and milestones (Moro Visconti, 2019).
The accounting background is composed of pro forma balance sheets (of some 3-5 years) and perspective income statements. The matching of these two documents produces expected cash flow statements. Economic and financial margins are the crucial accounting parameters for valuation that are represented by the EBITDA, the EBIT, the operating and Net Cash Flows, and the Net Financial Position, as it will be shown in the formulation of the appraisal approaches.
The appraisal methodology may conveniently start from a strategic interpretation of the business model (that derives from accounting data) to extract the key evaluation parameters to insert in the model, as shown in Figure 6.

Figure 6 – *Evaluation Methodology*

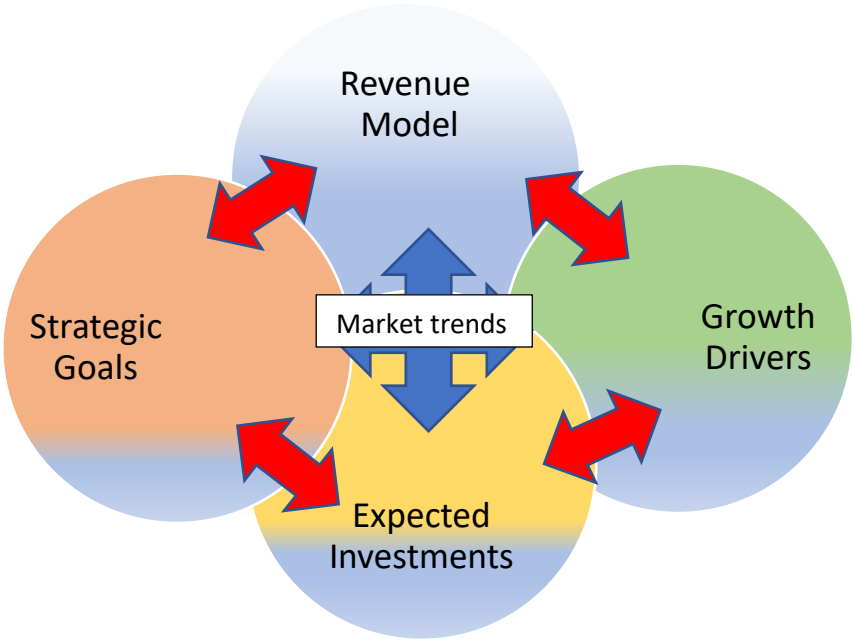


An analysis of the business model may conveniently consider:

1. The revenue model;
2. The strategic goals;
3. The growth drivers;
4. The expected investments;
5. Market trends.

The interaction between the business model and the strategic value drivers is illustrated in Figure 7.

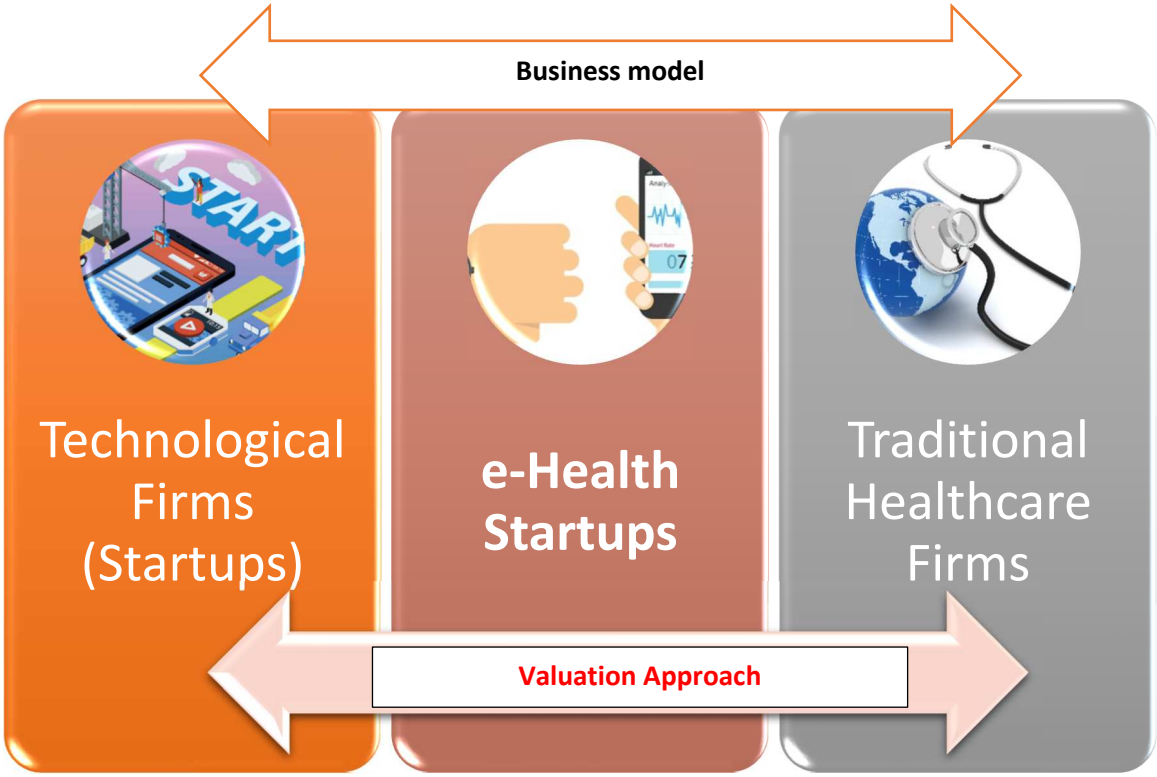
Figure 7 – *Business model and Value Drivers*



6. Valuation Methods

The evaluation criteria typically follow the (actual and prospective) business model of the target company, as illustrated in Figure 8.

Figure 8 - *Business Model and Valuation Approach*



A comparison of the primary evaluation criteria in traditional firms versus high-tech firms (startups) is reported in Table 2.

Table 2 – *Comparison of the main evaluation approaches of traditional firms, technological startups, and banks*

Traditional Firm	Technological Startup (IPEV, 2018)
Balance-sheet based (Fernandez, 2001)	Venture Capital method
Income	Binomial trees
Mixed capital-income	
Financial approach (Discounted Cash Flows)	
Market multiples (comparable firms)	

In this case, the value may be inferred even with differential income methodologies, traditionally used in the evaluation of intangible assets (within the income approaches).
According to the International Valuation Standard IVS 210, § 80:

80. Premium Profit Method or With-and-Without Method
80.1 The premium profit method, sometimes referred to as the with-and-without method, indicates the value of an intangible asset by comparing two scenarios: one in which the business uses the subject intangible asset and one in which the business does not use the subject intangible asset (but all other factors are kept constant). (…)
80.2 The comparison of the two scenarios can be done in two ways:
a) calculating the value of the business under each scenario with the difference in the business values being the value of the subject intangible asset, and
b) calculating for each future period the difference between the profits in the two scenarios. The present value of those amounts is then used to reach the value of the subject intangible asset.

Among the main evaluation methodologies, the following are the most relevant:

1. Financial approach (Discounted Cash Flows – DCF);
2. Market comparables.

6.1. The Financial approach

The financial approach is based on the principle that the market value of the company is equal to the discounted value of the cash flows that the company can generate ("cash is king"). The determination of the cash flows is of primary importance in the application of the approach, as is the consistency of the discount rates adopted.
The doctrine (especially the Anglo-Saxon one) believes that the financial approach is the "ideal" solution for estimating the market value for limited periods. It is not possible to make reliable estimates of cash flows for longer periods. "*The conceptually correct methods are those based on cash flow discounting. I briefly comment on other methods since - even though they are conceptually incorrect - they continue to be used frequently*" (Fernandez, 2001).
This approach is of practical importance if the individual investor or company with high cash flows (leasing companies, retail trade, public and motorway services, financial trading, project financing SPVs, etc.) are valued.
Financial evaluation can be particularly appropriate when the company's ability to generate cash flow for investors is significantly different from its ability to generate income, and forecasts can be formulated with a sufficient degree of credibility and are demonstrable.
There are two complementary criteria for determining the cash flows:

a.1. The cash flow available to the company (Free cash flow to the firm)

This configuration of expected flows is the one most used in the practice of company valuations, given its greater simplicity of application compared to the methodology based on flows to partners. It is a measure of cash flows independent of the financial structure of the company (unlevered cash flows) that is particularly suitable to evaluate companies with high levels of indebtedness, or that do not have a debt plan. In these cases, the calculation of the cash flow available to shareholders is more difficult because of the volatility resulting from the forecast of how to repay debts.
This methodology is based on the operating flows generated by the typical management of the company, based on the operating income available for the remuneration of own and third-party means net of the relative tax effect. Unlevered cash flows are determined by using operating income before taxes and financial charges.

Net operating income
- taxes on operating income
+ amortization/depreciation and provisions (non-monetary operating costs)
+ technical divestments (-investments)
+ divestments (-investments) in other assets
+ decrease (-increase) in operating net working capital
= **Cash flow available to shareholders and lenders (operating cash flow)**

The cash flow available to the company is, therefore, determined as the cash flow available to shareholders, plus financial charges after tax, plus loan repayments and equity repayments, minus new borrowings and flows arising from equity increases.
The difference between the two approaches is, therefore, given by the different meanings of cash flows associated with debt and equity repayments.
Cash flows from operating activities are discounted to present value at the weighted average cost of capital. This configuration of flows offers an evaluation of the whole company, independently from its financial structure. The value of the debt must be subtracted from the value of the company to rejoin the value of the market value, obtained through the cash flows for the shareholders.
The relationship between the two concepts of cash flow is as follows:

cash flow available to the company = cash flow available to shareholders + financial charges (net of taxes) + loan repayments - new loans [2]

a.2.The (residual) cash flow available to shareholders

This configuration considers the only expected flow available for members' remuneration. It is a measure of cash flow that considers the financial structure of the company (levered cash flow). It is the cash flow that remains after the payment of interest and the repayment of equity shares and after the coverage of equity expenditures necessary to maintain existing assets and to create the conditions for business growth.
In M&A operations, the Free Cash Flow to the Firm (operating cash flow) is normally calculated to estimate the Enterprise Value (comprehensive of debt). The residual Equity Value is then derived subtracting the Net Financial Position.
The cash flow for the shareholders is determined, starting from the net profit:

Net profit (loss)
+ amortization/depreciation and provisions
+ divestments (- investments) in technical equipment
+ divestments (- investments) in other assets
+ decrease (- increase) in net operating working capital
+ increases (- decreases) in loans
+ equity increases (- decreases)
= **Cash flows available to shareholders (Free cash flow to equity)**

The discounting of the free cash flow for the shareholders takes place at a rate equal to the cost of the shareholders' equity. This flow identifies the theoretical measure of the company's ability to distribute dividends, even if it does not coincide with the dividend paid.
Cash flow estimates can be applied to any type of asset. The differential element is represented by their duration. Many assets have a defined time horizon, while others assume a perpetual time horizon, such as shares.
Cash flows (CF) can, therefore, be estimated using a normalized projection of cash flows that it uses, alternatively:

- unlimited capitalization: $W_1 = CF / i$ [3]
- limited capitalization: $W_2 = CF$ a n¬i [4]

where W_1 and W_2 represent the present value of future cash flows.

The discount rate to be applied to expected cash flows is determined as the sum of the cost of equity and the cost of debt, appropriately weighted according to the leverage of the company (the ratio between financial debt and equity). This produces the Weighted Average Cost of Capital (WACC):

$$WACC = k_i(1-t)\frac{D}{D+E} + k_e\frac{E}{D+E} \quad [5]$$

Where:
k_i = cost of debt;
t = corporate tax rate;
D = market value of debt;
E = market value of equity;
D+E = raised capital;
k_e = cost of equity (to be estimated with the Capital Asset Pricing Model - CAPM or the Dividend Discount Model).

The cost of debt capital is easy to determine, as it can be inferred from the financial statements of the company. The cost of equity or share capital, which represents the minimum rate of return required by investors for equity investments, is instead more complex and may use the CAPM or the Dividend Discount Model (a method of valuing a company's stock price considering the sum of all its future dividend payments, discounted back to their present value. It is used to value stocks based on the net present value of future dividends).
The formula of the CAPM is the following:

$$E(r)_{FoodTech} = r_{free} + \beta_{FoodTech}[(E(r)_{market} - r_{free}] \quad [6]$$

Where:
$E(r)_{FoodTech} = expected\ return\ of\ the\ FoodTech\ listed\ stock$
$r_{free} = risk-free\ rate\ of\ return\ (e.g.,of\ a\ long\ term\ Government\ bond)$
$\beta_{FoodTech} = sensitivity\ of\ the\ FinTech's\ stock\ to\ the\ market\ price$
$(E(r)_{market} = expected\ return\ of\ the\ (benchmark)\ Stock\ market$

A central element is represented by the beta (β) of the startup to be evaluated that consists of the ratio between the covariance of the e-Health security with its stock market, divided by the variance of the market. Market betas, subdivided by industry, may be detected from the dataset of A. Damodaran (see, for instance, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html).

Once the present value of the cash flows has been determined, the calculation of the market value W of the company may correspond to:

(a) the unlevered cash flow approach:

$$W = \sum \frac{CF_0}{WACC} + VR - D \qquad [7]$$

(b) the levered cash flow approach:

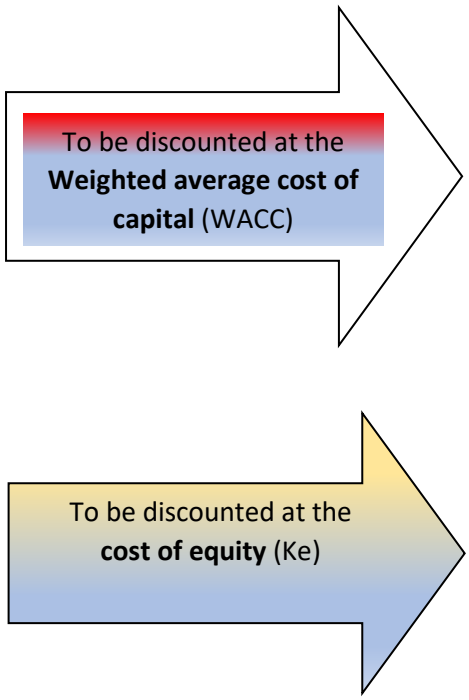
$$W = \sum \frac{CF_n}{K_e} + VR \qquad [8]$$

where:
$\sum CF_0/WACC$ = present value of operating cash flows
$\sum CF_n/K_e$ = present value of net cash flows
VR = terminal (residual) value
D = initial net financial position (financial debt - liquidity)

The residual value is the result of discounting the value at the time n (before which the cash flows are estimated analytically). It is often the greatest component of the global value W (above all in intangible-intensive companies) and tends to zero if the time horizon of the capitalization is infinite (VR / ∞ = 0).
The two variants (levered versus unlevered) give the same result if the value of the firm, determined through the cash flows available to the lenders, is deducted from the value of the net financial debts.
Operating cash flows (unlevered) and net cash flows for shareholders (levered) are determined by comparing the last two balance sheets (to dispose of changes in operating Net Working Capital, fixed assets, financial liabilities, and shareholders' equity) with the income statement of the last year.
The accounting derivation of the cash flow and its link to the cost of capital (to get DCF – Discounted Cash Flows) is illustrated in Table 3.

Table 3. - *Cash flow statement and link with the cost of capital*

Cash flow statement
EBIT + Depreciation and amortization
= EBITDA (A)
± Δ Operating Net Working Capital ± Δ fixed assets (CAPEX)
= Operating cash flow (unlevered cash flow to the firm) (B)
- Financial charges ± Δ net financial liabilities ± Extraordinary income and charges - Taxes ± Δ Equity
= Net (free) cash flow to the shareholders (levered cash flow) (C)
Reconciliation statement**:**
Closing cash and cash equivalents - Opening cash and cash equivalents
= Change in net cash flow = liquidity (D) = (C)



The net cash flow for the shareholders coincides with the free cash flow to equity and, therefore, with the dividends that can be paid out, once it has been verified that enough internal liquidity resources remain in the company. This feature, associated with the ability to raise equity from third parties and shareholders, are such as to allow the company to find adequate financial coverage for the investments deemed necessary to maintain the company's continuity and remain on the market in economic conditions (minimum objectives). They should allow for the creation of incremental value in favor of shareholders, who are the residual claimants (being, as subscribers of risky capital, the only beneficiaries of the variable net returns, which, as such, are residual and subordinate to the fixed remuneration of the other stakeholders).

The estimate of cash flows can be applied to any activity.

The differential element is service life. Many activities have a defined time horizon, while others assume a perpetual time horizon, such as company shares.

The discounted cash flow (DCF) approach can be complemented with real options that incorporate intangible-driven flexibility in the forecasts.

DCF is ubiquitous in financial valuation and constitutes the cornerstone of contemporary valuation theory (Singh, 2013). The robustness of the model, as well as its compatibility with the conventional two-dimensional risk-return structure of investment appraisal, makes it suited to a multitude of valuations. Accounting standards across the globe recognize the efficacy of this model and advocate its use wherever

practicable. FAS 141 and 142 of the United States and IAS 39 that relate to the accounting of intangible assets, recommend the use of DCF methodology for attributing a value to such assets.
Some caveats should be considered. According to OECD (2017):

- *"Valuation techniques that estimate the discounted value of projected future cash flows derived from the exploitation of the transferred intangible or intangibles can be particularly useful when properly applied. There are many variations of these valuation techniques. In general terms, such techniques measure the value of an intangible by the estimated value of future cash flows it may generate over its expected remaining lifetime. The value can be calculated by discounting the expected future cash flows to present value. Under this approach valuation requires, among other things, defining realistic and reliable financial projections, growth rates, discount rates, the useful life of intangibles, and the tax effects of the transaction. Moreover, it entails consideration of terminal values when appropriate" (par. 6.157).*
- *"When applying valuation techniques, including valuation techniques based on projected cash flows, it is important to recognize that the estimates of value based on such techniques can be volatile. Small changes in one or another of the assumptions underlying the valuation approach or in one or more of the valuation parameters can lead to large differences in the intangible value the approach produces. A small percentage change in the discount rate, a small percentage change in the growth rates assumed in producing financial projections, or a small change in the assumptions regarding the useful life of the intangible can each have a profound effect on the ultimate valuation. Moreover, this volatility is often compounded when changes are made simultaneously to two or more valuation assumptions or parameters" (par. 6.158).*
- *"The reliability of a valuation of a transferred intangible using discounted cash flow valuation techniques is dependent on the accuracy of the projections of future cash flows or income on which the valuation is based" (par. 6.163).*
- *"The discount rate or rates used in converting a stream of projected cash flows into a present value is a critical element of a valuation approach. The discount rate considers the time value of money and the risk or uncertainty of the anticipated cash flows. As small variations in selected discount rates can generate large variations in the calculated value of intangibles using these techniques" (par. 6.170).*
- *"It should be recognized in determining and evaluating discount rates that in some instances, particularly those associated with the valuation of intangibles still in development, intangibles may be among the riskiest components" (par. 6.172).*

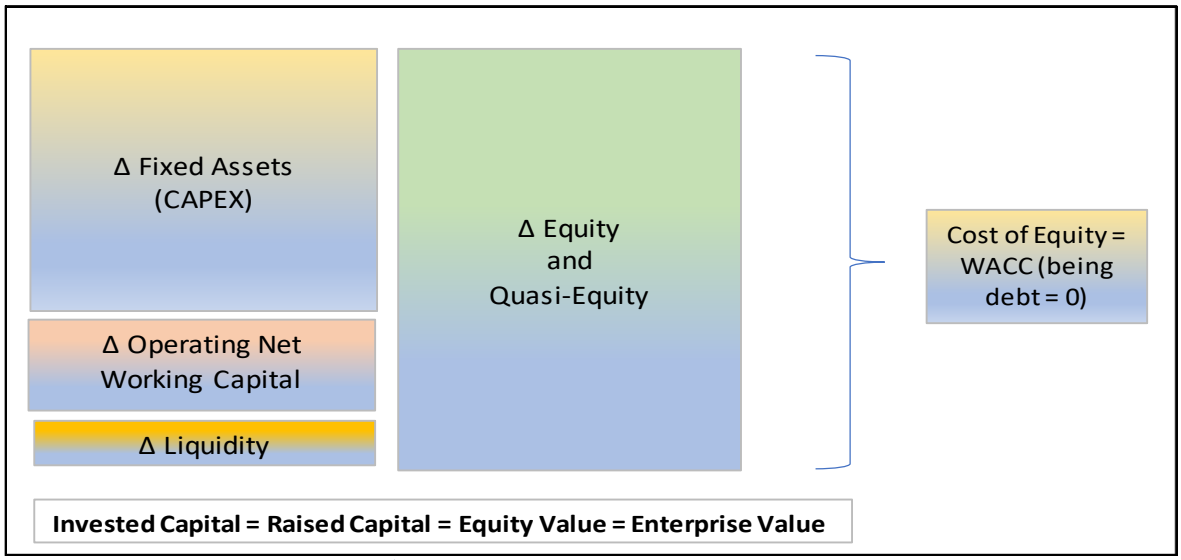
6.2. The Financial approach with Debt-Free Startups

Startups are normally debt-free, since they have little if any collateral value of their assets, and they produce negative cash flows, especially in the first years of their existence. Consequently:

- in the balance sheet raised capital (funds) tend to coincide with equity;
- in the income statement, EBIT is similar to the net result (considering that interest rates are non-existent, and taxes also);
- in the cash flow statement, the operating cash flow tends to coincide with the net cash flow;
- in the absence of cost of debt, the cost of capital (WACC) coincides with the cost of equity.

The interactions of the three main accounting statements in a debt-free startup are illustrated in Figure 9.

Figure 9 – *Interactions of income statement and variations of the Balance Sheet to Produce the Cash Flow Statement in a Debt-free Startup*



Income statement	Cash flow statement
Operating monetary revenues	EBIT
- operating monetary costs (monetary OPEX)	+ amortization, depreciation
= EBITDA	**= EBITDA**
- amortization, depreciation, provisions and write-downs	+/- Δ operating net working capital
= EBIT	+/- Δ fixed assets
+/- balance of extraordinary operations	**= Operating cash flow (unlevered)**
= Pre-Tax Result	+/- extraordinary income/expense
- (taxes, if any)	- (taxes, if any)
= Net result (similar to EBIT and Pre-Tax result)	+/- Δ shareholders contributions in kind
	+/- Δ shareholders' equity
	= Net Cash Flow

Liquidity so derives from:

- EBITDA (initially negative and so cash-absorbing but with high increase potential);
- Change in operating net working capital (sales growth is fueled by the cash-absorbing expansion of receivables and stock [wherever present], partially counterbalanced by a cash-generating increase in payables);
- Change in the CAPEX (net of cashless depreciation / amortization)
- Equity and quasi-equity injections (considering only liquidity cashed in, and not a cashless contribution in-kind).

Sales forecasting is the main and first value driver to consider, as it generates the revenues that, net of monetary operating expenditure (OPEX), form the EBITDA.

Sales are also related to the operating net working capital components, as they influence stock, and receivables. Sales are also output factors depending on input purchases that influence payables. It may so be argued that the Operating Net Working Capital is a function of the sales.
The following ratios can be used to interpret and forecast the expected outcome of the working capital:

Inventory Turnover	Cost of Goods Sold/Inventory
Inventory Turn-Days	360/Inventory Turnover
Accounts Receivable Turnover	Sales/Accounts Receivable
Average Collection Period	360/Accounts Receivable Turnover
Accounts Payable Turnover	Cost of Goods Sold/Account Payable
Average Payment Period	360/Accounts Payable Turnover

A further input factor of sales is represented by CAPEX.
Liquidity forecasts and occurrences are typically negative in the startup phase, with absorption of cash that is mainly due to a negative EBITDA, and a CAPEX increase (due to the investments necessary to startup the firm). The operating net working capital may be less significant, but it normally grows (so absorbing cash) when sales boost. The intervention of the shareholders is so periodically necessary to keep a cash equilibrium, avoiding both cash burnout and equity burnout.
Debt capacity indicators like the debt service cover ratio are meaningless in debt-free startups.

6.3.Empirical approaches (Market multipliers)

The market value identifies:

(a) The value attributable to a share of the equity expressed at stock exchange prices;
(b) The price of the controlling interest or the entire share equity;
(c) The traded value for the controlling equity of comparable undertakings;
(d) The value derived from the stock exchange quotations of comparable undertakings.

Sometimes comparable trades of companies belonging to the same product sector with similar characteristics (in terms of cash flows, sales, costs, etc.) are used.
In practice, an examination of the prices used in negotiations with companies in the same sector leads to quantifying average parameters:

- *Price / EBIT*
- *Price / cash-flow*
- *Price / book-value*
- *Price / earnings*
- *Price / dividend*

These ratios seek to estimate the average rate to be applied to the company being assessed. However, there may be distorting effects of prices based on special interest rates, in a historical context, on difficulties of comparison, etc.
In financial market practice, the multiples methodology is frequently applied. Based on multiples, the company's value is derived from the market price profit referring to comparable listed companies, such as net profit, before tax or operating profit, cash flow, equity, or turnover.
The attractiveness of the multiples approach stems from its ease of use: multiples can be used to obtain quick but dirty estimates of the company's value and are useful when there are many comparable companies listed on the financial markets and the market sets correct prices for them on average.
Because of the simplicity of the calculation, these indicators are easily manipulated and susceptible to misuse, especially if they refer to companies that are not entirely similar. Since there are no identical companies in terms of entrepreneurial risk and growth rate, the assumption of multiples for the processing of the valuation can be misleading, bringing to “fake multipliers”.
The use of multiples can be implemented through:

A. Use of fundamentals;
B. Use of comparable data:

B.1. Comparable companies;
B.2. Comparable transactions.

The first approach links multiples to the fundamentals of the company being assessed: profit growth and cash flow, dividend distribution ratio, and risk. It is equivalent to the use of cash flow discounting approaches.
Discount factors incorporate risk. According to OECD (2017):

- "*When identifying risks in relation to an investment with specificity, it is important to distinguish between the financial risks that are linked to the funding provided for the investments and the operational risks that are linked to the operational activities for which the funding is used, such as for example the development risk when the funding is used for developing a new intangible*" (par. 6.61).
- "*Particular types of risk that may have importance in a functional analysis relating to transactions involving intangibles include:*

  (i) risks related to development of intangibles, including the risk that costly research and development or marketing activities will prove to be unsuccessful, and considering the timing of the investment (for example, whether the investment is made at an early stage, mid-way through the development process, or at a late stage will impact the level of the underlying investment risk);

  (ii) the risk of product obsolescence, including the possibility that technological advances of competitors will adversely affect the value of the intangibles;

  (iii) infringement risk, including the risk that defense of intangible rights or defense against other persons' claims of infringement may prove to be time-consuming, costly and/or unavailing;

  (iv) product liability and similar risks related to products and services based on the intangibles;

  (v) exploitation risks, uncertainties in relation to the returns to be generated by the intangible" (par. 6.65).

For the second approach, it is necessary to distinguish whether it is a valuation of comparable companies or comparable transactions.
The comparability concerns different firms but is also related to their contents.
In the case of comparable companies, the approach estimates multiples by observing similar companies. The problem is to determine what is meant by similar companies. In theory, the analyst should check all the variables that influence the multiple.
In practice, companies should estimate the most likely price for a non-listed company, taking as a reference some listed companies, operating in the same sector, and considered homogeneous. Two companies can be defined as homogeneous when they present, for the same risk, similar characteristics, and expectations.
The calculation is:

- A company whose price is known (P_1),
- A variable closely related to its value (X_1)

the ratio $(P_1)/(X_1)$ is assumed to apply to the company to be valued, for which the size of the reference variable (X_2) is known.
Therefore:

$$(P_1)/(X_1) = (P_2)/(X_2) \qquad [9]$$

so that the desired value P_2 will be:

$$P_2 = X_2 [(P_1)/(X_1)] \quad [10]$$

According to widespread estimates, the main factors in establishing whether a company is comparable are:

- Size;
- Belonging to the same sector (see for instance the Statistical Classification of Economic Activities in the European Community, commonly referred to as NACE);
- Financial risks (leverage);
- Historical trends and prospects for the development of results and markets;
- Geographical diversification;
- Degree of reputation and credibility;
- Management skills;
- Ability to pay dividends.

Founded on comparable transactions, the basis of valuation is information about actual negotiations (or mergers) of similar - i.e., comparable - companies.
The use of profitability parameters is usually considered to be the most representative of company dynamics.
Comparables may be looked for consulting databases like Orbis (https://www.bvdinfo.com/en-gb/our-products/data/international/orbis).
Among the empirical criteria, the approach of the multiplier of the EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) is widely diffused. The net financial position must be added algebraically to the EBITDA, to pass from the estimate of the enterprise value (total value of the company) to that of the equity value (value of the net assets). The formulation is as follows:

W = average perspective EBITDA * Enterprise Value / sector EBITDA = Enterprise Value of the company [11]

And then:

Equity Value = Enterprise Value ± Net Financial Position [12]

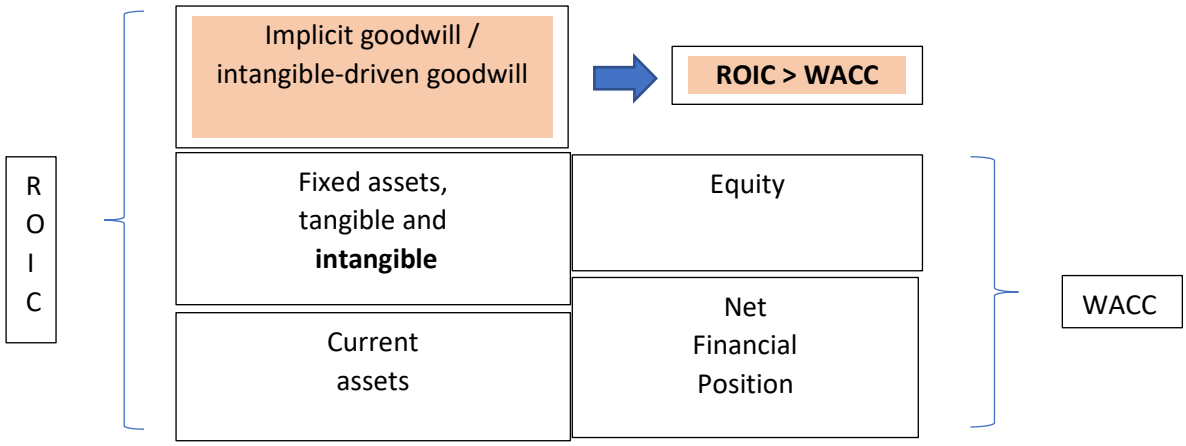
The DCF approach can be linked to the market approach since they both share as a starting parameter the EBITDA.

7. Competitive Advantage, Excess Returns, Economic Value Added, and Goodwill

Startups that survive Darwinian selection typically incorporate a competitive advantage. This reflects in goodwill that is not accounted for (unless purchased from third parties). The concepts of this section are excerpted and adapted from Moro Visconti (2020), chapter 17. Goodwill is a residual intangible since it incorporates all the added value that cannot be directly allocated to any other specific immaterial asset. Goodwill indicates the ability of a company or one of its branches to generate an extra-profit (new incremental wealth), that is the concrete attitude to produce profits higher than the average of the reference sector; this is represented by a typically indistinct set of intangible conditions (the image and the prestige of the company, the clientele, the organization, the management, the quality of the products, the commercial network, etc.) that express the competitive capacity of the company on the market.
The Competitive Advantage Period (CAP) considers the time frame during which the company is expected to be able to achieve returns on invested capital higher than the weighted average cost of capital (ROIC > WACC) and so represents positive goodwill. The implicit surplus value in the CAP is conveyed into the

strategic components of the company (competitive advantages, linked to product differentiation or cost advantages; technological, marketing and organizational resources and skills; industry attractiveness, etc.) and in the economic and financial aspects (first of all, the incremental EBITDA margin).
The intensity and duration of the CAP is at the base of the valuation models of the surplus value (implicit goodwill), driven by the intangible sources of the expected competitive advantages, which allow reinvestments at a rate of return on invested capital higher than the weighted average cost of capital (ROIC > WACC). Figure 10 shows the formation of goodwill.
The sustainable enterprise value corresponds to the valorization of the existing assets, added to the (typically intangible) value of growth opportunities.

Figure 10. - *Goodwill as a positive differential between the yield and the cost of invested capital*



The CAP is consistent with the notion of goodwill, in its meaning of excess return concerning the industry average. The concept is connected to the Economic Value Added and, in a multi-year cumulated perspective, to the Market Value Added.
The Economic Value Added (EVA) expresses the difference between the return and the cost of the invested capital (expressed in market terms). The Market Value Added (MVA) represents the present value of a stream of future EVA.
EVA is a performance measure devised by Bennet Stewart (1991), based on the difference between the return and the cost of capital. It is obtained by subtracting the cost of capital employed from the operating result (= EBIT) normalized and after taxes (NOPAT):

$$EVA = NOPAT - WACC * Ic \qquad [13]$$

or:

$$EVA = (r - WACC) * Ic \qquad [14]$$

where:

NOPAT = normalized operating income after taxes;
Ic = [adjusted] invested capital (shareholders' equity + financial debts + equity equivalents);
r = NOPAT / Ic = ROIC = return on invested capital;
WACC = weighted average cost of capital.

Being EVA expressed in terms of WACC, it is independent of the financial structure (unless the latter has an impact on the WACC; this is never the case in an "ideal" Modigliani & Miller world, where the financial leverage does not impact on the firm's value that only depends on its DCF) and therefore does not discriminate between levered and unlevered companies.
In any case, if a company is not indebted (D = 0), the invested capital corresponds to the net assets and the NOPAT ≈ net profit; so, NOPAT / Ci = Return on Equity (ROE) and WACC = ke (cost of equity). Since both the NOPAT and the invested capital are expressed at market value (thanks to the adjustments made with the Equity Equivalents), then NOPAT / Ic ≈ WACC = ke and consequently EVA ≈ 0. Based on EVA, a company:

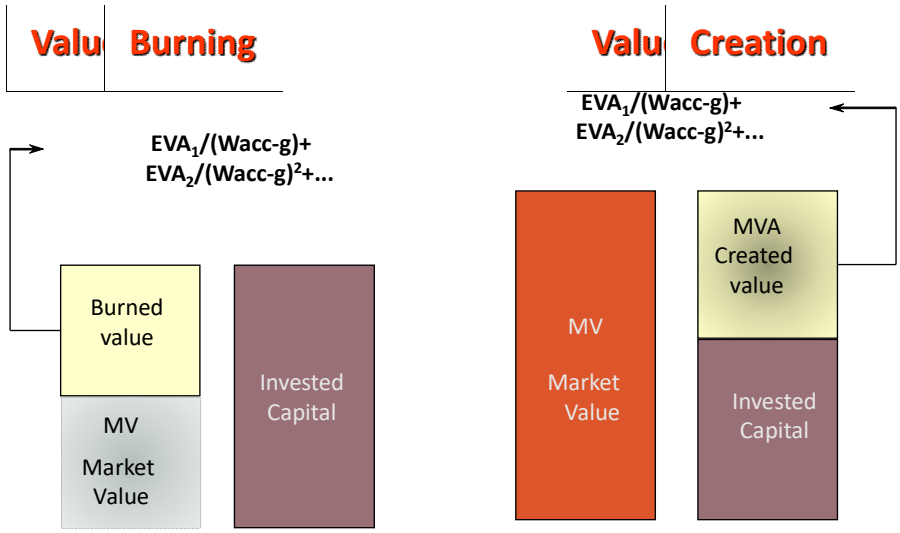
- Creates wealth (EVA > 0) when the return on capital (r = ROIC) is higher than the weighted average cost of capital (WACC);
- Destroys wealth in the opposite case (r = ROIC < WACC).

The original EVA calculation method prescribes some adjustments to the "raw" NOPAT and invested capital book values. These adjustments to the accounting parameters, to make them compliant with market values (equity equivalents) are necessary to express a correct measure of both the capital invested by the corporate lenders and the income available for the latter.
Market Value Added (MVA) is the difference between the market value and the invested capital, equivalent to the sum of the discounted future EVA:

MVA = market value - invested capital = present value of all future EVA = EVA1 / (WACC - g) = (economic profit of existing assets and growth opportunities) / WACC [15]

The MVA is the measure of the value that a company has created in excess (goodwill) compared to the resources already bound to the company. This relates, in particular, to the measure of the excess market value (referring to the value of the current and fixed assets, including intangible assets) concerning the book value of the capital raised (or invested), which is an expression of the accounting liabilities (shareholders' equity + financial debts = current assets + fixed assets + equity equivalents).
The MVA estimate can be broken down using a mixed capital-income valuation approach.
Since EVA is positive when r > WACC, a company has an MVA > 0 when it is expected that in the future r / WACC > 1.
Intangible assets typically have a significant role in the formation of EVA and MVA, as shown in Figure 11.

Figure 11. - *Relations between Economic Value Added and Market Value Added*



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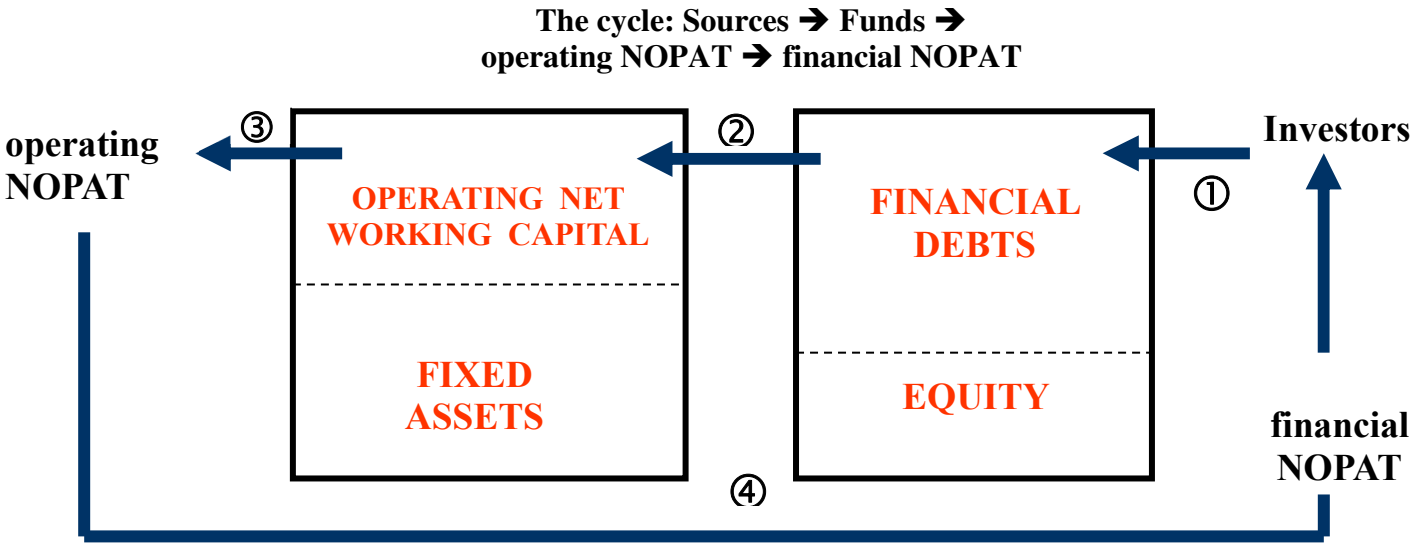
The acquisition of resources (funding sources or collected capital) is preparatory to their use (invested capital), even in intangibles that generate a positive economic and financial margin/flow (and a NOPAT) at the operational level. This positive economic margin assumes a financial connotation (through the EBITDA incorporated in the EBIT and then in the NOPAT), creating cash flows primarily allocated to debt service (operating cash flows) and, residually, to the remuneration of the shareholders (free cash flow to equity). The process is shown in figure 12.

Figure 12. - *Acquisition of Financing Sources and Creation of Economic-Financial Value*



① Funds acquisition of capital and debt (raised capital)
② Funds investment in net working capital and fixed assets (invested capital)
③ Generation of operating NOPAT (funds applications in net working capital and fixed assets ➔ sales ➔ operating NOPAT)
④ Operating NOPAT generates operating cash flows for investors (debtholders and shareholders)

The competitive advantage of a startup depends on several factors that are reflected in its business model. Concepts like the CAP, EVA, MVA, are fully consistent with the Franchise Factor Model of Leibowitz (2004). The accounting background of this value creation is represented not only by the difference between the return and the cost of capital (ROIC – WACC), expressed in book value and then market terms but also by what happens in the upper part of the income statement, considering sales and other revenues, operating fixed and variable costs, in monetary and non-monetary terms. Economic margins like the Added Value, the EBITDA (the difference between revenues and monetary OPEX), the EBIT are a cornerstone of any value appraisal. The EBITDA is the starting point for the evaluation approaches based on DCF or market multipliers. The EBIT is consistent with the NOPAT (used the estimate of EVA), after adjusting for operating taxes.
The application of these standard concepts to startups needs some fine-tuning. The e-Health industry is relatively recent, and it so discounts a novelty factor, with an expected growth above the commodity level. This incorporates a promise of earnings exceeding the cost of capital so that ROIC > WACC.
Above-average growth reflects in the digital scalability features of promising Startups. The rate of above-average earnings growth is the main component of goodwill (whose cumulation brings to a positive MVA), and this process is typically marginally decreasing across time.
In their first years, startups often experience superheated growth that is, however, limited in scope and duration. Longer-lasting growth stabilizes on sustainable patterns. When the market matures, entry barriers become porous, cheaper imitations are developed, innovation leads to improved or even radically different product models, distribution channels are penetrated, cost advantages are homogenized, pricing power erodes, and the market becomes commoditized (Leibowitz, 2004, p. 23). What happened to mature banks is likely to occur even to Startups.
In equilibrium, there is no extra-growth, and goodwill tends to zero.

REFERENCES

Barabási A. (2016), Network science, Cambridge, Cambridge University press.
Chen S., Cheng A., and Khanjan Mehta K. (2013), A Review of Telemedicine Business Models, Telemedicine and e-Health.April, pp.287-297.
Elliott T., Yopes M.C., (2019), Direct-to-Consumer Telemedicine, The Journal of Allergy and Clinical Immunology: In Practice, Volume 7, Issue 8, November–December, Pages 2546-2552
Fernandez P (2001) Valuation using multiples. How do analysts reach their conclusions? IESE Business school, Madrid.
Hein, A., Schreieck, M., Riasanow, T., Setzke M., Wiesche M., Bohm M., Krcmar H. (2019). Digital platform ecosystems, *Electronic Markets*, November
IPEV (2018), Valuation Guidelines, http://www.privateequityvaluation.com/Valuation-Guidelines.
Moro Visconti R., (2019), How to Prepare a Business Plan with Excel, https://www.researchgate.net/publication/255728204_How_to_Prepare_a_Business_Plan_with_Excel
Moro Visconti R., (2020), The Valuation of Digital Intangibles. Technology, Marketing and Internet, Palgrave Macmillan, Cham, April.
Osterwalder, A., Pigneur, Y., and Tucci, C. L. (2005). Clarifying Business Models: Origins, Present, and Future of the Concept, Communications of the Association for Information Systems (16:1).

Prescient & Strategic Intelligence (2020), Digital Health Market Research Report, https://www.psmarketresearch.com/market-analysis/digital-health-market

Rinsche F., (2017), The Role of Digital Health Care Startups, in: Schmid, A. ; Singh, S. (eds.), Crossing Borders - Innovation in the U.S. Health Care System. – Bayreuth, P.C.O. Verlag

Rochet J.C., Tirole J. (2003), Platform Competition in Two-Sided Markets, *Journal of the European Economic Association*, 1, 4, pp. 990–1029.

Schallmo D.R.A., Williams C.A. (2018), Digital Transformation of Business Models, Digital Transformation Now!, SpringerBriefs in Business, Springer, Cham.