

EXIT THROUGH AN IPO

The case of Science4you

Patrick Grilo Garcia

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Supervisor

Prof. José Paulo Afonso Esperança, Prof. Catedrático, ISCTE Business School, Departamento
de Finanças

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Patrick Grilo Garcia

Abstract – English

This project aims to assess the value of Science4you and consequently, analyse the option of executing an exit strategy through an IPO (Initial Public Offer). In order to achieve a reasonable result, the theoretical background for the several valuation methods is presented as well as the overall and financial background of the company and industry.

The valuation methods used to obtain the firm value are the Discounted Cash Flow and the Multiple Valuation. By applying both methods, it is allowed to compare Science4you with the peer group and to have a justifiable valuation of the company. The final value of the company results from the average of the three values obtained, leading to a value of 66 million euros.

Several alternative exit strategies were also considered but there was a special emphasis in studying the possibility of issuing an IPO. Considering a market capitalization equal to the shareholder value and maintaining the number of existing shares, the investors of the company would obtain a value per share of 120€.

Keywords: startup companies, discounted cash flow valuation, multiple valuation, IPO

JEL Classification: M13, M41

Abstract - Portuguese

Este projeto tem como objetivo avaliar o valor da Science4you e, conseqüentemente, analisar a opção de executar uma estratégia de saída através da emissão de uma OPA (Oferta Pública de Aquisição). De forma a obter um resultado fundamentado, são apresentados os conceitos teóricos necessários dos diversos métodos de avaliação, bem como o histórico geral e financeiro da empresa e da indústria.

Os métodos de avaliação utilizados são o *Discounted Cash Flow* e o Método de Avaliação por Múltiplos. Ao aplicar ambos os métodos, é possível comparar a Science4you com o grupo de pares e ter uma avaliação justificável da empresa. O valor final da empresa resulta da média dos três resultados obtidos, originando um valor de 66 milhões de euros.

Também foram apresentadas várias estratégias de saída, tendo sido dado especial ênfase em estudar a possibilidade de emitir uma OPA. Considerando uma capitalização de mercado igual ao valor do acionista, e mantendo o número de ações existentes, os investidores da empresa obteriam um valor por ação de 120€.

Palavras Chave: startup, discounted cash flow, métodos de avaliação por múltiplos, OPA

Classificação JEL: M13, M41

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This thesis was fulfilled as the final step for the completion of the master degree in International Management. My prior professional experience allowed me to have a better perspective, critical thinking and knowledge during the process of evaluating the company. It was decided to choose Science4you as the company to study due to the big development, growth and importance that the company achieved but also due to the close link between the company and ISCTE.

Of course that by choosing a young company like Science4you, it adds more challenges to the evaluation, so I would like to thank my Thesis' Advisor Professor José Paulo Esperança for all the help, time and guidance throughout the realization of the thesis.

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List of abbreviations

APV – Adjusted Present Value

BEI – Banco Europeu de Investimento

CAPM – Capital Asset Pricing Model

CEO – Chief Executive Officer

CMVM – Comissão do Mercado de Valores Imobiliários

D&A – Depreciation and Amortization

EBIT – Earnings Before Interest and Taxes

FCFE – Free Cash Flow to the Equity

FCFF – Free Cash Flow to the Firm

IPO – Initial Public Offer

MBO – Management Buyout

M&A – Merger and Acquisitions

QREN – Quadro de Referência Estratégica Nacional

WACC – Weighted Average Cost of Capital

1. Introduction

The aim of this thesis is to evaluate Science4you and determine the intrinsic value of its shares, with the intention to analyse a possible Initial Public Offering scenario. However, some valuations are more precise than others, the main variation of the final outcome will depend on the subjectivity of the assumptions taken into account since the conclusions of our valuation tend to reflect our biases. The bias can begin in the company we choose to evaluate, as well as the perception and view that we have of the company based on news or information we gathered before. (Damodaran, 2006)

There is another challenge regarding the company being evaluated: it is a startup company. The definition of startup is very ambiguous and differs from entrepreneur to entrepreneur or investor. According to Business Insider, most people determine by “its age, growth, revenue, profitability or stability”. In Forbes we can also obtain some definitions by CEOs, where some call it “a state of mind”, while others try to create rules to restrict the definition, such as TechCrunch writer Alex Wilhelm’s new rule of 50-100-500. According to the writer, a company can no longer be considered a startup when it accomplishes at least one of the following milestones: 50 million dollar revenue run rate (forward 12 months); 100 or more employees; worth more than 500 million dollar.

Usually, startups have a very short financial record, therefore evaluations are mainly based on the venture team, product attributes, management skill and experience, market growth and size, and expected returns (Milkova *et al.*, 2018). However, Science4you has been operating for 10 years and has more than 200 employees, therefore some people may consider that the company is no longer a startup. Nonetheless, the company shares a critical characteristic with most startups: fast growth. Due to the fact that the company is still expanding fast, it requires large amounts of investment. Therefore, some theories will be harder to apply since most valuation methods are more efficient for mature companies with a stable growth, whose future cash flows are more predictable and thus easier to forecast.

In order to apply the Discounted Cash Flow method to evaluate Science4you, it is required to assess the time required for the company to reach a stable growth. Damodaran (2009) explains that “*The judgment of when a firm will become stable is complicated by the fact that the actions of competitors can play an important role in how growth evolves over time.*”

This thesis aims to surpass the difficulties of evaluating a startup and obtain a fair value based on the financial records of the company, diminishing the subjectivity that is implicit in the commonly used methods for valuing startups. By having an understanding of the company's value, it would be possible to study the exit strategy options with more detail and have better business decisions.

Regarding the layout of the thesis, chapter two presents the literature review, including the main publications and studies that describe several methods of business valuation, as well as the applicability and advantages that underlie each method.

After that, in chapter three, it will be developed a detailed analysis of Science4you. In order to have a better understanding of the company, this chapter includes the history of the company, their portfolio, the internationalisation strategy, some financial indicators and an overview of the industry.

The evaluation of the company will be assessed in chapter four, where it will be explained the assumptions used to obtain a value through the Discounted Cash Flow valuation method and the development of the Multiple valuation method.

Finally, some exit strategies shall be presented in chapter five, demonstrating the importance of having an exit strategy. It will also be described in more detail the option to exit through an IPO, with the associated costs, advantages, disadvantages, timing and shareholder value.

2. Literature Review

2.1 Brief Overview

In order to evaluate a company it is essential to understand the definition of value. Value may be defined as the dimension of measurement used in an economy. In business, the value consists in the cash flows generated in the form of revenue and income. These are created by investing in fixed assets that grow over time (Agarwal, 2013). The primary way to create value in a company is through the firm's operations, which will generate revenue, capital that can be used for the company to either pay their daily basis operations, previous investment, to make new investments or to distribute the earnings to their shareholders.

To value an asset is an essential tool for the life of a company, especially when the asset that is being evaluated is the company itself. The valuation can be performed in order to examine the progress of a company, to forecast results, to buy or sell the company, or to compare the company with its competitors. In corporate finance it is crucial to understand the mechanism of valuation. In order to make intelligent decisions it is required to know the value of the asset and what determines that value (Damodaran, 2006).

However, valuations differ based on the asset since some value estimates have more uncertainty and assumptions than others. When evaluating a company, we can split uncertainty in three types, estimation uncertainty, firm-specific uncertainty and macroeconomic uncertainty (Damodaran, 2006). The author stresses that the main focus should be on making the best estimates of firm-specific information, such as the future cash flows, future earnings, growth of the company, the expectation we have on the performance of the company, and try not to bring our view about the macroeconomic variables.

2.2 Valuation Methods

According to Damodaran (2005), there are four approaches to valuation – i) Discounted Cash Flow Valuation, ii) Liquidation and Accounting Valuation, iii) Relative Valuation and iv) Contingent Claim Valuation.

Discounted Cash Flow Valuation	Liquidation and Accounting Valuation	Relative Valuation	Contingent Claim Valuation
Firm Value Models:	Book Value	Multiples:	Binomial
Free Cash Flow to Firm (FCFF)	Fair Value Accounting	Price/Earnings ratio	Black and Scholes
Economic Value Added (EVA)	Liquidation Valuation	Price/Cash Earnings	
Equity Value Models:		Price/Sales	
Dividend Discount Model (DDM)		EV/EBITDA	
Free Cash Flow to Equity (FCFE)		EV/Sales	
Adjusted Present Value			

Source: Damodaran, A. 2005. *Valuation approaches and metrics: A survey of the theory and evidence*. Now Publishers Inc.; Fernández, P. 2002. *Valuation using multiples: How do analysts reach their conclusions?* Research paper no. 450, IESE University of Navarra, Barcelona

2.2.1 Discounted Cash Flows Valuation

The Discounted Cash Flows valuation measures the value of an asset by calculating the expected cash flows of that asset in the present, discounting them at a rate that reflects their associated risk. The basis of this approach is that the present value of an asset is not measured by its worth or price but by the cash flows we expect to earn in the future from that asset. This is the most used approach in academic terms, having the best theoretical credentials. (Damodaran, 2005).

According to Damodaran (2005) there are four variants of discounted cash flows valuation in practice:

- 1- The expected cash flows are discounted at a **risk-adjusted discount rate**;
- 2- In order to estimate the value of a risky asset, the expected cash flows are adjusted for risk to arrive at **certainty equivalent cash flows** and are discounted at a riskfree rate.
- 3- The **adjusted present value** approach can be divided into two phases. Firstly the business is valued without debt. Only afterwards it is considered the marginal effect of borrowing money, positive and negative, on value.
- 4- The company is valued based on a function of the **excess returns** that are expected to generate on its investments.

There are common assumptions in the four approaches but there are also variants in the assumptions taken that make the results differ. The most common approach is the risk-adjusted discount rate. Essentially, when valuing an asset with a higher risk, a higher discount rate will be used to discount the expected cash flows and a lower discount rate for assets with a lower risk. (Damodaran, 2005) In this methodology, there are two approaches, the firm valuation and the equity value. (Damodaran, 2005)

2.2.1.1 Firm Value Model

This approach values the whole company, reflecting the value of all claims on the firm which include not only the assets in place but also growth assets, that consist in expected cash flows of investments yet to be made. The value obtained is considered the firm or enterprise value (Damodaran, 2005 and 2006). So from here on, it will be considered that the firm value is the same as enterprise value. Within this category of valuation we will use Free Cash Flow to the Firm Model (FCFF).

Free Cash Flow to the Firm – FCFF

In the *FCFF* model the entire firm is valued by discounting the free cash flow to the firm, which are the cash flows before debt payments and after reinvestment needs (Damodaran, 2005), at the weighted average cost of capital (WACC), that consist in weighted average of the after-tax cost of debt and cost of equity (Goedhart *et al.*, 2005).

To calculate the FCFF of a firm, we can use the following formula:

$$\text{Free Cash Flow to Firm} = \text{After-tax Operating Income} - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in non-cash Working Capital}, \quad (1)$$

$$\text{After-tax Operating Income} = \text{EBIT} * (1-t) \quad (2)$$

This model uses two assumptions/conditions that need to be met. The first basis for this valuation is that the firm is growing at a stable growth rate, a rate that it can sustain perpetually. Hence, the characteristics of the firm have to be consistent with the assumption of a stable growth rate. More specifically, the reinvestment rate used to calculate the FCFF should be consistent with it and the use of a constant cost of capital for companies in a stable growth rate assumes that the debt ratio of the firm is constant over time. (Damodaran, 2005). In case the company meets both requirements, in the most general cases the value can be

calculated by using the following equation:

$$Value\ of\ Firm = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t}, \quad (3)$$

n= Life Time of Asset

FCFF= Free Cash Flow to the Firm

WACC= Weighted Average Cost of Capital

Considering the fact that Science4you is still in an expansion and internationalization phase, the growth rate varies greatly each year, failing the requirement of growing at a stable growth rate, in the short term. For that reason, the previous formula cannot be applied to the company. However, Damodaran (2005) provides an alternative that is better explained in his website, which is called the Two-Stage FCF Model. This model can be applied to companies that will reach a steady state, growing at a stable growth rate, after n years. In this model the value of the firm can be obtained by:

$$Value\ of\ Firm = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t} + \frac{[FCFF_{n+1}/(WACC-g_n)]}{(1+WACC)^n} \quad (4)$$

As the name implies, this formula is composed by two stages. In the first stage, the growth rate is higher and the present value of the cash flows is calculated until a predetermined period of time (n). The second stage is titled terminal value, in which is expected that after the predetermined horizon the company's cash flows grow in a stable-growth rate (g_n) for perpetuity.

2.2.1.2 Equity Value Model

While the firm value models value the entire company, the equity valuation models focus on the equity stake in the business, based on the shareholders perspective, as equity holders in the business. In this type of valuation we will use the Free Cash Flow to the Equity Model (FCFE).

Free Cash Flow to the Equity – FCFE

In this approach the equity is valued by calculating the free cash flows to the equity, that consists in the cash flows after all reinvestment needs and debt payments, discounted at the cost of equity, which is the rate of return appropriate for the equity risk in the company. (Damodaran, 2006)

To calculate the FCFE and the Value of the Equity we can use the following formulas:

$$FCFE = \text{Net Income} + \text{Depreciation} - \text{Capital Expenditures} - \text{Change in non-cash Working Capital} - (\text{New Debt Issued} - \text{Debt repayments}), \quad (5)$$

$$\text{Value of Equity} = \sum_{t=1}^{t=n} \frac{FCFE_t}{(1+K_e)^t}, \quad (6)$$

n= Life Time of Asset

FCFE= Free Cash Flow to the Equity

Ke= Cost of Equity

We can get from firm value to the equity value by subtracting the value of all non-equity claims to the firm value, more specifically the value of debt. Note that the FCFF is a pre-debt cash flow, while in FCFE we have to take the debt into account. In the case we have leverage and it is expected to change in the future, it is more difficult to estimate debt issues and debt repayments. However, as seen before, in order to calculate the WACC for the firm value it is required to have information about debt ratios and interest rates.

Discount rates

In order to implement any of the models described above and calculate the free cash flows it is required to estimate discount rates. As mentioned above, one of the discount rates used to calculate the firm value is the WACC, which combines the return rates for both the investors (shareholders) and creditors. The formula for WACC can be defined as follows:

$$WACC = \frac{D}{D+E} K_d (1 - T_m) + \frac{E}{D+E} K_e, \quad (7)$$

D= Debt

E= Equity

K_d= Rate of return for debt, cost of debt

K_e= Rate of return for equity, cost of equity

T_m= Corporate Tax rate

The main advantage of the WACC is the fact that it considers both sources of capital and each one is weighted by the fraction of the capital structure it represents (Luehrman, 1997). To determine the cost of equity the most common model used is the capital asset pricing model (CAPM) which uses the following formula:

$$K_e = R_f + \beta_i(R_m - R_f), \quad (8)$$

R_f= Risk free rate

β_i= Beta

(R_m – R_f) = Risk Premium

In order to obtain the risk free rate, the best option is to look into the country's treasury obligation with long periods (e.g. 15 year government bonds), since it is the most riskless asset available. In theory, a riskless asset is one in which the investor knows the expected return with certainty, having no default risk. (Damodaran, 2006)

In terms of the risk premium, according to Damodaran (2006) it can be defined as the expected return that the investors demand by investing in an average risk investment instead of a risk-free investment. The most commonly used method used to calculate the risk premium is based on the historical data. In this method, the risk premium is calculated via the “difference between average returns on stocks and the average returns on risk-free securities over an extended period of history” (Damodaran, 2006).

The beta consists in the risk that an investment adds to a portfolio, which is not observed on the market, therefore needs to be calculated by taking a set of assumptions. According to Damodaran (2012) there are three approaches to estimate the beta, the first is to use the historical data on market prices, the second is to estimate it from the fundamental characteristics of the investment, and the third is to estimate it from accounting data. However, since the company that is going to be analysed is not publicly traded, it is not possible to use the first, so the approach used to estimate the beta is the one based on the fundamentals of the business. By using an alternative method, the bottom-up betas, it is possible to obtain the beta without needing past prices of the firm to estimate it. This approach assumes that if we put together the beta of two assets, we will obtain the weighted average of the individual assets betas and so, the beta of a firm can be obtained by the weighted average of the betas of all the businesses the company is in (Damodaran, 2012).

Simply put, this method uses the unlevered beta of the industry since companies in the same industry face similar operating risks and therefore have similar operating betas (Goedhart *et al.*, 2005). The formulas used are:

$$\beta_{u_{business}} = \frac{\beta_{comparable\ firms}}{[1+(1-t)\left(\frac{D}{E}ratio_{comparable\ firms}\right)]}, \quad (9)$$

β_u = Unlevered beta

t = Marginal tax rate

We have to take into consideration the several businesses in which the company is operating:

$$\beta_{u_{firm}} = \sum_{j=1}^{j=k} \beta_{u_j} \times Value\ Weight_j \quad (10)$$

In which it is assumed that the company is operating in k different businesses. After obtaining the unlevered beta of the firm, we can obtain the levered beta of the firm by using the Debt-to-Equity ratio of the firm:

$$\beta_L = \beta_u [1 + (1 - t) \left(\frac{D}{E}\right)] \quad (11)$$

The cost of debt is define as the firm's current costs to obtain finance to fund their assets, projects and investments. According to Damodaran (2012), when the company has long-term bonds, the calculation of this cost is simple, we only need to access the market price of the bond as well as the coupon, the maturity and through them calculate a yield that can be used as the cost of debt. However, this scenario is not possible for companies that do not issue bonds and have no rate. In these cases, the solution proposed by Damodaran (2012) is to either check recent borrowing history from the company or to estimate a synthetic rating.

The first approach looks at the most recent borrowings of the firm and uses the default spreads charged to the company to obtain the cost of debt. The second consists in assigning a rate to the firm based on its financial ratios, just like a rating company would do. This assessment starts by looking at the rating classes and investigate the financial characteristics shared by the firms within each class. Then, based on the company's interest coverage ratio, it is possible to obtain a synthetic rating and use it to estimate a default spread. By adding the spread to the risk free rate we will arrive at the pre-tax cost of debt.

$$Interest\ coverage\ ratio = \frac{EBIT}{Interest\ Expenses}, \quad (12)$$

$$After\ tax\ cost\ of\ debt = Pretax\ cost\ of\ debt \times (1 - Tax\ rate) \quad (13)$$

2.2.1.3 Adjusted Present Value

Opposing to the previous models where the debt financing is captured in the discount rate, the Adjusted Present Value (APV) approach separates the value of debt financing from the value of the assets in place in the firm. Essentially, we start by calculating the value of the firm as if it was financed entirely with equity, without any debt, and only when the debt is added it is considered the net effect on value of both the benefits and costs of debt. The benefits of debt consist in the fact that interest expenses payments on certain debts are tax deductible, acting as tax shields by lowering the taxable income for the firm. The costs of debt consist in the increase of the bankruptcy risk, the bankruptcy cost (Damodaran, 2006). Therefore, the formula to calculate the value of the firm consists in:

$$\text{Value of Firm} = \text{Value of Business without debt} + \text{PV (Expected Tax Shields)} - \text{PV (Expected Bankruptcy Costs)}, \quad (14)$$

PV= Present Value

In the APV method, we estimate the value of the firm in three steps. The first step consists in estimating the unlevered value of the firm, which is done by discounting the expected free cash flows to the firm by the unlevered cost of capital. Therefore, the formulas will be:

$$\text{Value of Unlevered Firm} = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+K_u)^t}, \quad (15)$$

$$K_u = \text{Unlevered Beta} + \text{Risk free rate} + \text{Market Risk Premium Rate}, \quad (16)$$

K_u= Unlevered cost of capital

The second step will consist in calculating the present value of the expected tax shields. Damodaran (2005) simplified the previously used formula by assuming the tax rate as constant and using the cost of debt as discount rate, reaching the following formula:

$$\text{PV (Expected Tax Shields)} = \frac{(\text{Tax Rate}) \times (\text{Cost of Debt}) \times (\text{Debt})}{\text{Cost of Debt}} = \text{Tax Rate} \times \text{Debt} \quad (17)$$

The final step of this model is to assess the bankruptcy costs and the default risk given a certain level of debt. Theoretically, to estimate the expected bankruptcy costs it is necessary to calculate the impact that the additional debt has in the probability of default and the direct and indirect cost of bankruptcy, as shown in the following formula:

$$PV(\text{Expected Bankruptcy Costs}) = (\text{Probability of Bankruptcy}) \times (PV \text{ of Bankruptcy Costs}) \quad (18)$$

However, this estimation poses the most significant problem in the APV model since both the probability of default and bankruptcy costs cannot be calculated directly. (Damodaran, 2005) Due to this fact, the majority of the authors who use and analyse the APV model do not use the expected bankruptcy costs in their assessments such as Luehrman (1997) and Goedhart *et al.* (2005) Despite this fact, Damodaran (2005) proposes two ways to obtain the probability of default, one is to estimate a bond rating just like in the cost of debt mentioned before, and the other consist in a statistical approach in which it can be estimated the probability of default at each level of debt. In terms of the bankruptcy costs, it can be estimated based on studies that have researched these costs in real bankruptcies.

2.2.2 Liquidation and Accounting Valuation

The liquidation and accounting valuation is based in the valuation of the existing assets of a firm, establishing that all assets should be valued individually. By adding them together it is possible to reach the total value of a company. (Damodaran, 2005)

This model has three main approaches, consisting in the book value, fair value accounting and liquidation valuation. The first values a company based on their income statements and balance sheets. However, according to Damodaran (2005) this approach is only acceptable when the company is mature, with prevailing fixed assets and little or no growth opportunities. “For firms with significant growth opportunities in businesses where they can generate excess returns, book values will be very different from true value.” (Damodaran, 2005: 52) Taking into account that Science4You is a young and growing company, it would be unreasonable to apply the book value.

Another method, the fair value, was described by the author as the return to the book value of assets due to a strong push from both accounting rule makers and regulators. Their ambition was that the analysis of balance sheet and the consequent net worth are good measures to represent the fair value of assets and companies. Nonetheless, many authors believe that this approach will only increase the potential for accounting manipulation. So, the credibility for this approach may be arguable and for that reason, it won't be used.

Lastly, the method of liquidation value measures assets as if they were sold right away. The value obtained through this method should be very similar to the one obtained by using the discounted cash flows. The main difference is the urgency on the liquidation of the assets, that may result in a bigger discount rate, which may underestimate the real value. The discount rate is associated not only to the number of potential buyers, but also to the state of the economy and the characteristics of the asset. In cases where the seller is eager to sell their assets, the discount rate will have a big impact in the process.

Damodaran (2005) concludes by affirming that the liquidation valuation is not advised to be used in healthy companies that have opportunities and market to grow, since it will represent a conservative estimation. In relation to companies that are unstable and where the going concern assumption used in the discounted cash flow valuation is not met, the liquidation valuation approach is more likely to obtain a realistic estimation. Considering that none of these methods apply to the case of Science4you, they will be excluded of the evaluation process.

2.2.3 Relative valuation

In relative valuation, the value of an asset is obtained based on the pricing of similar and comparable assets in the marketplace. Essentially, we are trusting market values, basing our assessment on the price traded in the market or at least, the average of prices. It is a simpler method to adopt and frequently used, since it reflects the market fair value. As stated by Damodaran (2002) “almost 90% of equity research valuations and 50% of acquisition valuations use some combination of multiples and comparable companies and are thus relative valuations”.

In order to compare values of similar companies it is necessary to standardize the values to a common variable, which can be the revenues generated by the company, earnings, book values, or measures that are specific to the sector that the company operates. (Damodaran 2005) Furthermore, it is important to understand which companies can be compared and called “similar/comparable”. According to Damodaran (2005), a company can be considered comparable when it presents identical size, cash flows, growth potential and risk as the firm being valued. Even though analysts define a comparable company as one that operates in the same business, it is not possible to use this comparison when there are not enough firms in the industry.

To perform a relative valuation, there are several multiples to use, which according to Fernandez (2002) can be divided in three groups:

- Multiples based on the equity of the company, the company's capitalization;
- Multiples based on the value of the company, the company's equity and debt value;
- Multiples based on the growth references.

Some examples of the most used multiples based on capitalization are Price Earnings Ratio (PER = share price/earnings per share), Price to Cash Earnings (P/CE= share price/(net income before depreciation and amortization)), Price to Sales, Price to Book Values (P/BV) (Fernandez, 2002). However, since Science4You is not publicly traded it is not possible to obtain the share price, but can be an option to obtain the value of the peers chosen.

The multiples based on the value of the company are the most practical to use in the valuation of Science4you. In this category, one of the most used multiples by analyst is the Enterprise Value to EBITDA (EV/EBITDA), since the enterprise value considers both the market value of equity as well as the market value of debt. It can also be used the Enterprise Value to sales and Enterprise Value to Unlevered Cash Flows.

In terms of multiples based on the growth references, they are mainly used in growth industries such as technology and health, like the PEG (PER/growth of earnings per share in the next five years) and Enterprise Value to EBITDA growth, that considers the EBITDA growth in the next five years (Fernandez, 2002).

Even though the multiples are a frequent valuation method, they usually face a wide dispersion, reason why its use in valuations became questionable. Nonetheless, as stated by Fernandez (2002), multiples should be used as a second stage of valuation, after using a different method to value a company. In fact, by comparing the multiples assessed with the ones of comparable firms it will be possible for analysts to appraise the valuation and to identify differences between the firm being evaluated and the others it was compared with.

2.2.4 Contingent Claim Valuation

Contingent claim valuation applies the notion of an option into valuating an asset that share option characteristics. An option is a contract that provides the owner the right, but not the obligation, to either buy or sell a determined security or other financial asset during a certain

period of time or on a specific date in the future at a predetermined price (strike price). The owner (option holders) pays a premium to the seller (option writer) to exercise this right. An option that provides the right to buy is titled call option, whereas an option that provides the right to sell is titled put option. An option buyer expects that the market value of the asset increases, which will allow him to acquire the asset at a lower price (strike price) and sell it for a higher price (market price), obtaining profit (Investopedia.com).

Adapting the theory of options to valuation, “an asset can be valued as a call option if the payoffs on it are a function of the value of an underlying investment; if that value exceeds a prespecified level, the asset is worth the difference; if not, it is worth nothing.” (Damodaran 2006)

Essentially, options valuation is used to make decisions considering the specific circumstances. As markets become more unpredictable, it becomes necessary to include uncertainty in the decision making process, since most of the important strategic decisions are made in uncertain environments.

Unlike the DCF approach, in which we assume a single decision in the beginning, the contingent claims valuations considers multiple decision pathways as a consequence of adapting to uncertainty and learning throughout the development of the project. It brings more flexibility in managerial decision making, not only to analyse investments but also to operational decisions.

For the reasons mentioned, this methodology is mainly used to analyse investments in projects or operational decisions where companies have the option to expand, to temporarily suspend, to postpone and to abandon the investment. (Schwartz, 2013)

The most common contingent claim valuation models are the binomial and the Black-Scholes model, which are mainly used when valuing companies that operate in sectors that explore resources or commodities that can be traded in the secondary market such as oil, gold or gas. The reason behind this is the fact that the value of the firm is deeply related to the market price of the resource that the firm explores, so the company can increase or decrease its production according to the market price in order to maximize its wealth.

Undoubtedly, this model is not appropriate to use for valuing Science4You since the company does not operate in a sector that explores natural resources.

3. Science4you company overview

3.1 Company Presentation

The idea behind Science4you started in 2007 in a final undergraduate project of the current CEO Mr. Miguel Pina Martins and a collaboration between ISCTE and FCUL (Faculdade de Ciências da Universidade de Lisboa). The students from ISCTE had to develop a business plan for ideas conceived by the FCUL students and the group of Mr. Miguel Martins received the idea of physics kits. In order to reach a wider market, the group had the idea of turning the kits into scientific toys, making it more fun to use, educative and scientific, entering a non-existent market. In 2008 Mr. Miguel Martins decided to turn the idea into a reality and through own and external funds, from InovCapital (now Portugal Ventures), ISCTE and FCUL lecturers, and a group colleague called Luis Martins, the company was created.

3.1.1 Products

Nowadays, Science4you's activities include not only the development, production and commercialization of educative and scientific toys, but also develops activities for children such as birthday parties, animation for weddings and baptisms, holiday camps and scientific animation. Every toy kit includes a book that is more than just an instruction manual, it also illustrates educational content related to the toy and encourages children to engage in fun experiments. The firm aims to be one of the top three biggest toy makers in the Iberian Peninsula and its growth prove it.

The company offers a wide variety of scientific and educational toys that cover several educational purposes, allowing children to have fun while learning all about different science fields including Physics, Astronomy, Chemistry, Agronomy, Ecology and Paleontology. All Science4you's toys are included in the STEM category, meaning that the company's products help kids to gain knowledge in the areas of Science, Technology, Engineering and Mathematics by stimulating their skills while playing. Furthermore, the firm's toys include the Brain Activator stamp which indicates the educational skills that can be stimulated by each toy. The skills that can be developed with Science4you toys are concentration, vocabulary, manual skills, creativity, memory, social skills, reasoning and learning.

In order to reach a wider market in Portugal, Science4you created several categories of toys according to each need and characteristic of the target:

- Science Júnior is a specific category for younger children, aged from 3 to 5 years old. The kits aim to provide positive stimulation to children, helping their neurocognitive development and increasing their fondness for learning;
- EcoScience was created with the ambition to alert and make children aware of the climate change, giving more importance to renewable energies, ecology and environmental protection, by contributing to a sustainable development;
- The Science category is focused in inciting children's interest for several areas of science, from biology to physics, encouraging them to ask questions in an entertaining and pedagogical way during the practical experiments;
- Build & Play integrates a collection that develops children's motor skills, imagination and reasoning while building replicas of 3D vehicles and discovering dinosaurs and precious stone through the use of excavation techniques;
- Craft4you is a category that not only stimulates kids to develop their fine motor skills, but also stimulates their imagination by cutting, shaping and coloring. The collection includes balloons, clay and other, which develop children's skills through the elaboration of works that require manual dexterity and thoroughness;
- Due to the importance that technology has nowadays, it is crucial that children can use it in a fun, educative and safe way. That's why Science4you developed a technological category for the kids, the Tech4you;
- Books&Learn focuses in educative books and encyclopedias, teaching Mathematics, Science, Portuguese and Technological evolution with a fun component, which will improve their school performance;
- The category Games4you comprises a collection of puzzles, 3D puzzles, quizzes, board games and educative games. This encourages family and friend time, where learning is a fun, yet challenging, task;
- The final category is AnimalPlanet, which offers a collection of animal replicas. The collection has wild animals, farm animals, pre-historical animals, sea animals and fantasy animals. Each replica includes an exclusive educative e-book from Science4you that presents several characteristics and curiosities of the animal.

3.1.2 Corporate Department

In addition to the products marketed for the general public, the company develops products according to the need of each partner, brand or company, without losing the educational component that is characteristic of the firm's toys. This personalization can be made to birthday presents for the employees' children, for clients, suppliers, for Christmas gifts, a company's anniversary and much more important moments. Every toy can be adapted to a company through its box and the respective educational book. Furthermore, the company gives the possibility of creating an educational toy from scratch that is related to the business of the company, a topic or in the context of an environmental action that is being implemented by the requesting company. Besides the personalized toys, the company also offers personalized giveaways and merchandising for companies that are launching a new product and wants it to be highlighted. Nonetheless, the corporate services cover more than personalized toys, giveaways and merchandising, it also offers vouchers, parties and scientific workshops for children and adults.

3.1.3 Internationalisation

Even though Science4you is 100% Portuguese it started early the process of internationalisation by exporting to Spain in 2009 by request from FNAC. The company took that decision since it was a similar market with a low risk and investment. In 2010 it started exporting its products to Angola, Mozambique and Brazil. The exportation for those countries made sense due to the fact that they are Portuguese-speaking countries, making it easier to enter the market, not only because of the language, but also because of the cultural similarities. A year later Science4you opened its first office outside Portugal through a partnership with *Parque Científico da Universidad Autónoma de Madrid*, which included the university's logo on the toys sold in Spain. In 2012 the company started to export to France, Cape Verde and later on, Greece. In 2013, Science4you opened the first office in England, located in London, which represented a huge opportunity due to the English language market. During the same year, some products from Science4you entered the Polish market through Biedronka and Jumbo chains of stores through a partnership with Jerónimo Martins group. In 2014 the company continued its aggressive internationalisation strategy and not only started selling in the United States of America, but also opened the first street store in Madrid. In 2017 the company entered 10 new markets, Morocco, Dominican Republic, Latvia, Estonia, Slovenia, Croatia, Serbia, Taiwan, Russia and Belarus.

Despite the fast growth in foreign countries, during the first years the firm did not participate in any industry fairs. However, in 2010 the company initiated a project called *Science4you – Internacionalização e I&D* which ambitioned to double the international business volume. The project was financed by *Quadro de Referência Estratégica Nacional* (QREN) and had three main pillars:

1- Development of new and unique products, that had an innovative and strong educational component in partnership with FCUL;

2- Improvement of the quality of the products through the investment in assembling equipment inherent to logistics;

3- International Marketing, which had as focal point the participation in International Fairs and the personal contact with potential clients.

Following the main objectives established by the project, the company started participating in international fairs in 2011, by undertaking the Nuremberg Toy Fair in Germany and the London Toy Fair. By 2013 the company was already participating in six international fairs. This represented an opportunity for the company to establish new business relationships, to do some networking and expand its partnerships. This kind of strategy proved to be advantageous since it created some important partnerships for the company, an example being the one made with the Oxford University that was signed during the London Fair in 2013. The cooperation between these two parties included the inclusion of Oxford University's logo in the packaging and the review of the content in English by the university. By having the university's logo in the packaging, it brought a new dimension for the products of Science4you in England. The fairs were also a way for the company to do some marketing, since it hosted thousands of visitors and included the participation of some companies from all over the world, allowing the company to have more exposure.

As stated by Mr. Miguel Martins "The internationalisation plans are a way of countering the limitations of the domestic market". In order to face the saturation of the Portuguese market the company uses every opportunity to enter new market through an aggressive internationalisation strategy. Nowadays, after 10 years of activity, the company can be found in over 40 countries around the World and the foreign markets represented 60% of total revenues during the first semester of 2017.

3.2 Financial Indicators

Before evaluating the company, it is important to see how the company is performing to understand if it is growing and if it is financially stable or not. For that reason, in this chapter, we will analyse some financial indicators of the company, which will complement the overview made before.

The data provided by the company is only for Science4you S.A., which does not represent the total financial overview, since it is not the consolidated financial data.

3.2.1 Revenues

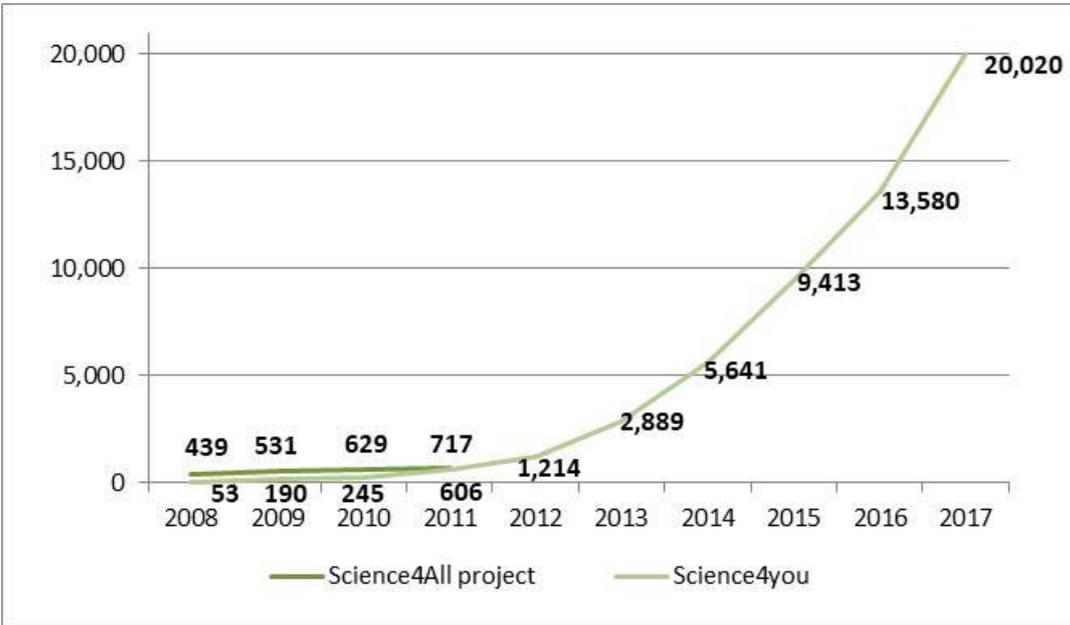
As mentioned before, the company started from an undergraduation project. In that project the students had to analyse the market, the competitors, the marketing strategy and all other necessary aspects for a business plan, such as the financial analysis. Today, after more than 10 years, it would be interesting to compare the performance predicted by the student for the new company (Science4All) and the real performance that the company achieved. For the real company, the value of revenues were assessed by adding the value of sales to the value of own work capitalized.

In the project, the students analysed not only the number of children between 0 and 14 years old, but also the number of schools with laboratories and the number of physics teachers, since they represented a target as well. The students considered that their project was inserted in the category of Educational Services and according to their estimation, in the first year of activity they expected revenues of 439 thousand euros, with a penetration of 12% of physics kits, 2% of scientific toys and 66% of training. Of course, this represented a very optimistic forecast since a company needs time to develop a stable supply chain, to develop both scientific toys and physics kits, to hire employees for the several areas of the company and give them the necessary formation, and of course, to obtain some market recognition. It was a very short time to obtain such development. Regarding the Science4All project's revenue growth, it was expected to be around 21% during the second year, 19% and 14% in 2010 and 2011, respectively.

When we compare both, the project and the real company, the differences are very clear. Even though we cannot analyse both until 2016, it is possible to observe in table 1 that the data diverges. Science4you obtained revenues of around 53 thousand euros in the first year, far inferior of what the students expected to obtain. During the first year, Mr. Miguel Martins had

to do most of the work, from receptionist to financial and commercial director. He had to go to several stationeries and toy stores to talk with people and show them his products, doing the deliveries himself, reason why the results are so different. Nonetheless, there is another aspect that differs between the two revenues which is very interesting and that is the slope of both revenues growth. While the fictional company expected higher results during the first year, it presents a lower slope of the revenues growth in the following years. In the second year that Science4you operated, the result was 190 thousand euros, which means that the revenues more than tripled just in one year. The third year was the one in which Science4you had the lowest growth regarding revenues, presenting a growth of 29% which is still superior to the highest growth assessed by the students, which was 21%. Since 2010, the growth was always far superior from what was expected in the project, which is clear when we look at both revenues' slopes. Taking into account the success of the company and the aggressive internationalization strategy mentioned before, it is clear why the slope is so different.

Table 1 – Revenues (thousand €)



Source: Science4you

Despite the great difference in results in the first year, by 2011 the revenues from both companies were very similar with Science4you obtaining 606 thousand euros. According to the assessment made and the real data, it was expected that by 2012 the revenues from the company surpassed what the students expected that the fictional company would make with a result of 1,214 thousand euros. The following years the company continued to obtain a fast

growth and by 2017 the revenues amounted 20 million euros, which means that just in the last 5 years the company multiplied the 2012 revenue by 16.

3.2.2 Operational Costs

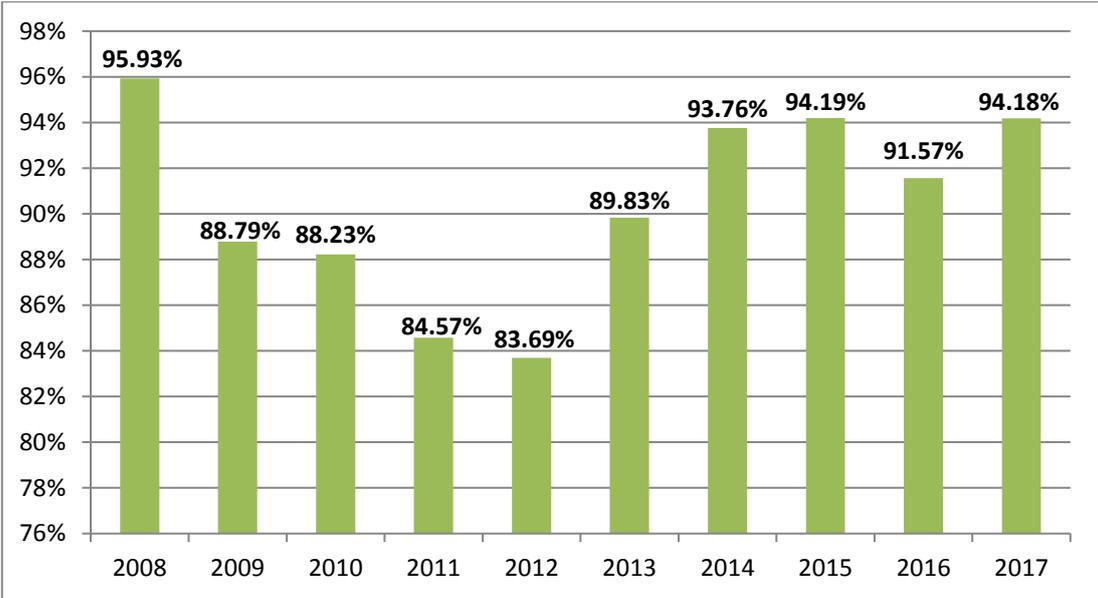
The operational costs are the ones that the company undertakes to perform its activities, such as personnel expenses and external services and supplies. The distribution of the costs depends on the activity of the company, if it offers products or services, if it needs strong investment in assets and therefore has a bigger depreciation, are just two cases that can explain the differences between different companies operational costs. Science4you's main operational costs include cost of goods sold, external supplies and services, and personnel expenses, in this order. By observing the operational costs in % of revenues, it is possible to understand if the company is obtaining economies of scale and the impact of the investments made.

As we can observe in table 2, the operational costs in the first year were considerable, representing around 96% of revenues, giving the company a very low margin for the others costs associated with the net income. As it was expected, in the second year the ratio decreased 7% and stabilized in the following years. The fact that the ratio of operational costs and revenues is declining does not mean that the operational costs are diminishing, rather that their growth is being slower than the growth of revenues.

In 2013 the ratio started to increase reflecting the opening of the first office in England and entry into the Polish market in a partnership with Jerónimo Martins. In 2014 the company entered the American market and opened its first street office which could contribute to the increase of the ratio. In general, the percentage increases in phases of investment but it is always followed by a decrease in the following years, reason why, as shown in the table 2, the company started to decrease its ratio in 2016 as expected.

According to the company’s blog and the news, at the end of 2017 Science4you obtained 10 million euros of funding from *Banco Europeu de Investimento* (BEI) which allowed the company to start expanding its activities, develop new products, reinforce the e-commerce strategy and create 300 jobs by 2020. These investments are the reason why the operational costs increased in 2017, being expected to increase a little bit more in 2018 and maybe 2019.

Table 2 – Operational Costs in % of Revenues



Source: Science4you

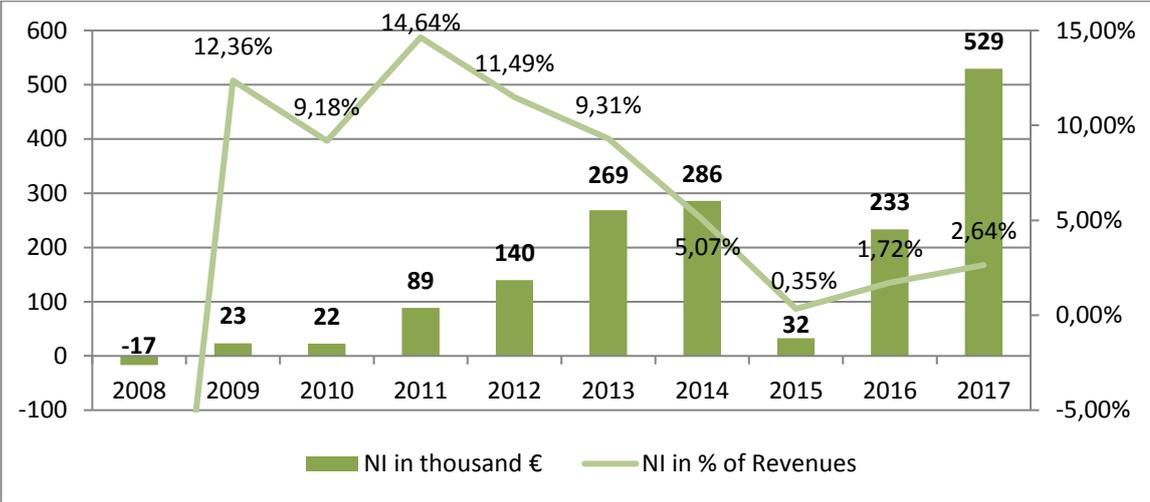
3.2.3 Net Income

One of the most important indicators, if not the most important, is the net income. It allows to assess whether the company is having a good performance and being profitable or not. Basically, net income corresponds to the company’s total earnings, being calculated by subtracting all the costs of doing business from the revenues. The costs of doing business consider not only the operational costs, but also the depreciations, interest, taxes and other expenses.

As we can see in table 3, the company obtained a negative net income in the first year. Taking into account the ratio that was previously mentioned in table 2, it was expected that the company would not be profitable in the first year, since after the operational costs the company must deduct the interest as well in the income statements. Despite the negative result in the first year, the company never had a negative net income again. In the second and

third year of activity, it obtained 23 and 22 thousand euros, respectively. In the following years, Science4you had a big growth in net income and from 2010 to 2014, in just five years, the company increased their net income in almost 13 times with a result of 286 thousand euros. In spite of this growth, the results in 2015 had a big decrease, not only due to the operational costs, as we can see in table 2, but also due to the increase in depreciations and taxes. The increase in depreciations means that there was an investment in assets which is linked to the new offices and stores, while the taxes may have to do with accounting or tax corrections, however it is not possible to be sure, since we lack the detailed information about the accounts. In 2016 the company achieved again a big growth in net income which almost mitigated the decrease that it had in 2015. In 2017 the company had the biggest net income in its history, with a value of 529 thousand euros.

Table 3 – Net Income



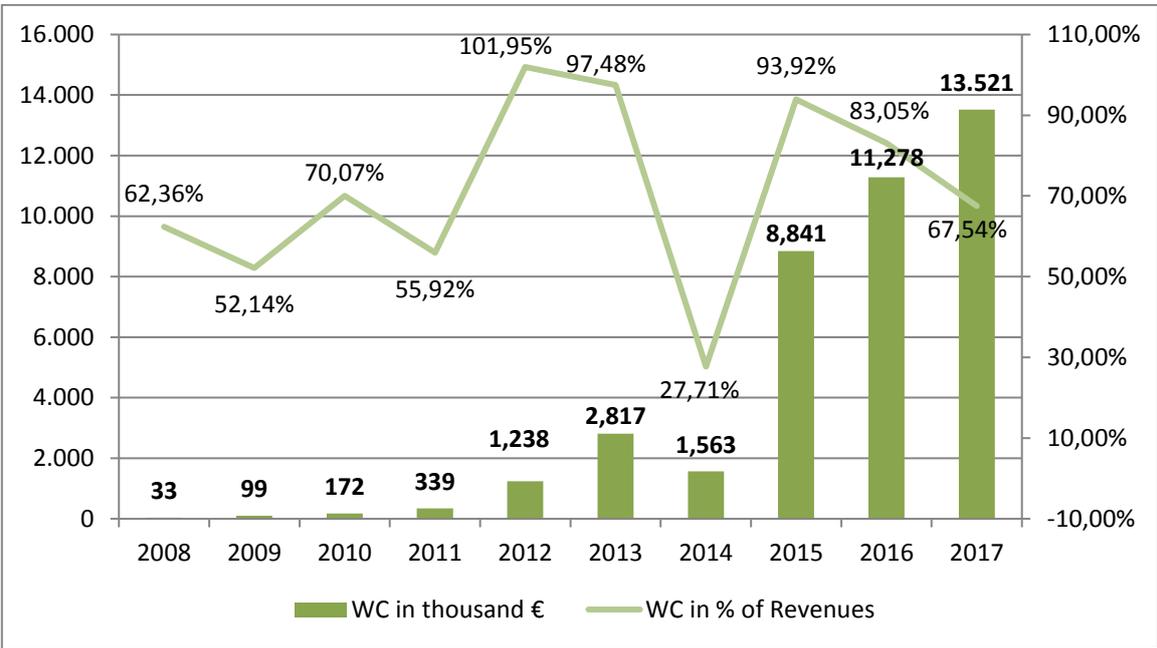
Source: Science4you

3.2.4 Working Capital

The last indicator that is going to be analysed is working capital. This consists in the difference between the current assets and the current liabilities. Currents assets represent the assets that are expected to be converted into cash within one year, including cash, inventory, accounts receivable and other liquid assets. Current liabilities correspond to the firm’s obligations or debt that are due to suppliers and creditors within one year, which include short term debt, accounts payable and other debts. Therefore, working capital measures the company’s net position in liquid assets. (Fazzari *et al*, 1993)

Some companies may have a strategy that focus more in supplier credit for growth or that need to contract loans in order to grow, invest in non-current assets, which will result in a negative working capital. However, excluding 2014 and 2017, Science4you always had more value just in cash than in total non-current assets, being a very liquid company. The firm also has positive and growing working capital throughout the years being again the exception the year of 2014. The decrease in 2014 resulted from an increase of the current liabilities, more specifically, short term debt and accounts payable, which was not followed by an identical growth in current assets. The decrease coincided with the year that the company opened the store in Madrid, which may be the reason why it had the decrease, due to the investment in non-current assets. Nonetheless, in 2015 the value in current assets almost tripled, increasing from a value of around 5.4 million to 14 million in just one year. In the following years the growth has decreased, which will be the tendency, meaning that even if the working capital continues growing, it will grow less and less in terms of percentage each year. The information about Working Capital can be observed in the following table 4.

Table 4 – Working Capital



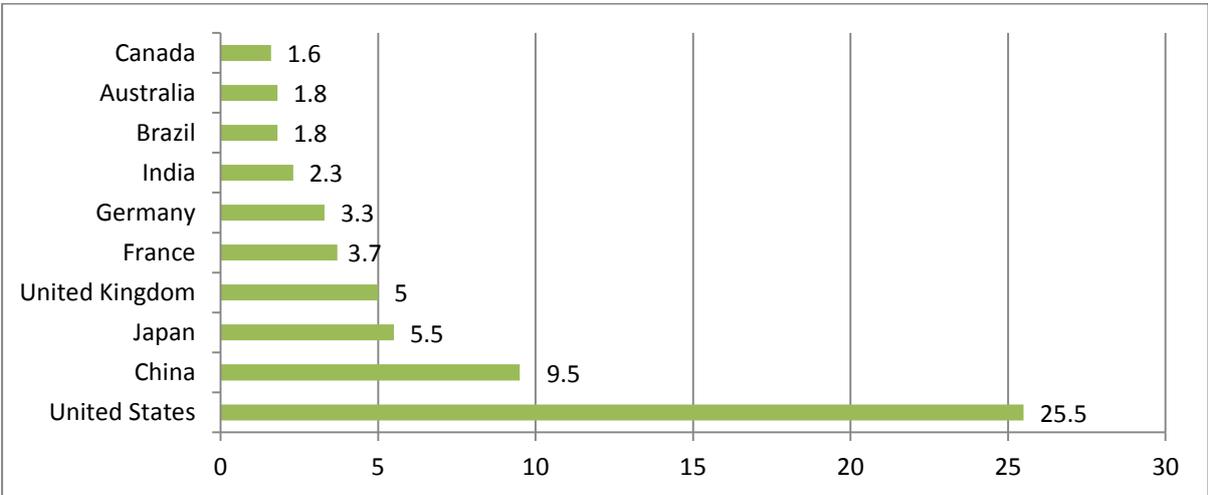
Source: Science4you

3.3 Industry Overview

In order to have a better understanding of the financial indicators of Science4you and how the company is performing, it is important to contextualize the industry in which the company operates, the main opportunities and challenges that the company is facing and can face in the future.

Science4you operates in the toy industry, having products for children from 0 to 14 years old. The world's toy & games industry is a billion-dollar industry. According to Statista in 2016 the total revenue of the world toy market was 88.8 billion dollars, which according to today's currency (14-05-2018), is around 74.2 billion euros. The industry of toys is always associated to the industry of games, therefore it comprises toys, dolls, video games, puzzles, construction games, collectibles, intelligent toys and much more, being dominated by five main players, Mattel, Lego, Namco Bandai, Hasbro and Jakks Pacific. In 2016 Mattel was the industry leader with a revenue of 6 billion dollars, closely followed by Lego with about 5.4 billion dollars. Namco Bandai, the Tokyo-based company, ranked third in 2016, due to its strong presence in its domestic market. The top five players are constituted by three American companies, the North American market being one of the most important and profitable market for these companies. It is estimated that in 2015 just in the United States the total size of the toy market was 25.5 billion dollars as shown in table 5. It is also possible to observe the importance of the Asian toy market, more specifically China and Japan, which are part of the top three countries in terms of size of toy market.

Table 5 – Size of toy market worldwide 2015 (billion US\$)



Source: Statista

The toy industry is extremely competitive, since it has low barriers to entry and consumers are price sensitive. Therefore, producers face a big pressure in terms of cost and price competition, which is reflected in the production strategy taken by them. Many producers opt to outsource their production to China to lower their production costs. According to Eurostat, in 2016 the amount of toys imported by European Union was worth around 7.2 billion euros and China was the biggest supplier, being responsible for 85% of it. Data gathered by Statista also emphasizes the importance of China in the toy industry, showing that in 2016 China was the leader in exporting toys, games and sports requisites with an amount valued in approximately 43.71 billion dollars.

3.3.1 Toy Demand

The toy demand is influenced by growing competitions from substitute products such as electronic games, apps for smartphones and tablets, but also by infant maturity, seasonality and by the ageing population. The toy industry is growing not only due to video games which benefit from an increase of the adult consumer base as the video games become a popular leisure, but also from licensed toys. According to Euromonitor, licensing has a big impact on traditional toys and games. There has been an increase of toy manufacturers that use TV and films to produce intellectual property, leveraging the popularity of those characters to increase toy sales, “Star Wars” products being the main example, which in 2015 reached 700 million dollars in sales.

As mentioned before, Science4you already has technological products such as drones, tablets, smartwatches and cameras that can reduce and face the threat of the substitute products and infant maturity. Nonetheless, the threat of ageing population is eminent. Therefore it is important to know how the population has aged since Science4you started to operate, not only in the main markets that the company is operating in, but also in China. China has a big impact in the industry due to the production and size of market, representing an opportunity for Science4you to explore. Despite having a big market, entering the Asian market would also represent a great challenge to Science4you due to the low costs/prices that the companies practice.

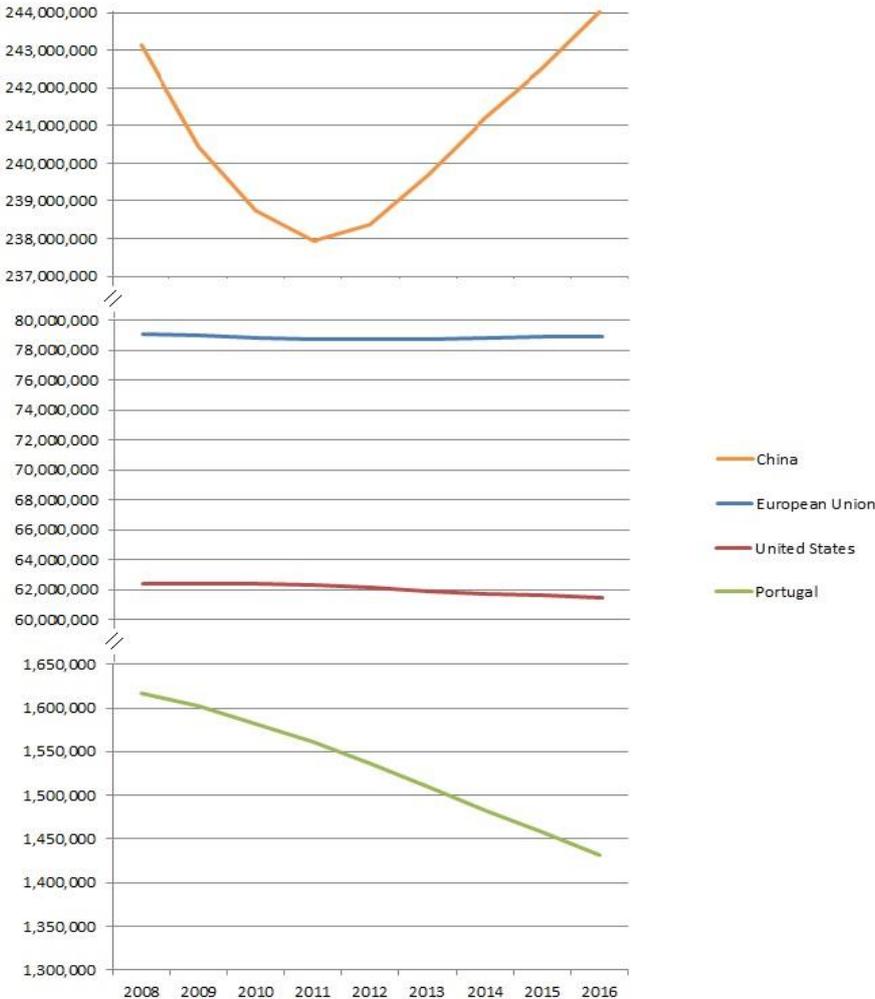
3.3.2 Ageing Population

In Portugal, the country in which the company started to operate and that today represents 40% of the company revenue, had a decrease of almost 200,000 children since the company started to operate. So, in just 8 years, from 2008 to 2016, the population in Portugal between 0

and 14 years old decreased 11.52%, as shown in chart 1. The decline was constant over the years, and faster during the last 4 years, with a yearly decline superior to 1.70%. On the other hand, during the last years, with exception to 2016, the number of children in the European Union increased, which almost mitigated the decrease felt during the first years.

It is expected that the United States will have a big impact in the sales of Science4you, as it was shown before, it is the biggest market and represents a big opportunity for the company to grow. For that reason it is important to analyse the impact of ageing population in the country. In the United States the number of children also decreased, despite the small growth during 2008 and 2009. In the last 6 years, the number of children decreased almost one million, which represent a decrease of 1.47%.

Chart 1 - Total population between 0-14 years of age



Source: WorldBank

In China there was a sharp decline of population between 0 and 14 years old due to the one-child policy implemented in 1979. Couples that did not comply with the policy could face the possibility of fines, sterilizations, and forced abortions. In the graphic it is only possible to show a part of this sharp decline. In 2014 the policy was relaxed, being allowed to have more than one child if one of the parents was an only child. However the one-child policy had a big impact on the population structure age, threatening economic growth due to lack of labour force. Therefore, in 2016 a two-child policy was implemented, allowing couples to have one more child. Both measures, the relaxation of the policy and the two-child policy, had an impact in the number of population between 0 and 14 years old, as shown in graphic 1. It is expected that the number of children increases in the future.

Lastly, despite not being represented in the graphic it would be important to mention Brazil since it is a country where the company already operates in but can easily try to grasp a bigger market share. The number of children has decreased constantly since 2008, from around 50 million to 46 million in 2016, representing a decrease of 8% just in the last 8 years.

3.3.3 E-commerce

Another trend that is having a big impact in the toy market in the United States is e-commerce. According to Statista, the number of consumers that buy toys or games on the internet in the U.S. is constantly increasing since 2008. In the spring of 2017, within a period of 12 months, the number of consumers that shopped these items online amounted to 47.99 million. The trend of e-commerce is having a big impact in other countries and industries, one example being the deliveries by Uber Eats, which deliver food from several restaurants, such as McDonalds at home. It became necessary for every company to provide platforms that allow customers to buy their products through the internet, otherwise it can represent a weakness and the company can lose clients to its rival.

4. Company valuation

In order to determine the value of Science4you it will be used two valuations methods: *Free Cash Flow to the Firm (FCFF)* and *Multiples valuation*. As mentioned in the Literature Review, the *FCFF* is a *Discounted Cash Flow* method, while the *Multiples valuation* is a *Relative valuation* that will be used as a second stage of valuation to complement the values obtained through the *FCFF*.

4.1 Discounted Cash Flows method

This methodology is the most commonly used. However, for it to be precise we need to make accurate forecasts and it all depends on the assumptions taken.

For the time horizon for the projections, we have chosen a period of five years. This horizon is an acceptable amount of time to make assumption for, after this period it would be pure speculations, reason why it will be implemented the terminal value. It will be assumed that after the five years, the company will reach it's maturity, starting to have a stable growth for perpetuity. The growth rate (g_n) assumed for the projection of the value of perpetuity is 5%.

4.1.1 Assumptions

In order to assess the company's value, we defined a set of assumptions regarding the projections of the financial indicators used in the calculation of the *FCFF* and the discount rate.

Due to the lack of updated projections made by the company, which can be found in a business plan, the projections will mainly be based on the growth average and the tendency shown during the last four years. The average does not consider the first years of activity due to very high growth rates, which will hardly be achieved by the company in this phase of development.

4.1.1.1 Revenues

The first approach to obtain an appropriate forecast was to search for more updated information in the website of the company or news that mentioned revenues goals, comparing the goals with the average of the revenues growth in the last years. However, it was only possible to obtain information for the goals of 2017 and not for 2018. In addition, the revenues goals for 2017 are related to the consolidated data, making it impossible to compare with the data provided by the company for this thesis.

Science4you continues to have an increase in revenues every year, but the growth is decreasing. From 2014 to 2016 the revenues growth decreased from 95% to 44%. Considering the tendency it was expected that revenue growth decreased in 2017 as well, however, due to a deal with Target, the company entered the American market, obtaining a revenue growth of 47%. According to the newspaper Jornal de Negócios and Science4you's blog, it was stated by Mr. Miguel Martins that if the products are well-accepted by the customer, the sales in the American Market can reach 6 million in 2018.

Taking into consideration the reasons mentioned above, the forecast made in annex 1 considers that the company's revenue growth in 2018 will decrease to 40%, mainly due to the business with Target, which can mitigate the declining expansion in other markets. In the next years, it will be considered that the revenue growth will decrease 10% in 2019 and 2020, having a revenue growth of 30% and 20% correspondingly. In the remaining years of our projections, the company will have a decrease of 5% yearly, until it reaches a stable growth rate for perpetuity of 5%.

These projections are also made upon the assumption that the company continues to have an aggressive internationalization strategy but as the revenues grow, the slope of the revenue growth decreases, which has been the case for the last years of activity.

4.1.1.2 Other operating profits

Science4you's profits are not obtained only from revenues. In our assessment, the revenues include the sales of goods and services that are associated with the main operations of the company, as well as their own work capitalized.

Nonetheless, there are still some operational profits which are not included in the revenues but contribute to the net income, such as the operating subsidies and other revenues and gains. These profits represented a small part of the income and in the last four years have been slowly decreasing, rounding the 300,000€. However, in the last year, there was one item added which was the inventory variation. This item provides a substantial increase in the other operating profits and therefore needs to be considered.

It is possible to read in Note 10 of the annexes of the financial statements provided by the company that this difference comes from the improvement of the processes of internal control at the inventory level. The company now has the necessary information to ensure the

decomposition of the goods at the level of inventory categories. For that reason, the information reported for 2017 is not comparable with the previous periods.

Even though the information cannot be compared to previous years, it is still necessary to consider the impact that it will have for the next years. In order to have a more precise forecast, it was calculated the inventory variation for the last four years (the value of 2017 is the one from the financial statement), adding those values to the total value of other operating profit for each year. The value that will be used to our forecast is the average of that sum for the last four years, as we can see in annex 2.

4.1.1.3 Operational Costs

The operational costs (variable and fixed), that were presented in table 2, in 2017 accounted for approximately 94% of revenues. Due to lack of information, the operational costs were estimated based on the percentage of Science4you's revenues. The percentage increases in phases of investment but is always followed by a decrease in the following years.

As mentioned previously, the company obtained 10 million euros of funding in 2017, being a part of the investment to expand the company's activities. These investments are responsible for the increase of the operational costs in 2017 and it is expected that the percentage of operational costs increases, as explained before. It is assumed that the company will invest in the expansion of the activities in the first years, trying to optimize their production and obtain a bigger level of production and efficiency. For this reason the operational costs will be higher in the first years of the financing.

Therefore, the estimation made in annex 3 considers that the operational costs percentage will increase a little bit more in 2018 reaching its highest at 96%, due to the big investment made to expand the company activities. Nevertheless, it is expected that this percentage decreases and the company starts to obtain a better profit margin as suppose in an economy of scale. In 2019 and 2020 it is expected that the percentage will decrease slowly by 1.5% each year and in the next two years by 2%. Since it is forecasted that the company will reach a stable growth after the next five years, it is foreseen that the company shall obtain better profit margins than it has today. Then, for perpetuity it was predicted operational costs of 88.5%, a percentage similar to 2009 and 2010 but not the lowest that it has obtained, being a fair operational percentage for a mature company. In addition, when compared to mature companies such as Lego and Hasbro, it is a very conservative assumption. In 2017 Lego's operational costs

accounted for 70% of revenues and Hasbro's 84%. These two companies represent just an example of the several companies of the industry that have lower operational costs ratio.

4.1.1.4 Capital Expenditure and Depreciations

Capital expenditure (CAPEX) consists in the funds that the company uses to acquire, maintain or upgrade its assets and can be observed in the company's Cash Flow Statement. CAPEX can be divided into Growth CAPEX and Maintenance CAPEX. The first, are the funds used to increase the capacity of the business or attract new customers, such as building a new factory or purchasing equipment. The other, are the expenses necessary to keep the daily operations working at full speed which can include the repair of machinery or the replacement of old technology.

Regarding the depreciations, due to the fact that the value of depreciation and amortization in the income statement is not divided, it is not possible to analyse the growth of each one individually, only as a whole. Therefore, the assumptions made to estimate both the value of depreciations, amortizations and the CAPEX, were the following:

- 1 – The value of fixed tangible assets or property, plant & equipment (PP&E) was forecasted using the average rate of tangible assets resulting from the company's revenues in the last four years. The average ratio obtained was 7.69%;
- 2 – Regarding the value of intangible assets, it was used the same logic as in point 1. The average rate of intangible assets resulting from revenues in the last four years is 5.22%.
- 3 – To forecast the depreciation and amortization (D&A), it was applied the average rate in the last four years of depreciations in relation to the total value of assets (tangible and intangible) of the same period;
- 4 – The value of CAPEX was forecasted using the following formula:

$$CAPEX = (Tangible\ and\ Intangible\ Assets_t - Tangible\ and\ Intangible\ Assets_{t-1}) + Depreciations_t + Amortization_t \tag{19}$$

Table 6 – Science4you’s depreciation, amortization and CAPEX forecast

	2014	2015	2016	2017	2018 F.	2019 F.	2020 F.	2021 F.	2022 F.	Perpetuity
Revenues	5,641	9,413	13,580	20,020	28,028	36,437	43,724	50,283	55,311	58,076
Tangible	324	880	1,194	1,377	2,155	2,802	3,362	3,867	4,253	4,466
% of Revenue	5.73%	9.35%	8.80%	6.88%	7.69%	7.69%	7.69%	7.69%	7.69%	7.69%
Intangible	316	507	790	818	1,388	1,804	2,165	2,490	2,739	2,876
% of Revenue	5.60%	5.38%	5.82%	4.09%	5.22%	5.22%	5.22%	5.22%	5.22%	5.22%
Total	639	1,387	1,985	2,195	3,543	4,606	5,528	6,357	6,993	7,342
D&A	294	591	980	1,223	1,716	2,231	2,677	3,078	3,386	3,555
% of Total assets	46.00%	42.59%	49.39%	55.71%	48.42%	48.42%	48.42%	48.42%	48.42%	48.42%
CAPEX					3,064	3,294	3,598	3,907	4,022	3,905

4.1.1.5 Non-cash Working Capital

As mentioned previously, the working capital corresponds to the difference between current assets and current liabilities. However, for valuation purposes, the non-cash working capital is commonly used. This indicator excludes from the current assets the value of cash and marketable investment such as short term government securities, treasury bills, common stock, commercial paper and other financial instruments with high liquidity and very short maturities. The value of short term debt will be excluded from the current liabilities (Damodaran, 2006).

The forecasted value of non-cash working capital was calculated as a percentage of the revenue. This will consider the average of the last four years, as demonstrated in the annex 4.

4.1.1.6 WACC

In order to calculate the FCFF it is required to assess the value of our discount rate, the WACC, which combines both the cost of debt and the cost of equity.

- **Cost of Debt**

To compute the cost of debt, K_d , it was decided to look at the company’s borrowings to obtain the average spread charged. Since the information available does not allow to order the loans by date, the default spread will be obtained by dividing the total amount of annual interest by the total amount of debt, as demonstrated in the annex 5. The cost of debt was assessed in this manner and not based only on the average spread because, by using the second option, it would not be considered the amount of debt associated to each spread. Therefore the cost of

debt that will be used is 2.01%. The detailed information regarding the finances of the company is included in the annex 6 and 7.

- **Cost of Equity**

Risk free rate

The cost of equity, K_e , as mentioned in the literature review, will be calculated using the CAPM formula. Firstly, it will be needed to assess the risk free rate which, as the name implies, corresponds to an asset that does not have any risk associated to it or that the risk of default is minimal. Therefore, to obtain the value of risk free rate, we will look to a 10 year government bond from Germany, since it is the closest to a risk free asset. Germany is rated AAA by Moody's, Standard & Poor's and Fitch, which is the highest rate that can be provided. According to Bloomberg on 17/04/2018 the yield of a 10 year German Government Bond is 0.5%, which will represent our risk free rate.

Risk Premium

The risk premium was obtained from Damodaran's Country Default Spreads and Risk Premiums, updated in January 2018. In annex 8 it is possible to observe some countries' risk premium, which were selected based on the company's international presence. Since Science4you is a fully Portuguese company with their productions based only in Portugal, the value that will be assumed for the risk premium will be the one of Portugal.

Beta and Peer Group

In order to estimate the Beta of Science4you it was used the bottom-up beta approach which was explained before in the literature review. The first step used in this methodology is to categorize the different types of business that the company operates in.

The toy industry is commonly associated with the game industry. The data found puts the two products together, comparing toy companies with games and videogames companies. Nowadays it is very hard to separate one from the other, when a videogame has success it is complemented with collectibles, when a toy industry has success it starts to diversify to games, videogames and technologies to reach a wider market, just like Science4you is doing with the Games4you and Tech4you. The industry of toys and games is very broad, therefore the majority of the company's products can be identified as a product of the industry. The ones that can be inserted in a different category are the educative books and the animation

activities that the company makes, such as birthday parties, holiday camps and so on. However, due to lack of detailed information regarding the distribution of revenue by products, it is expected that these represent a small part of the company total revenues, while the toys and games have the biggest share of the revenues.

For those reasons, it was decided to define the industry of toys and games as the only industry/business of the company. Therefore the unlevered beta (β_u) of the business will be equal to the unlevered beta of the firm.

Subsequently it was extracted the Beta from a defined group of publicly traded companies that operate in the industry of toys and games, the peer group. The peer group is very important, not only for the calculation of the Beta, but also for the multiple valuation that will be analysed later on. The peers should be composed by companies that not only operate in the same sector, but that are also similar in size, cash flows and growth rate. It was not possible to obtain the financial information of companies in a similar phase that Science4you, since those companies are private and do not provide their data for the public. For that reason the peer group is composed by mature companies that operate in the industry of toys & games, but are in a different lifecycle. This demands us to consider an additional risk stemming from the still high growth rate.

The values of the peer group and the calculation of the beta are shown in annex 9. The value of Beta and the balance sheet for 2017 were obtained from Yahoo Finance, while the debt/equity ratio was computed based on that information. Due to lack of information regarding the marginal tax rate, it was used the KPMG's Corporate tax rate table for the calculation of the unlevered beta of the business. The tax rate chosen for each company was based on the companies' origin country.

Regarding the calculation of the unlevered beta of the business, Damodaran (2012) provides two options:

1. Calculate the average beta for the firms and average debt/equity ratio, using the averages to calculate the average unlevered beta of the business;
2. Calculate the unlevered beta for each company and only then calculate the average of the unlevered betas;

It was decided to use the first approach, since according to Damodaran “it is preferable because unleveraging an erroneous regression beta is likely to compound the error”. Considering the fact that Sciecen4you is still a startup it would not be reasonable to consider the average beta of the chosen peers. For that reason, the average beta of the peers will be multiplied by two to assess the beta of the business, which has the same result as calculating the levered beta and then multiply by two.

To calculate the levered beta, it is required to use the real debt/equity ratio of the company, which was used according the financial information of 2017. The value of the levered beta (β_L) obtained from the calculations was 2.04.

WACC inputs

After applying all assumptions mentioned above we obtained the cost of debt and the cost of equity making it possible to compute the value of WACC rate. We can observe in table 7 all the inputs utilized to assess the value of WACC, which resulted in a WACC rate of 6.434%.

Table 7 – WACC inputs

WACC	
Debt (2017)	20,419,762
Equity (2017)	9,589,738
Corporate Tax	21%
<u>Cost of Debt</u>	2.01%
<u>Cost of Equity</u>	16.75%
Beta	2.0418
Risk Free rate	0.50%
Risk Premium	7.96%
WACC	6.434%

4.1.2 FCFF

After considering all assumptions, it is possible to obtain the value of the FCFF through the formula of Damodaran.

Table 8 – Calculation of Free Cash Flow to the Firm (thousand €)

	2017	2018 F.	2019 F.	2020 F.	2021 F.	2022 F.	Perpetuity
(+) Revenue	20,020	28,028	36,437	43,724	50,283	55,311	58,076
(+) Other operating profit	1,308	1,900	1,900	1,900	1,900	1,900	1,900
(-) Operational Cost	18,854	26,907	34,433	40,663	45,757	49,227	51,398
% of Revenue	94.18%	96.00%	94.50%	93.00%	91.00%	89.00%	88.50%
(-) D&A	1,223	1,716	2,231	2,677	3,078	3,386	3,555
EBIT	1,267	1,305	1,673	2,284	3,347	4,598	5,023
t	21%	21%	21%	21%	21%	21%	21%
EBIT*(1-t)	1,001	1,031	1,322	1,804	2,644	3,633	3,969
Capital expenditure	600	3,064	3,294	3,598	3,907	4,022	3,905
D&A	1,223	1,716	2,231	2,677	3,078	3,386	3,555
Change in Non cash WC	4,540	4,341	5,640	4,888	4,399	3,373	1,855
FCFF	-3,658	-4,659	-5,381	-4,005	-2,584	-376	1,764

As mentioned in the beginning of the thesis, the fact that the company is a startup could bring a result that was different from what was expected. In order for the company to grow, it requires big investment not only in their current asset such as inventory, but also in non-current asset like tangible assets (machinery, property), as a result the company has a big value of CAPEX and change in Non-Cash Working Capital. The fast growth of the company is possible not only by the reinvestment of the earnings but also due to the fact that the company is being leveraged, using borrowed capital to support their investments, which also affect the profit margin of the company.

However, we can see that as the company walks towards a more mature lifecycle of the business with a stable growth, the percentage of operational costs diminish and consequently the profit margins improves. At the same time the decrease of change in non-cash working capital and CAPEX, will also contribute to improve the result in FCFF.

4.1.3 Valuation

After the calculation of every FCFF, it is possible to obtain the value of the firm. Since we used the Two-Stage FCFF Model, we will have two values. The present value (PV) for the explicit forecast period which consist in the five years of forecast that we made, and the present value of terminal value, that represents the value for perpetuity with a stable growth rate.

Table 9 – Science4you’s Firm Value (thousand €)

	2018 F.	2019 F.	2020 F.	2021 F.	2022 F.	Perpetuity
FCFF	-4,659	-5,381	-4,005	-2,584	-376	1,764
WACC	6.43%	6.43%	6.43%	6.43%	6.43%	6.43%
Discounted FCFF	-4,377	-4,750	-3,322	-2,014	-275	90,066
PV Explicit forecast Period	-14,738					
PV of Terminal Value	90,066					
Value of Firm	75,328					

As expected, the PV for the explicit forecast period is negative, since all the FCFF are negative. However, when we add both values, we will obtain a firm value of 75 million euros.

4.1.3.1 Sensitivity analysis

Finally, to complete the valuation made by the DCF model, it will be presented a sensitivity analysis in which the values of the growth rate for perpetuity and the operational cost for perpetuity will change. Since the changes for the explicit forecast period would not differ much due to the high growth and investment, the values will only be different for perpetuity.

The chosen indicators are based on the impact that they have in the final value of the company and on the fact that these indicators are the ones that are most likely to differ. In addition, these indicators are the ones that the company can control, while the others are more susceptible to the market and the economic changes. The rest of the assumptions will remain equal.

It is possible to see bellow, in table 10, the firm value of Science4you according to the different value of the growth rate and the operational cost for perpetuity.

Table 10 – Scenario Analysis (thousand €)

Operational Costs g_n	87.0%	87.5%	88.0%	88.5%	89.0%	89.5%	90.0%
	3%	35,121	30,323	25,525	20,727	15,929	11,131
3.5%	44,327	38,684	33,041	27,398	21,755	16,112	10,469
4%	57,316	50,481	43,645	36,810	29,975	23,140	16,305
4.5%	77,021	68,377	59,733	51,089	42,446	33,802	25,158
5%	110,469	98,755	87,041	75,328	63,614	51,900	40,186
5.5%	179,734	161,663	143,592	125,521	107,449	89,378	71,307
6%	408,656	369,573	330,491	291,408	252,326	213,243	174,161

As we can see, even in the worst case scenario with a growth rate of 3% for perpetuity and the operational costs representing 90% of the value of revenue, the company would still have a positive valuation with a value of 6,333 thousand euros.

4.2 Multiple Valuation

As mentioned in the literature review, the multiple valuation should be used as a second stage of valuation. By using this methodology it will be possible to complement the result obtained previously through the DCF Model. It will allow not only to compare the multiples assessed with the peer group to identify differences, but also to define a new valuation according the average multiple of the peers, being a very useful tool.

The peer group chosen will be the same as the one used for the calculation of the beta. Despite the difference in size, it allows to have a good perception of the value that Science4you has, just like it was done with the DCF Model.

The values of the peer group were extracted from Yahoo Finance and are presented below in table 11.

Table 11 – Multiple Valuation

Company	Market Cap. (Million €) ¹	Enterprise Value (Million €) ²	Enterprise Value/Revenue ²	Enterprise Value/EBITDA ³
Mattel	4,146.06	5,918.17	1.45	131.96
Hasbro	9,077.87	9,345.36	2.14	11.38
Jakks Pacific	53.95	139.44	0.27	-3.43
Namco Bandai	6,929.34	4,807.91	0.98	8.1
Spin Master	3,421.47	N/A	N/A	N/A
Playmates Toys	107.57	3.16	0.04	0.37
Activision Blizzard	45,381.01	41,895.31	7.14	22.5
Electronic Arts	33,887.39	28,077.88	6.59	21.8
Nintendo	41,952.00	N/A	N/A	N/A
Sega Sammy Holdings Inc	3,423.65	2,044.48	0.79	6.38
Tomy Company	732.11	854.39	0.63	5.43
Take-Two Interactive Software	10,925.21	9,930.49	6.21	49.51
GameStop Corp.	1,145.18	1,036.52	0.14	1.84
Atari	152.80	138.96	7.76	N/A
Zynga	2,850.42	2,014.52	2.8	34.36
Ubisoft Entertainment	8,850.00	8,750.00	5.32	41.36
Average	10,814.75	8,211.18	3.02	25.50
Science4you		75.3	3.76	30.26

Source: YahooFinance

1 - Shares outstanding is taken from the most recently filed quarterly or annual report and Market Cap is calculated using shares outstanding.

2 - Data derived from multiple sources or calculated by Yahoo Finance.

3 - EBITDA is calculated by Capital IQ using methodology that may differ from that used by a company in its reporting.

In order to obtain the market capitalization and enterprise value in euros, some values were converted according to the currency of their country of origin and the corresponding conversion rate, which can be seen in annex 10. Regarding the multiples of Science4you, they result from the valuation obtained previously in the DCF Model.

As it was expected, the multiples of the peer group presents a very disperse range of values. For that reason, it was used a vast number of companies, allowing to have an average that provided a better perception of the industry. From the data gathered, we can observe that Science4you has higher multiples values than the average of the industry. Despite the difference in size from most of the companies, the higher multiple value means that Science4you has a very good performance in comparison to its rivals. It is useful to have a perception of the multiples that each company has in the industry.

The multiples can also be applied to obtain a new valuation for the company. It will be applied the average multiple obtained from the peers to the values of Science4you, allowing the comparison between the value obtained from the DCF model and from the multiples. The calculation of the firm value through the multiple valuation method can be observed below in table 12.

Table 12 – Firm Value through Multiple Valuation (thousand €)

Science4you	2017		2017
Revenue	20,020.17	EBITDA	2,489
Average (EV/Revenue)	3.02	Average (EV/EBITDA)	25.50
Enterprise value (EV/Revenue)	60,432.31	Enterprise Value (EV/EBITDA)	63,491.88

By using the average multiples of the peer group, Science4you is valued between 60 and 63 million euros.

5. Exit strategies

Lastly we will approach exit strategies, the definition, reasons why every company should have one, the different types, and apply one to the case of Science4you.

An exit strategy is a plan that can be executed by an investor, a business owner or an entrepreneur for the transaction of the ownership in a company to other investors or another company. It allows the business owner to reduce or liquidate his share of the company, which depending on the performance of the company, can either result in a substantial profit or to limit losses. Therefore, every company should have an exit strategy, regardless of it being successful or not. These do not occur only when the company is failing. Quite the opposite, there are several reasons for a company to have an exit strategy even when it is successful.

5.1 Reasons to create an exit strategy

One of the main reasons for a company to have an exit strategy is to reward outside investors. The investors may want to collect their return. The main objective of an investor is to obtain compensation from a previous investment. While dividends may be a way to obtain profit, when we are talking about an investment of hundreds of thousands or even millions, it would take several years until the investor obtains a profit. By having an exit strategy, the external investors can have a better perception of the timeline until they obtain profit.

On the other hand, we have the perspective of the entrepreneur. Some entrepreneurs simply like the struggle of creating a new business. When a company reaches a certain level, the entrepreneur can get bored of the daily managerial decisions of a mid-sized company and look for something new and more challenging.

By having an exit strategy, the management team can also structure better the company to optimize the return in case of exit. It would help to take business decisions that otherwise could be harder to make and to have a proper measurement of success. In order to understand whether or not the company is having a good performance, the management team would only have to see if the company is developing according to their exit strategy goal.

In addition, the company would be better prepared for eventual unexpected offers. As companies grow, they may start looking at other companies as a way to grow through an acquisition or merging. In case a company has an exit strategy, it would avoid be unprepared for eventual opportunities so it could make the most out of those offers.

These are just some of the reasons that can contribute for the early creation of an exit strategy. It does not need to be linked to a plan in case the company has bad results but can be done for both scenarios, the optimist and the pessimist.

5.2 Different exit strategies

Regarding the exit strategies, there are several available for an entrepreneur to exit a business. It will be presented the most obvious and talked about strategies. Each option has its pros and cons, therefore the decision depends entirely on the managers and investors, the role that they want to have in the future of the company and the reasons why the company wants to have an exit strategy.

The first, but the least used, option is the liquidation of the company. The liquidation of the business consists in shutting down the company, stop operating and sell the remaining of the assets. It is the least rewarding strategy since the shareholders will only receive the market value of the company's assets after the creditors are repaid (StartupDecisions.com). In addition, the intangible assets are not considered, which can result in a substantial loss, reason why it is mostly applied in case of insolvency.

The second strategy is often used as a growth strategy, which is merging and acquisition (M&A). Merging is when two existing similar companies fuse into one new company, usually to gain more market share, to enter a new segment/market, to have complementary skills or just to share resources (Entrepreneur.com). An acquisition, as the name implies, takes place when a company acquires another either with stock or cash. This strategy is one of the most common exit strategies since it represents an easy and efficient opportunity for future growth in terms of revenues. Acquisitions are very price negotiated and it is up for the acquirer to decide what to do about the management team of the acquired company. For those reasons, it is useful to have a perception of the enterprise value, to support a negotiation process.

Another option is a management buyout (MBO). A MBO is a transaction in which the management team of a company acquires a part or the whole business. The funding can be a combination of debt and private equity. The main advantage of this strategy is that the entrepreneur or the shareholders receive their share, providing immediate liquidity, while the company maintains the same managerial team that understands the business. For the managers it can be a way to potentially obtain greater rewards, since they will stop being just employees and be owners as well.

Lastly, there is the option to issue an Initial Public Offer (IPO). An IPO, as the name suggests, is when a company issues stocks for the first time to the public or in other words, goes public. It is said as “to go public” because only after a company issue an IPO it is possible to publicly trade stocks from the company, whereas prior to that, the company can be approached by investors but is not obligated to sell anything. Basically, it consists in selling at least a portion of the company’s shares to the public, which can be traded on a stock exchange by everyone. In the process, a financial institution will serve as intermediary, known as underwriter. The underwriter values the firm and estimates an indicative price range and sets the offering price to the market (Investopedia.com).

5.3 Exit through an IPO

There is a lot of debate between choosing an IPO or being acquired by a public/private company, but in the end, what matters the most is to maximize the value that the entrepreneurs and investors will obtain. It depends on the perception that the private and public market has about the company. The approach chosen for this study will be the IPO. An IPO is a risky strategy, since it makes the company open to any external capital. It is the most complex and interesting long-term option to study and the one that should be considered by Science4you, as a possible exit option in the future. Therefore, to have a better understanding of this type of exit strategy, it will be analysed some characteristics such as advantages, disadvantages, timings and costs associated.

5.3.1. Advantages

Issuing an IPO brings several advantages for the company, the most obvious one being the fact that it is the option that raises the most funds, in a way that minimizes the company’s weighted average cost of capital, which can be used to repay debts, to invest in acquisitions, working capital and so on. In addition, due to the highly scrutinized auditing that is required before an IPO, the financial reports would become more accurate which would result in an increase of confidence that will likely lead to a lower interest rate on loans. Therefore, an IPO would not only allow the company to obtain funds but it would also facilitate future funding through credits or subsequent stock offerings.

By broadening the base of ownership and having a large group of diversified investors instead of undiversified entrepreneurs makes it easier to raise capital but also increases the value of firm share. (Benninga *et al.*, 2005) Due to the increase of company’s exposure, public image

and credibility it can also improve the company's sales, profits and investor's attention. However it is important to take into consideration that by going public the company subjects itself to being monitored by outsiders, from investment banks, to auditors and analysts, and depending on the company's financial statement, it can have a positive or negative impact.

On the other hand, it can also be used as a way to establish a market price/value for the company which can facilitate acquisitions, in exchange for shares of stock (Brau *et al.*, 2006). The same theory can be applied to human resources, it is possible to attract and retain skilled employees and management team through liquid equity participation.

5.3.2 Disadvantages

Despite all the benefits that come from becoming public, there are also some requirements, costs and impacts that can be disadvantageous. If Science4you became public, not only would it lose the "private benefit of control" but it would also become obligated to have additional regulatory requirements and disclosures, as stated before. Despite the fact that the founder can maintain the majority of the decision making, the shareholders will want the leadership to take decisions based on their interest, even if it is not what the founders envision for the company. The regulations would be costly and require many hours of labour. Any negative aspect in the provided information could have an impact in the market value and consequently, the stock price. Therefore, the company would have more pressure on short-term, since it is what influences the public market, while the management team may want to take decisions based on the long-term view of the company.

In addition, the fact that the information about the company becomes public, it would also bring an opportunity for competitors, suppliers and customers to disseminate the information and use to their advantage. This could result in losing some competitive advantage to the opposition.

Another point commonly raised by academics and analysts, which can be harmful for the company is underpricing. During the process of an IPO, there can be information asymmetries that will lead to differences between the market's and underwriter's valuation. Consequently, it will affect their perception of the right value of the stock price. The IPO transaction process is not only very expensive, mainly due to underwriter fees, but it could also result in underpricing. This consists in establishing a lower stock price than expected by the market, so in the end of the first day of trading, the closing price will be higher than the initial offer price

established (Brau *et al.*, 2006). This will mean that the issuing company should have established a higher stock price, losing money in favor of the investors that traded during the first day. On the other hand, if the price is too high, the market may not accept the IPO price, which will lead to the decrease of the stock price and the money raised by the IPO. Therefore, it is very important to calculate the right value of the stock price and know the best timing to enter the market.

5.3.3 Timing

Issuing an IPO has several consequences for the company, it is necessary to make a trade-off between the benefits and the associated costs and implications. Therefore, as the environment in which the firm operates changes, the incentives to be public or private change as well. (Benninga *et al.*, 2005) In order to maximize the share value and amount of money raised through the IPO, it is fundamental to take advantage of the best opportunity to become public. According to the survey made by Brau (2006), the main factor taken into account by CFOs to decide the timing of their IPOs is the overall stock market conditions, followed by the general industry conditions. Even though the CFOs did not give much importance to the IPO market conditions, empirical research says otherwise. This is due to the fact that investment bankers follow the IPO market closely, and factors such as underpricing within an industry give the underwriters a significant importance in terms of timing.

It is recommended to look at IPO market conditions to have a good indication of the valuation that investor will likely assign to the company (Brau *et al.*, 2006). Other aspect mentioned by Benninga (2005) are the cash flows. According to the author, the expected cash flows are correlated with stock prices, so entrepreneurs issue shares when the cash flows are high, obtaining a higher stock price.

5.3.4 Costs

As mentioned previously, one of the disadvantages of issuing an IPO is the extensive amount of costs that are associated with the process. Thus, it is important to have a notion of the costs that Science4you would have if it decided to issue an IPO. The values that will be presented will not represent the total costs but the amount that the company will at least have to pay.

According to *Comissão do Mercado de Valores Imobiliários* (CMVM), which is the entity responsible for regulating the financial market, when a company wants to issue an IPO it is mandatory to have an intervention of a financial intermediary, usually a bank. The costs paid

to the financial intermediary consist in commissions whose value does not have legal limits. The main commissions paid to the banks are the custody commission and brokerage commission. The prices of these commissions can be assessed in CMVM's website, which not only has the price lists of all the banks that provide these services but also has a simulator for companies that intend to issue an IPO. However, due to lack of specific information, it is not possible to perform the simulation for the case. Nonetheless, to have a notion of the costs, we checked the price list of *Banco Comercial Português*, which is the company's main creditor. According to the price list, issuing an IPO has a commission of 0.50% if it is done in the bank or by phone call, or 0.20% if it is done by internet or mobile app.

In addition, the company also has to cover other costs, such as commissions charged by the markets in which the company issues the IPO, fees and taxes. For this case, it will be assumed that the company would be listed in Euronext Lisbon. According to Euronext, there are three type of fees; admission fees, annual fees and subsequent admission fees.

The admission fees are paid only one time in the moment of the initial listing. They are shown in annex 11, however it may not be the final value to pay. If the company wants to be listed in more than one Euronext market it will have to pay an additional fee of 10,000€. The company may also be required to pay a handling fee for action such as the review of documents, which depending on the number of actions and employees will cost at least 10,000€.

The annual fees, as the name implies, are the fees that a company must pay every year to continue listed on the stock market. These will be billed in the last week of January and can be seen in annex 12 for more detail.

Lastly, the subsequent admission fees are the ones that the company needs to pay in case it decides to raise additional capital after it is already listed. These can be observed in annex 13.

The costs mentioned above do not represent the total costs. It is still required to consider the costs associated to underwriter, auditors, valuation services and reports, restructuring, new financial reporting system and so on. After considering all costs the amount will reach millions.

5.3.5 Shareholder value

To conclude, the value that each shareholder would receive in case of an IPO or acquisition will be estimated. According to the annex 13 of Science4you's Financial Statements, at 31st of December of 2017 the equity is represented by 382,490 shares with a face value of 1€.

In order to assess the value that the shareholder would receive, first it is required to compute the shareholder value, which will be equal to the firm value minus the debt. In the previous section we assessed three different firm values, so for this calculation it will be computed the average value (75,327.51; 60,432.31; 63,491.88). The final firm value for Science4you is 66,417.23 thousand euros. After subtracting the debt value of 2017 of 20,419.76 thousand euros, a shareholder value of 45,997.47 thousand euros will be obtained, with a value per share of 120.26 €. We can see the value for each shareholder in table 13.

Table 13 – Science4you’s Shareholder value

31/12/2017	Number of shares (unit)	Total Value (thousand €)
Miguel Rente de Pina Martins	86,851	10,445
FCR Portugal Ventures Industrias Criativas	84,894	10,209
FCR Portugal Ventures Finicia	63,272	7,609
Fundo de Capital de Risco Portugal Ventures Internacionalização	41,839	5,031
Millennium Fundo de Capitalização, FCR - (MCF)	26,974	3,244
Fundo de Capital de Risco Portugal Ventures Grandes Projetos de Investimento	25,641	3,084
Luís Manuel Farinha de Matos Martins	11,519	1,385
António Manuel Marcos Gomes Vallera	10,000	1,203
João Manuel de Almedia Serra	10,000	1,203
Jorge Augusto Mendes de Maia Alves	10,000	1,203
José Paulo Afonso Esperança	5,250	631
Pedro Manuel de Sousa Leite Inácio	2,000	241
António Sarmiento Gomes Mota	1,125	135
Clementina Maria Dâmaso de Jesus Silva Barroso	1,125	135
Mohamed Azzim Gutamhussen	750	90
Ana Mafalda Calçada Marques Vicente	250	30
José Carlos Moutinho dos Santos	750	90
Nuno Filipe Braga Mendes	250	30

As we can see from this table, in just ten years of activity, the value of shares increased one hundred and twenty times. Considering the fact that the company is still growing, it is possible that this value changes as well. Nonetheless, in case the company decides to execute an exit strategy, the investors would receive a big profit from their investment.

6. Conclusion

This project aimed to value a Portuguese company that is gaining market share each year. It should be considered that the exercise of evaluating a company is subjective and for a startup it's even less precise. From the chosen methodology, to the assumptions that are used, each person may have a different opinion and perspective of the most correct options. Therefore, it's not possible to allege that this valuation is 100% correct, since every prediction has an uncertainty associated to it. Nonetheless, this project sought to mitigate these uncertainties to the maximum extent by applying the most suitable methodologies and discuss the forecasts with an investor of the company that has privileged information. For those reasons, I trust that these results represent an accurate assessment of the company's value.

It was decided to use the DCF methodology to value the company, being complemented with a multiple valuation which not only allowed to compare the company with the peer group selected but also assessed a different value based on the peers' average. Both valuations had a similar result, ranging from 60 to 75 million euros. The difference results from the fact that the company is still growing and has yet to reach maturity. It is fair to say that the most appropriate firm value to attribute to Science4you is the average obtained from the three results that is 65 million euros.

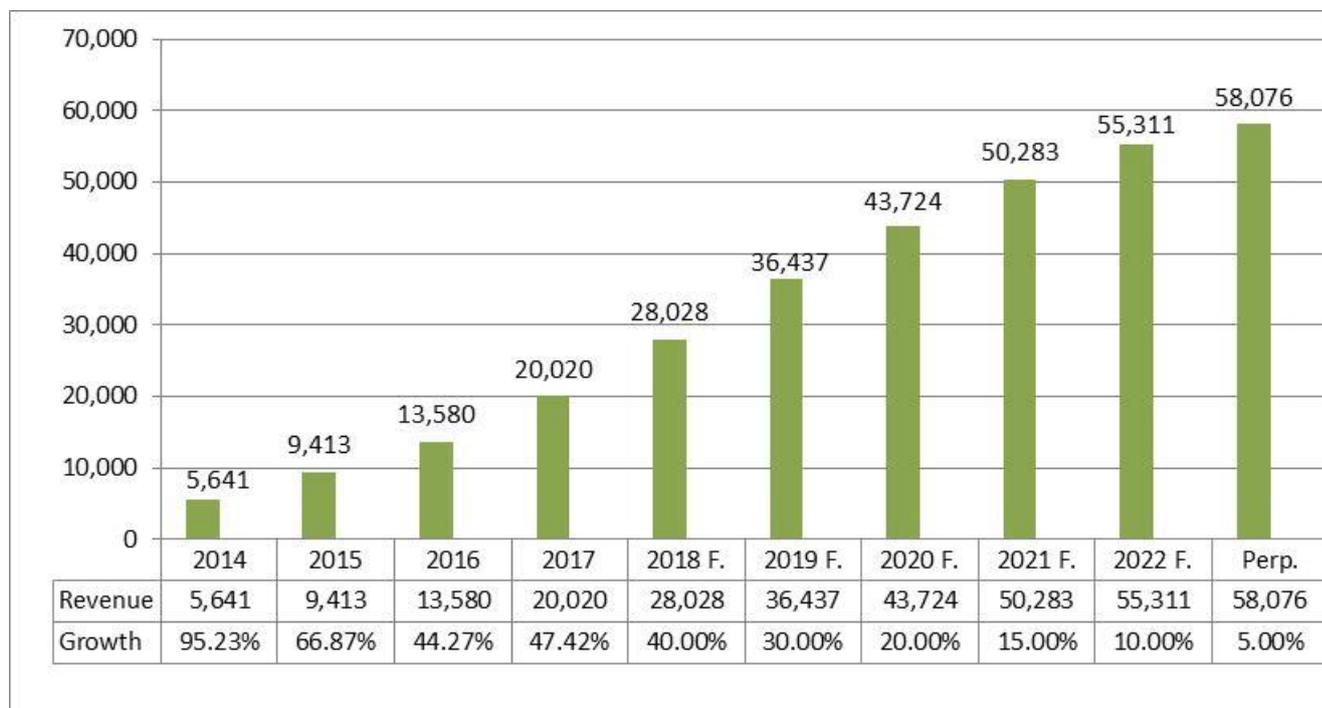
The company has been demonstrating a high growth rate every year, therefore the assumption of reaching maturity in just 5 years with a growth rate for perpetuity of 5% may be conservative. This problem demonstrates the difficulty in applying valuation methods, that are usually used in mature companies, to startups.

For future research, it would be interesting to apply similar evaluation models based on the financial records when the company finally reaches a more mature state with stable growth rate and has a more predictable growth. It would have more precise results due to the lack of the uncertainty that is associated with making assumptions for startups. Another exercise that could bring further support to the final value would be a comparison with the post IPO value of companies of similar age, growth rates and financial indicators.

To conclude, the project can be useful for the shareholders of Science4you as well as to potential investors and analysts. This valuation can be used to study and analyse a potential IPO. By becoming public, the company could obtain a vast source of funds and the investors could obtain the compensation for the early investment.

Annexes

Annex 1 – Science4you revenue forecast (thousand €)



Annex 2 – Other operating profit forecast (thousand €)

	2014	2015	2016	2017	2018 F.	2019 F.	2020 F.	2021 F.	2022 F.	Perp.
Other operating profits	364	303	289	1,308	1,900	1,900	1,900	1,900	1,900	1,900
Inventory variation (included)				1,126						
Inventory variation (assessed)	1,146	1,535	2,654							

Annex 3 – Operational Costs forecast (thousand €)



Annex 4 – Non-cash working capital (thousand €)

	2014	2015	2016	2017	2018 F.	2019 F.	2020 F.	2021 F.	2022 F.	Perpetuity
Non-cash working capital	3,344	6,002	9,920	14,459	18,801	24,441	29,329	33,729	37,102	38,957
% of Revenues	59.28%	63.76%	73.05%	72.22%	67.08%	67.08%	67.08%	67.08%	67.08%	67.08%

Annex 5 – Science4you’s Cost of Debt (Brief)

Total Debt	14,812,400
Total Annual Interest	297,450
Cost of Debt	2.01%

Annex 6 – Science4you’s Debt in euros (Detail 1)

Finance	Crédito Agricola	Banco Popular	Novo Banco	Santander Totta
1	Ammount 200,000 Spread 4.00%	Ammount 200,000 Spread 1.75%	Ammount 100,000 Spread 2.25%	Ammount 250,000 Spread 4.81%
2		Ammount 200,000 Spread 1.75%	Ammount 200,000 Spread 3.75%	
3		Ammount 300,000 Spread 1.75%		
4		Ammount 300,000 Spread 1.75%		
5		Ammount 700,000 Spread 1.50%		
6		Ammount 12,400 Spread 2.50%		

Annex 7 – Science4you’s Debt in euros (Detail 2)

Finance	Millennium BCP	Caixa Geral de Depósitos	BPI	Banco BIC	Montepio
1	Ammount 150,000 Spread 3.94%	Ammount 250,000 Spread 2.75%	Ammount 900,000 Spread 2.00%	Ammount 1,000,000 Spread 1.50%	Ammount 2,000,000 Spread 2.25%
2	Ammount 200,000 Spread 3.10%	Ammount 500,000 Spread 2.75%	Ammount 1,000,000 Spread 1.50%		
3	Ammount 350,000 Spread 3.00%		Ammount 1,000,000 Spread 1.50%		
4	Ammount 1,000,000 Spread 1.50%				
5	Ammount 1,500,000 Spread 1.50%				
6	Ammount 1,500,000 Spread 2.38%				

Annex 8 – Damodaran Country Default Spreads and Risk Premium

Country	Moody's rating	Rating-based Default Spread	Total Equity Risk Premium	Country Risk Premium
Angola	B2	5.64%	11.42%	6.34%
Brazil	Ba2	3.08%	8.54%	3.46%
Cape Verde	B2	5.64%	11.42%	6.34%
Croatia	Ba2	3.08%	8.54%	3.46%
Dominican Republic	Ba3	3.69%	9.23%	4.15%
Estonia	A1	0.72%	5.89%	0.81%
France	Aa2	0.51%	5.65%	0.57%
Greece	Caa2	9.23%	15.46%	10.38%
Latvia	A3	1.23%	6.46%	1.38%
Morocco	Ba1	2.56%	7.96%	2.88%
Mozambique	Caa3	10.25%	16.60%	11.52%
Poland	A2	0.87%	6.06%	0.98%
Portugal	Ba1	2.56%	7.96%	2.88%
Russia	Ba1	2.56%	7.96%	2.88%
Serbia	Ba3	3.69%	9.23%	4.15%
Slovenia	Baa1	1.64%	6.92%	1.84%
Spain	Baa2	1.95%	7.27%	2.19%
Taiwan	Aa3	0.62%	5.78%	0.70%
United Kingdom	Aa2	0.51%	5.65%	0.57%
United States	Aaa	0.00%	5.08%	0.00%

Annex 9 – Unlevered Beta and Levered Beta calculation

Company	Country	Corporate tax rate ^a	Stock Market	Beta ^b	Debt/equity ^c	β_u Business	β_u Firm	β_L
Mattel	United States	40%	NASDAQ	0.71	3.9612			
Hasbro	United States	40%	NASDAQ	0.57	1.8908			
Jakks Pacific	United States	40%	NASDAQ	0.4	2.9591			
Namco Bandai	Japan	30.86%	Tokyo Stock Exchange	0.51	0.3992			
Spin Master	Canada	26.50%	TSX - Toronto Stock Exchange	0.36	0.8765			
Playmates Toys	Hong Kong	16.50%	HKEX - Hong Kong Exchanges	0.24	0.2253			
Activision Blizzard	United States	40%	NASDAQ	0.79	0.9729			
Electronic Arts	United States	40%	NASDAQ	1.01	0.9010			
Nintendo	Japan	30.86%	Tokyo Stock Exchange	0.78	0.2343			
Sega Sammy Holdings Inc	Japan	30.86%	Tokyo Stock Exchange	0.87	0.6745			
Tomy Company	Japan	30.86%	Tokyo Stock Exchange	0.61	2.0555			
Take-Two Interactive Software	United States	40%	NASDAQ	1.63	2.1375			
GameStop Corp.	United States	40%	NYSE	1.42	1.2766			
Atari	France	33%	Euronext Paris	0.45	1.7027			
Zynga	United States	40%	NASDAQ	0.54	0.2060			
Ubisoft Entertainment	France	33%	Euronext Paris	1.74	1.2773			
Science4you	Portugal	21%		1.57875 ^d	1.3594 ^e	0.7612	0.7612	2.0418

a – Information extracted from KPMG’s corporate tax table

b – Information extracted from Yahoo Finance

c – Calculated based on Financial data of 2017 from Yahoo Finance

d – Average multiplied by two

e – Average

Annex 10 – Conversion rate

Currency	Country	Conversion
USD	United States	0.8359 €
JPY	Japan	0.0076 €
CAD	Canada	0.6542 €
HKD	Hong Kong	0.1065 €

Source: Bloomberg, visited at 14-05-2018

Annex 11 – Euronext Lisbon Initial Admission Fee

FEE TABLE INITIAL ADMISSION

MARKET CAPITALISATION (IN €)	ADMISSION FEE	MAXIMUM FEE
Up to 10,000,000	€10,000	€ 10,000
From 10,000,001 to 100,000,000	0.05%	€ 55,000 (€ 10,000 + € 45,000)
From 100,000,001 to 500,000,000	0.04%	€ 215,000 (€ 55,000 + € 160,000)
From 500,000,001 to 1,000,000,000	0.03%	€ 365,000 (€ 215,000 + € 150,000)
From 1,000,000,001 to 2,500,000,000	0.02%	€665,000 (€365,000+€300,000)
Over 2,500,000,000	0.01%	€ 2,000,000

- Example of calculation for an Issuer with a market capitalisation of €100,500,000:

$$\text{Admission fee} = 10,000 + 45,000 + (100,500,000 - 100,000,001) \times 0.04\% = \text{€}55,200$$

Source: Euronext, visited at 28-05-2018

Annex 12 – Euronext Lisbon Annual Fee

ANNUAL FEE TABLE EQUITY SECURITIES

1.	NUMBER OF EQUITY SECURITIES*	FEE	MAXIMUM FEE***
	Up to 2,500,000	€ 2,940	
	From 2,500,001 to 5,000,000	€ 3,990	
	From 5,000,001 to 10,000,000	€ 9,240	
	From 10,000,001 to 50,000,000	€ 14,910	
	From 50,000,001 to 100,000,000	€ 19,530	
	Over 100,000,000	€ 24,150	
2.	MARKET CAPITALISATION OF ISSUER**	VARIABLE FEE	
	> € 150,000,000	€ 10 for each million Market Capitalisation exceeding € 150,000,000	
Annual Fee = 1+2 (if applicable)			€ 55,000

* Number of Equity Securities of the same category outstanding at the date of Initial Admission or on 31 December

** The Market Capitalisation shall be calculated for the year the Issuer is first admitted to a Euronext Market on the basis of the closing price on the date of the Initial Admission and for each subsequent year on the last closing price of the relevant year

*** Subject to section 3.2.4 regarding multiple listings

Source: Euronext, visited at 28-05-2018

Annex 13 – Euronext Lisbon Subsequent Admission Fee

FEE TABLE SUBSEQUENT ADMISSION

AMOUNT ADMITTED (IN €)	FEE	MAXIMUM FEE
Up to 10,000,000	0.1%	€10,000 (min. € 100)
From 10,000,001 to 100,000,000	0.04%	€ 46,000 (€ 10,000 + € 36,000)
From 100,000,001 to 250,000,000	0.035%	€ 98,500 (€46,000 + € 52,500)
From 250,000,001 to 500,000,000	0.03%	€ 173,500 (€ 98,500 + € 75,000)
From 500,000,001 to 1,000,000,000	0.025%	€ 298,500 (€ 173,500 + € 125,000)
From 1,000,000,001 to 2,000,000,000	0.015%	€ 448,500 (€ 298,500 + € 150,000)
Over 2,000,000,000	0.0075%	€ 1,000,000

- Example of calculation for an Issuer with an amount admitted of €20,000,000:

$$\text{Admission fee} = 10,000 + (20,000,000 - 10,000,001) \times 0.04\% = €14,000$$

Source: Euronext, visited at 28-05-2018

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