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THE FINANCIAL IMPACT ON THE GROWTH OF SOLVAY WITH THE ACQUISITION OF CYTEC INDUSTRIES, INC.

CASE STUDY

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Abstract

This project is presented upon a form of a case study, and the goal is to evaluate the impact on the financial growth of Solvay with the acquisition of Cytec Industries, Inc and make a possible prediction in the financial results of future years of Solvay that is directly related to the acquisition itself.

To achieve this objective, it is carried a theoretical bibliographic revision on the theme of merger and acquisitions to explore in depth the concepts and all the processes from the beginning to the end of a merger and acquisition. The main concepts will be related to the main reasons of why firms choose to merge or acquire another company, as well as their advantages, disadvantages, process of negotiation and evaluation forms.

Once that chapter is finished, the case study begins, where it is presented the reasons of why Solvay decided to acquire Cytec, the negotiation phases and naturally the values involved. In order to have a general knowledge about both firms, a wide description of the businesses of both companies is presented, as well as their main financial transactions 2 years prior the acquisition. After that information, it is presented the calculations that will determine if the acquisition did in fact brought value to Solvay, and to do that, it will be used the financial data provided by Solvay up to 3 years after the acquisition. Furthermore, and to conclude this project, the final chapter is going to be a conclusion regarding the value of this acquisition, in which the acquisition did in fact added value to Solvay and the prediction is that in future years it will keep this pace.

Keywords: Acquisition, Merge, Growth, Discounted Cash Flow.

JEL- Journal of Economic Literature

M&A- Merge and Acquisition

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Introduction

The phenomenon of mergers and acquisitions (M&A) is related to a consolidation of firms or even assets by some types of financial transactions such as merge, acquisition, tender offers and purchase of assets. Companies use this strategy as a way to growth and even to start their business in some other country or continent as a way of globalization among other reasons. It has started to be a trend especially in the recent 50 years; therefore, it has caught the attention of several authors that analyzed innumerous cases and have made their own conclusions regarding the challenges that this strategy presents and also the benefits that it might bring to the companies.

For this case study, the companies chosen were Solvay and Cytec as they are two companies with huge financial power and both are big players in their own industries. Solvay had a huge history of acquisitions in the past and they tended to be very successful on that regard, showing again and again great financial results in their segments in direct result of the acquisitions themselves. They have always been very attentive to the market, looking for a profitable business. The automotive and aerospace market were very profitable businesses in 2015 and ones that Solvay always wanted to grow, so they decided to acquire Cytec in 2015. Cytec at the time was one of the main leaders in that industry so it is a very interesting case to see how Solvay adapted to this business, the negotiation process and most importantly, to evaluate how good the transaction was overall and how it will affect the future of Solvay.

Throughout this report there are many goals and milestones, the first one consists in sharing with the readers a bright picture about mergers and acquisitions, mainly their key points, the differences between mergers and acquisitions, the types, valuation techniques and objectives of doing this strategy. The second one is about to explore in detail the companies that this project will be focused on, and dig very deep about the business plan of each company 2 years before the acquisition of Solvay to Cytec, their strategy, story, main goals, main conquers and biggest challenges they faced. Right after giving the reader a strong message about each firm, it will be addressed the topic of the acquisition itself, with the costs of it along with the negotiation's phases and adaption phase. In this case study there will be more focus on the activities of each firm two years before the acquisition, the year of the acquisition and then 3 years after the acquisition. The final step of this project will consist in a very detailed analyses about the cash flows and financial parameters of Solvay in order to understand if this acquisition did in fact added value and growth to the company or if it was a failed attempt. The model chosen to make the calculations to reach the present value and compare it to the value of the acquisition is the discounted cash flow model and it will take in consideration the cash flows of the 3 years after the acquisition was made (2016, 2017 and 2018) as Solvay presents in their annual financial reports information that can be used directly in the formula of this model. The calculations will be made in an excel sheet where all the data will be there including all the formulas and then that information will be transferred to this report where it will be presented to the reader the main results.

Regarding the first part of the plan which is the theoretical part, the methods used will be scientific reports and books of many authors, where the critical information will be retained and used in the best way that can transmit the most solid points regarding M&As (Merger and Acquisitions). Some examples of past M&As will also be presented as a way to understand the typical mistakes, the steps that should be taken and also success stories.

Regarding the case study itself, as previously mentioned it will be presented and analyzed the business of the companies involved, their strategic plan, market analysis based on numeric and research data in order to gaze at the environmental side point while the transactional context is being applied. The numeric information for the financial calculations is available in the websites of Solvay and Cytec as well as in some other articles.

After this introduction, it begins the literature review, followed by the case study, with the history of both companies and the financial calculations and in the end, a conclusion will be presented to share with the reader the final thoughts about the value that this acquisition added to Solvay.

1 Literature review

1.1 Merger and acquisitions in a global level

In the market narrative, M&As are used mainly as a good opportunity for growth in a new market that the company that is being acquired has already a solid structure in their specific business so it will be easier for the company that is acquiring the other to overcome unnecessary challenges and high costs to enter a new market from the scratch (Trautwein, 1990). M&A are often used as a way to operate with players from a completely different industry (Lynch, 2006) or even acquiring a competitor which Solvay did back in 2011 when they acquired Rhodia. According to Sinkin and Putney (2017) not all mergers and acquisitions are actually ideal matches but they can in an effective manner reach an agreement that can benefit both parties. The authors defend that the most important issue that will reflect the success of the transaction is about the time that the owners of an acquired firm are thinking about working full time, and an interesting outcome comes out of this question. If they are planning on a timetable above 5 years a merger is a better option, otherwise an acquisition will be the optimal choice.

Even though M&A can be a great leverage to increase the market value of a company it usually takes the opposite direction as recent studies show (Schoenberg, 2006; Zollo and Meier, 2008; Papadakis and Thanos, 2010) in which is proved that most companies that engage in that practice do not achieve the established goals in a short run. In recent years international acquisitions and mergers have been the main way of expanding into foreign markets (UNCTAD, 2000) however this is often a tricky path mainly because of lack of awareness from the management team in a culture level with the country in which they want to operate, their manners, the target and the institutions itself (Zaheer, 1995).

Whichever scenario happens, in every M&A transaction, it is important to distinguish mergers and acquisitions because they are always different in the way of execution, work frame outcome, process of development and most importantly the planning. Mergers are nothing more than two companies that are autonomous in they own way and then they join together under a single force so the companies will forcedly lose their own identity in favor of the new merge that they created (Wayes, 1963). On the other hand, we have acquisitions that is basically the complete acquirement of the management of a different company but it can also be stated to be a fairly number of transactions whereby a person acquired the domination over the net assets of the company. Still in these subject, mergers are usually created by means of holding a company, which basically happens in a situation where two different companies are united by the creation of a new company or a situation where one of the companies, usually the one with the biggest market value absolve the other company on a bid for its share.

According to Sinkin and Putney (2017) every company that tries this approach of M&A must have strong reasons to do so, and very often that interest comes from market opportunities, more specifically from the conditions that the industry is facing and financial developments. Another important factor would be the opportunities that come from the outside, sometimes even financial ones like interest rates, market trends and even the development that technology is facing nowadays. Finally, the company could also make an acquisition in order to reduce the risk of losing a supplier by acquiring a common distributer.

1.2 Business opportunities and downsides from mergers and acquisitions

There are a lot of reasons for which a company should consider merging but Sinkin and Putney (2017) believe that the most common ones are geography, niche services and bench strength. Bench -strength is based on the idea that firms are using mergers to contribute for growth as there is a lack of talent in the accounting profession. It also as the goal to have a solid and secure succession team that will keep working with the same principles and level of success. In this field, merger will lead to better opportunities for internal promotion of talent and will add value to the partners.

The second reason previous mentioned goes in hands with the idea that successor firms are normally looking for a position in which they can create a niche service. The owners of acquired firms are obviously looking for a bigger client base because it is an opportunity for a steady increase of value to the firm. A merge will offer the opportunity to combine services of niche consulting and auditing in the new firm. Finally, as the name geography indicates is basically a move that many big firms with a solid geographic growth plan like to put in action, mainly because they believe that the presence of the company in some other place will represent a good growth in the sales force and perhaps a good reputation boost. Nowadays that is easier to do mainly due to the advance in technology that makes the operation in other environments a lot easier and that is the reason why some firms are keen to merge with a company from another city or country. Moreover, with this strategy, the partners from one side can focus on one area and the other side in some other pending business. Being that said, this game plan is in a lot of situations a great opportunity to enhance the reputation of the organization in the market. Savarnya (2012) states some disadvantages in merging that might lead to a poor and unsuccessful business. He talks about the difference in the culture of each company, the complexity that a transaction that this type entails and finally he advocates that the employees of both companies may be not so happy with the change and obviously every single one of these reasons can damage irreversibly the new business plan.

Sinkin and Putney (2017) defend that a lot of the considerations that are a cause of concern in mergers also apply to acquisitions, however that are a few primary differences, mainly the value of the acquired firm that can be best defined in terms of multiples, where a multiple of 1 means that the market value and the selling price would be a perfect match. Usually when the buyer does not make a big offer upfront, the periods of payout will dramatically be lengthier and that will have an impact on the multiple, so we can conclude that the greater the profit for the company that is acquiring, the bigger the multiple will be. Savarnya (2012) believes that acquisitions have strong downsides mainly from a managerial perspective, which can be caused by a bad evaluation of the target and possible inefficiency of reaching a synergy. The author also reveals that acquisitions are a good way to avoid needless competition as well as a much inferior risk when it comes to develop a product from the very start.

In a marketing perspective this is good way to build a brand-new product line, ease down or eradicate rivals or even protecting a certain established market and possibly reduce the costs of advertising (Arthur, 1963) but looking for a more financial point of view we can observe that M&As can escalate turnover with impacts in the inflation of EPS (Weston & Brigham, 1977). M&As can often times bring out the best of managerial staff, most of the times due to the fact that new personnel is needed, and Artur (1963) advocates that the success of a large company depends on a great extent to the management team and through M&As, new more talented members can neutralize the others that are not so competent, so because of this large nature, the company has convenience of having the more skilled managers principally to the fact that they can pay better salaries and they present more opportunities than many others. It can also be seen some opportunities when it comes to economics of large-scale production in a matter that by doing a M&A the materials are standardized and the origin of inventory is assured, and this happens because through M&As a bigger company is created so usually it will reinforce the skill in negotiation with suppliers (Arthur, 1963). On a last note Anora and Kumar (2012) make a special review on taxes and how it can be a good opportunity for a deal of M&A advocating that a company that has a lot of profits can acquire a loss marker in order to take advantage of the target`s loss to their own advantage in a way that they can reduce the tax liability.

On this topic it is also important to refer some big downsides of M&A that have happened in the course of the years and Bhattacharyya (2018) has identified and defended that there are three main reasons, being the loss of identity from one company one of those reasons and often times the goodwill also can be lost though it will depend if the acquiring company has the goal of using the goodwill of the acquired company or not. The second reported problem is a problem of adaption, a lot of problems can arise from M&A in terms of employment, business area and functional levels. The author defends that an effective way to solve the problem would be the agreement of the accounting system in the new group but even when this direction is on the right track, generally there will be a lot of complications on the asset control and profitability that can be used as a tool of operational decision or control management. The main idea that the author presents regarding this topic is that there will always be some differences in opinion so the most effective thing to do is to gather a committee in which all the members from the various accounting organization can meet each other and hopefully all of them reach a well-accepted decision.

Finally, the last topic that Bhattacharyya (2018) mentioned is the gap in the normal relationship between workers and that is particularly common in a big company where a normal employee might feel meaningless in the complex organization that was originated by a merge or acquisition although this might be fought with some well performed personnel policy as well as a satisfactory communication. Even though this is a real problem, the author claims that this should never be an obstacle for an investor who is interested in a M&A transaction considering that that is not a crucial part of the business. Like in every transaction in the business world there will always be things that the management will have to sacrifice in order to accomplish greater things. Lastly the author is keen to the idea that a M&A transaction can work as a strategy to boost a business in a relatively bad economy mainly because the upsides are greater than the downsides.

1.3 Variety of mergers and acquisitions

According to Gaughan (2005) we can classify M&As into three main types: conglomeration; vertical and horizontal. Savarnya (2012) also shares the same insights on conglomeration.

On a deeper level conglomeration is nothing more than when two companies that have no common business areas come together (Savarnya, 2012), being that by form of acquisition or merge. It was fairly popular around 50 years ago in a defense mechanism for companies not to merge or acquiring a company in the same market or selling the same product due to the fact that most of the times this type of M&A is carrying an antitrust enforcement (Gaughan, 2005). An example of a conglomerate company is General Electric (GE) but they failed when they acquired Kidder Peabody, mainly due to their lack of experience in the sense that getting a brokerage firm was too much of a big step for a company that was primarily used to do marketing on several products. If we look at a brokerage firm, the assets are its workers and in this case the brokers, so they are financially speaking human assets, not material assets so if they are not dealt in a proper way they can always leave to another competitor when the contract ends and that was the main fault. Concluding, the big lesson from this case is that if a company is not used to deal with human assets, perhaps this is not the acquisition that is best suited (Gaughan, 2005).

The author defends that a vertical M&A happens when both companies have a seller and buyer relationship and the companies construct correlative equipment or deliver similar services but at different periods, decide to merge together. It is often times extremely forward in a way that sometimes it is possible to see combinations between companies and suppliers or with customers. Companies use this kind of approach in virtue of acquiring more power in the supply chain process and increase efficiency while reducing costs as much as possible. According to Investopedia a good way to exemplify a vertical merger would be a car manufacturer buying a tire company. Not only the cost of the tires would drop but it would also be a great opportunity to diversify the business by selling the tires to other automaker companies. As mentioned previously, this example would support the idea that a vertical merge is oriented in reducing costs and by doing that it will directly lead to an increase in profits which will expand the revenue streams. Looking to the bad side of vertical mergers, Sudarsanam (2003) believes that this type of mergers is in many cases used to obstruct competitors from having access to materials and by doing that they would be in control of the products and its price, so they would basically annihilate clean competition.

Finally, a horizontal M&A is a deal of when two rival organizations that work in the same industry join together. This can be highly beneficial for both companies since the competition is greater in large corporations so a possible win in the market share with a horizontal M&A is a scenario that pleases the managers, also if one of the companies sell products that are related to the other, the new merged company will have an wide extent of products to offer to the costumers so that being said it helps massively in the diversity of the corporation and will possibly help entering new markets. It is widely used to make a more efficient economies of scale (Weston, Siu, and Johnson, 2001). An example of this type of M&A is the acquisition that Solvay did to Rhodia back in 2011.

1.4 M&A negotiations and early stages

In a normal situation, M&As are deals that are done in a friendly way and it starts when the managers of one company contacts the management staff from the other, normally by investment bankers, and most of the times it will require the board approval so it is crucial to keep every board director updated on how the negotiation terms are moving. Occasionally the progress goes in a very smooth way and both parties reach a deal in a short time, however this may lead to a bad synergy between both companies and in some cases the seller might win a lot of money simply due to the fact that the buyer side wanted to do the deal fast so they wasted more money than what the market value actually was so it affects a close examination of the agreement and other times what appear to be friendly negotiations turns into a hostile takeover like the case of when

Moore Corporation acquired Wallace Computer Services, Inc. when they failed to reach an agreement after 5 months of negotiations (Gaughan, 2005).

Anora and Kumar (2012) believe that is in the best interest of everyone to make the HR involved in the entire process to have a department that is evaluating the situation considering all the people that are involved in the organizations and it is in the HR responsibility to analyze and respond in the best interest of the managers to people doubts, helping massively to avoid confusion and both the people and the company will have a clear view on goals from one another. A good way for both groups to find common spots and different ideas would be a cultural judgment development where the two groups could locate every distinct point that separates them and try in a subtle way to reconcile them, because after all, communication is the most important part at this stage. Any silence will only fuel an untrusty environment and sooner or later the organization will face the problem of unwanted gossip and rumors due to the lack of contact and by doing this it would be easier to explain and reveal hidden problems (Anora and Kumar, 2012). The same authors also create a big emphasis on designing a realistic process that is in reach of all departments so that facilitates the operation and it can create a solid strategic plan that would reflect the core values of the new formed organization. Kumar, Upadhyayula and Gupta (2012) believe that the level of success that a merge or acquisition will have starts long before the actual operation take place. They defend based on a study that the executives of companies that had success doing a M&A process explain their success to these four reasons: management capabilities, due diligence, strategic fit and business synergies (Harding and Yale, 2012). Considering past experiences, we can really observe how crucial the times before the actual transaction were and how it influences the quality of the operation. Gadiesh and Ormiston (2002) are keen to the idea that the failure of merge itself can be explained due to cultural differences, inadequate planning, the cost of the operation was beyond the true market values and not a strong position in the leadership. As explained before, pre-merge problems are one of the major causes of failure so it will be explored in detail some of the best strategies to overcame unsuccessful M&As.

Kumar, Upadhyayula and Gupta (2012) as mentioned before argue about strategic fit and how it is a big factor to take in consideration. Markides and Williamson (1994) share the same thought, however they discuss the idea that both companies do not really have to be complementary. Even though they talk about this hypothesis they still say that it can lead to an increased shareholder value if the differences between one another are understood and clear and they have to be closely exanimated because if they are not, it will lead certainly to disaster. The main conclusion to strategic fit is that if a company tries to merge without having this concept as a primary thought and is only looking for following a rival that has a lot of profit it will lower the shareholder value (Lynch and Lind, 2002). Due diligence was another factor that the authors gave emphasis and it consists in the idea that the capabilities of both companies must be analyzed, such as financial situation, marketing, management, legal technicalities and others (Cartwright and Cooper, 1993; Steffen, 2001; Hayward, 2002). This process helps to identify synergies and the fair price to acquire, but often times synergies are not easy to find (Reed and Luffman, 1986). In a scenario where synergies do not take place, it is important to have alternatives as a significant amount of times this strategy comes with unexpected contingencies (Lynch and Lind, 2002). Sometimes it can happen that the final deal is not exactly in agreement with what the acquirer expected even though they had negotiations and did all the right steps and they end up going nowhere but it is better to realize that a good negotiation is not possible in the due diligence stage than to pursue with the agreement and fail in the future. Other factors that the authors find interesting are goodwill, that indicates the premium paid above the market value which can be a result of the high feature of the staff team, disparity that as the name suggest it shows the differences between the companies on a management level and depending on how big they are, different approaches have to be done and lastly the technology factor mainly due to a statistic stat showing that companies that are involved with the new developments of technology are more likely to achieve success.

The most common reason for why companies decides to merge is diversification, and there are two types. It can either be related or unrelated diversification. Lubatkin and Chatterjee (1994) present their idea and they explain that diversifying to similar business is a good option because it has less risks and could increase productivity and create an economy of scale. Two related companies in terms of their market share can have a perfect merge in conditions of scale and ultimately, they can grow a lot and lead to a synergistic effect in the process. Unrelated diversification can actually be a proper way to create economic value, and Markides and Williamson (1994) defend that more companies should expand assets that they possess and that cannot be infiltrate in a rapid way by competitors instead of thinking straight up on economies of scale and by using that strategy those assets would be a competitive advantage. It is important to explore the idea of over diversification, which have happened in the past and it only increases the marginal costs while simultaneously decreasing marginal benefits leading to a loss of value (Markides, 1992). Ultimately the best way to indulge in an unrelated diversification is to focus on the financial integration in which is more important to focus on the finances of the job and not so much on the operations.

Another two factors that can contribute to a solid M&A process is the management capabilities and past experience in the field. According to Kumar, Upadhyayula and Gupta (2012) is important to check the capabilities of the management of both companies to understand what changes needs to be done in the managerial structure. As explained before top managers are needed in this context and if they have no qualification for this process there must be changes in the method. One way to achieve it, would be hiring people from the outside. Past experience is also a plus, and Gadiesh and Ormistom (2002) argue that some companies that have been doing a series of M&As can change the way they are doing business and quite possibly the nature of the industry depending on the size of the company and its operations. In companies that have a natural taste for acquiring can take some insights from paste acquisitions and learn from them so the next ones go even better than the last ones, being this always a learning and improvement process. Even though this premises apply, there are some exceptions, Hayward (2012) express the fact that companies are heterogeneous so one M&A transaction would not provide enough information for the next one. These companies that have a lot experience in this matter carry the benefit of possessing some elements according to its nature. They might even have a range of employees that have mastered the ability of some important skills needed in a M&A process like negotiation and these conditions give these companies a leverage over others that have no practical knowledge in the area. As a final note on this topic it is important to refer that all the experience in the world is not an alternative to other factors that were explained above, and to prove that point, a study was made and the conclusion was that some newbie companies regarding M&A experience that adopt a good system were having similar results in terms of benefit and failure as the most experienced ones.

The interest of acquiring a firm can be often times a process of investigation that is motivated by the bidder`s investment bank approaching it with a number that it would be a perfect match for the bidder. If the acquisition that is being analyzed considered as a small size, there is an intermediate that is a business broker. Almost all mergers have in the contract a tangible adverse clause and this very same clause will give the chance for each side to withdraw from the arrangement in case that a big event would change the value of the deal (Achim, 2015). Gaughan (2015) claims that the value is subjective in a way that each party as their own thought of how much is the true price, so is in the bidder and the seller side the responsibility to determine together the best value to which the transaction should take place. Each valuation can differ to various reasons, being the most common the uses of the seller side assets and mixed beliefs on the possible growth of the target, so taking this in consideration occasionally a friendly and quick deal is not always an option. As a side note it is important to refer some elements that are a big part of some deals, such as regulatory and financial approvals, that must be approved prior the strategic movement could lead to an achieved affair, so as it can be concluded, some companies engage in a negotiation where there are some terms of confidentiality in where both groups share confidential information that cannot be shared with anyone from the outside. In M&As there are a lot of things in play, so it is crucial that a good arrangement is achieved and in everyone's interest, so due to the natural friction between the management of both companies, that have different ways to achieve profit in their own companies, it is necessary a third element to find some common sense within the board of each company and to make it easier to skip some technicalities. Throughout the years a lot of M&As have adopt this kind of behavior and naturally a lot of specialists in the field have made their own opinion about his matter. Achim (2015) after looking upon some statistics has made his own judgment and he noticed that nowadays the importance of an intermediate in a M&A process is very high and he puts managers, financial advisors, accountants and auditors in a frequent group that as a big role on this scene as they are a crucial part in terms of what the potential merge or acquisition gives to the shareholders. His study also puts the CEO experience as a way to predict how successful the M&A will be and he concludes that firms with ex investment directors in the management staff have higher chances to acquire and they are fairly more efficient at it whereas more traditional managers that are not as adventurous, thus they are not usually keen for M&A operations. The fact that he places financial advisors in a top rank position has to do with their possible experience in the target country, this obviously in a global level merge or acquisition. As discussed above, traditional companies have major differences in the way they treat this manner and has a way to protect themselves they adopt conservative accounting paths, although it has enormous influence over diversification discount and value of goods. When it comes to auditors, Achim (2015) tries to explain that they have a huge role in the M&A process, and to defend his hypothesis he shows a statistic in which we can see that the costs that the acquirer has are much lower if a large auditor is auditing the company that they are trying to do business with.

1.5 Merger financing

M&A process have a lot of parties integrated in the deal, so a favorable outcome depends on the effectiveness of everyone involved, and naturally it has several expenses to the companies. Being that said it is necessary to have large amounts of cash prepared, and if there is not enough liquidity, it is necessary to look for another method of financing (Levine, and Aaronovitch, 1981).

For big deals all cash might mean that the bidder needs to include debt, and obviously it may lead to adverse risk problems. Since a M&A can have a cost of billions, it would be too much for some companies to handle, however it has the advantage of not being so dependent on a company's performance (Gaughan, 2015). The way that most companies use to finance a merge or acquisition is by exchanging stocks, and the idea is that the acquirer company exchange its stock for the shares of the company that is being acquired, so both sides share risks similarly. This method can be highly beneficial to the buyer side when the stock is overvalued, meaning they will get more stock from the other side than they would get if they paid in cash, but it can harm as well if the stock declines (Gaughan, 2015).

According to Docurex (2018), being agreeable to take on a seller`s debt is another way to finance that does not require stock or cash. In the business world it is visible companies that cannot get rid of debt mainly due to high interest costs so in these cases it is crucial for the debtors to defend the company from more losses and a good way to do that is through a merge or acquisition with a firm that can pay up those costs. That is a good way to overcome the problem as it is usually good for every part involved, including the creditor`s and the seller`s. When a large part of the other company is acquired the acquiring company will have the chance of restructure the entire company because they will have a lot of power during liquidation.

Another way of financing is through an IPO (Initial Public Offerings), issuance of bonds and loans. Many times the beginning of a M&A process in a certain company is extremely enthusiastic, as in the future it can be a great source of profit for them if everything goes well, and by doing an IPO it will create a bubble of excitement and the price of shares can increase and they can more easily negotiate the interest rates with the investors. The only problem with this strategy is that it will increase volatility so the price of shares can fall any time making this a risky strategy that most companies try to dodge (Aaronovitch and Sawyer, 1975). Corporate bonds as described before can be a beneficial form of accumulating cash from the public and shareholders, and this works by releasing certain bonds that already have an established time and rate. Bonds have the disadvantage that the money is not possible to use until the expiration of the bond so this is more popular among investors that prefer to choose an investment with lower risk. Lastly loans can be another way around however it is pricey even with low interest rates, especially when considering millionaire deals (Hapeslagh and Jemison 1991).

As discussed, looking at the numerous ways of financing, it is possible to assume that a lot of options are available and the best fit for each deal is determined by both parties and to choose an effective approach they must have in consideration their background, financial situation, the market value of their respective companies, the debt they accumulated and other financial parameters. They must be aware that no matter which method they use there will always be some risks until a certain extent and it is in their own responsibility to make a planned decision, meaning doing due diligence during the interaction as discussed in the previous model (Teerikangas andVery 2006).

1.6 Reverse mergers

The interest of companies in reverse mergers is nothing new, it is actually a process with many years and it basically consists in a private company that decides to merge with another company that is already public. They are very popular mainly to their usual low-cost price and their time duration that tends to be surprisingly low. Being that said, this is a process that might attract especially small firms (Adjei, Cyree, and Walker, 2008). This strategy is often times compared to an IPO as a way to go public, however an IPO is a pricey strategy, instead, with a reverse merge, the company that was formed can issue securities so they dodge having all those costs associated.

Adjei, Cyree, Walker (2008) refer in more than one occasion that this should be a perfect way for small companies to go public especially if they are not ready for the pressure that an IPO carries like regular audits, thus they will have a much higher probability of success. Even though reverse mergers can be a good process, an IPO, despite of having high costs, the underwriters play a good role in the process and help in the market stabilization, and if done properly, it can lead to enhancing the liquidity in a much bigger way than a reverse merger, raising more capital and generally having a better provision in the market.

In terms of aftermarket success, Hensler (1997) concluded that 5 years after issuance, one quarter of the firms are delisted. On another study, Gleason (2005) examined a high number of firms that had done reverse merger in the past and he found out that most of those companies did not had much improvement in terms of profitability and more than 50% of those failed to survive after 2 years of when the process was made. He also came to the conclusion that when compared to an IPO a reverse merger presented a much higher volatility and higher short-term stock returns. As we can conclude based on the studies, we can see that an IPO is typically more efficient and is mainly due to the support of the underwriters that is lacking in a reverse merger. A good example of a reverse merger would be the merge between Ariel Corporation and Mayan Network Corp. back in 2001, where Mayan acquired Ariel and the shareholders from Mayan side owned almost the entire new company created and the Ariel side only had a very small percentage. This example is definitely the most common one when we look at the size of the companies, which just shows that a reverse merger is not only for small firms and in the end, it presented success on both sides. Ariel was able to improve their financial condition that at the time were far from the best and it gave Mayan the opportunity to explore public markets in a phase where they just had made a deal with their first customer.

1.7 Anti Hostile Takeover Tactics

A hostile takeover is when a certain company puts a bid on a firm that they want to acquire and in which the management of the target firm is against that move and they will actively persuade the shareholders not to sell their part to the other company. It is very common to see a bid that is directly suggested to the shareholders without any warning to the board members, which transmit the idea that the acquiring company is not interested in negotiating with the other side (Firth, 1979). In other cases, the initial idea is to have a friendly bid, however due to lack of consensus between companies sometimes they turn out to become a hostile bid. Savela (1999) states that normally hostile bids and offers are presented to shareholders of the company that will possibly be acquired to gain maximum control over the company without needing to waste any time in negotiations with the board members of the target firm. This kind of strategy is just another way of acquiring and the reasons behind it are the same as other normal non-hostile takeovers, being the only difference between them a reason for the acquirer company to be hostile. The most common reason for this to happen is when a company with high potential is not being run in the most profitable way, standard reason is because of the poor management, and it is well reflected in the financial parameters such as stock value, that is far from the potential value of the firm making it undervalued (Firth, 1979). The most effective thing to do in this case is to replace the management and the common way to do so is through a hostile takeover. In this case the acquiring company sees the gap of value between the potential and the real market value of the firm and they want to make a shift in the management staff to reach a full possible growth, increasing the value of the acquired firm (Pearce, Robinson, 2004).

In the business world, bad management does not hold on for very long. After a certain time the tendency is for them to be replaced, and that can be connected to a lack of potential growth or even when the main plan is not on agreement with the shareholders point of view, so it is crucial for the management to take the shareholders into consideration in every impactful decision (Weston et al, 2004). Even though it is forced, a hostile takeover can be an effective move, it replaces bad management, give value to the acquired firm with potential and it even helps the shareholders. What has been observed in the last years is that the positive impact is usually going to the shareholders of the acquired company and the firm that acquired is paying a premium for their company. In conclusion the shareholders are the main winners, gaining a lot of value when the deal is done properly, therefore a good hostile takeover is an acquisition that gives top priority to the shareholders (Firth, 1979).

Naturally for a hostile takeover to take place there’s need to be an offer to the shareholders, and the bid that is offered is logically higher than what the firm is actually worth in the markets so they have a much higher chance of getting a positive response from them and possibly the board directors as well. The bid premium is nothing more than the difference between the real value and the offered one and the number of this bid premium will depend on the size of the company, on how much the acquiring company is willing to pay and negotiation skills in general from both sides (Gaughan, 2007).

Since this tactic is wildly popular, a lot of companies have developed some tactics over the years to protect themselves from this kind of scenarios, and some of them have really different perspectives in the way they approach it. Some companies try to block totally the investment from the acquiring company and they actively try to stop the bidder from taking control over their company stocks while others are smoother and they will only make an effort to increase the bid so they receive a wider bid premium (Schwert, 2000). Normally the reason why the board members of the target firm are receptive to a hostile takeover is not always linked to the value of bid but also to the fear that they have that the company will be jeopardized with the acquisition, lowering the sales, slow or stagnating growth in the future and possibly losing their jobs to members from the acquiring company. There are many defense tactics and they are chosen accordingly to the strategy that the acquiring company is using.

The defensive measures can be divided in preventive and reactive strategies, being the preventive ones applied when the board members feel that their company is vulnerable to attacks considering their financial situation so the defenses are worked before the attack itself leaving them prepared while the reactive ones happen when the attack already took place mainly because the board members are not imposing barriers to hostile takeovers, believing that the shareholders can improve their wealth when the firm is acquired at premium (Pearce and Robinson, 2004). Starting with the preventive ones we can classify golden parachutes, poison pills and corporate charter amendments as the main ones (Pearce and Robinson, 2004). Poison pills is a strategy in which the company that is exposed to the attack offers to the shareholders preferred stocks in the merged firm as a natural result of a favorable acquisition so the goal is to dilute the stocks in such an extent that the acquirer firm is unable to get an important part of the firm without the agreement of the board resulting in a failed business, losing money and time. It is a strategy that can also be used to win more time to think about the bid, start negotiating with the other side and possibly try to increase the bid premium, raising shareholders wealth (Theobald, 2006). Golden parachutes have the intention of turning a hostile takeover into a very expensive transaction by distributing a mass sum payment to the board of the target firm. This strategy comes in place usually when the acquirer firm has already got a part of the target company shares, normally around 30% (Lambert and Larcker, 1995). By default, this is a strategy that works better if combined with other measures and it can increase the wealth of shareholders. Its main job is to align incentives for both shareholders and the board of the target firm so they are inclined to not making many obstacles to takeovers as their wealth is aligned with shareholders interest (Gaughan, 2005). Lastly, there is corporate charter amendments and it is basically a measure that has the intention of stagger the elections of executives in the attacked company so they are not elected over the year. The idea behind it is that an established team of executives is going to be able to avoid the acquiring firm advances. By using this strategy, the attacked company will have the possibility to stop the attacking company to install a new board member (Pearce and Robinson, 2004). It is important to state that none of these measures alone will prevent a bidding firm from making a successful takeover over the target company. These strategies however will gain time for the attacked company for them to think of the best solution in their case (Schwert, 2000).

As far as the reactive measures there are a few ones that are to an extent effective. A very used one is greenmail and it is used when the bidder interest is short term profit rather than long term corporate control. Greenmail is associated with repurchasing the shares of stock that were captured by the acquiring company at a premium in exchange that the attacker company stop consider the other firm for a takeover. This is a fairly good tactic however it only works with bidders that are looking for short term profits so they can win money by selling the shares that they already bought and not bidders who are thinking on the long term to control the company (Weston et al, 2004). Litigation is also a possible measure and it implies that the target company can take action and negotiate the bid that the bidders offered to the shareholders. This a strategy that can delay the process of the takeover itself but is not powerful enough versus bidders that are thinking long-term. Litigations by norm involves restraining orders, pursuing legal injunction or even a law suit against the acquiring firm (Schwert, 2000). In the meantime, the attacking company is preparing their defense, the target company has a window to invest on other defense techniques or even to negotiate with the bidder so they can increase their bid in exchange of dropping those litigations. It can even harm the reputation of the bidder company with so many litigations that the shareholders from the target company might be suspicious about their intentions making the deal harder to close (Pearce and Robinson, 2004). It is also possible to have a tactic that involves minimal effort and extremely cheap when a company is facing a takeover and the way it works is that the board members try their best to convince the shareholders that the takeover will have a bad result on the company and also on the share price. Usually the board will try to point out to the shareholders that the bid does not represent the true value of the firm and depending on the case they can argue that both firms operate in different industries and that a takeover would only lower the value of the firm in the future. Regardless of what they share with the shareholders they need be cautious about it, as the shareholders might think that the board is only trying to convince them so they can keep their jobs without thinking about their wealth (Weston et al, 2004). Lastly another common reactive strategy is called the crown jewel. This tactic goes in hands with the idea the an hostile bid is related to the assets of the target firm or even their own operations, and using the crown jewel defense the firm can sell the assets that are interesting in the eyes of the attacking firm to make them look less attractive and that way the takeover might not make sense anymore. A way to implement this is to sell their assets to a friendly company and the after-a while, acquire them back at an agreed price (Schwert, 2000).

1.8 Growth

As mentioned in previous topics, growth is by far one of the most fundamental reasons for M&As. Many times, the company only has a limited amount of time to take advantage of an opportunity that can expand their business within their industry. Going for a M&A process to increase growth is many cases the best option as a M&A can be a much faster process than internal growth and that is why this is often a tempting path (Diamond, 1984). When a firm is growing very slowly through internal expansion, the main rivals can react fast and take over market share, cancelling out advantages that the firm had in the first place, so very often the best answer to this problem is to acquire or merge with another company that has an established management and necessary resources. A lot of opportunities require immediate action, otherwise they might vanish in a short run and this could mean that the firm has created a revolutionary product meaning that they have a time advantage over their rivals (Sudarsanam, 2003). Even though there are ways to protect the idea, such as patents it will not stop other competitors with better resources to develop a similar product without violating any patent (Ismail, 2005). There are many types of M&As so depending on which type the firm chooses, they might expand their own business in their industry or outside, and when they decide to growth on another industry, they are diversifying which will be explained in detail in the next subtopic (Lynch, 2006).

It is a constant challenge for the management staff to demonstrate growth especially when both the firm and the industry have already achieved it, especially when the demand from the costumers for the products of the industry slows down. In this scenario M&As can be a crucial factor to present growth through revenue growth and also an increase of profitability. For the managers this is a pleasant scenario as it is much tougher to increase the profit through improving their own firm than it is through using the revenues from the target company (Weston, Siu, and Johnson, 2001). Even though it can indeed successfully present some growth, the managers now have more responsibility because now they run an even bigger enterprise. Overall the corporate managers must certificate that if they enlarge their enterprise with a merge or an acquisition with another company, they must have proportional profits and contribute in a larger way to the shareholders wealth (Trautwein, 1990). With this information it can be advocated that the main goal for the corporate managers of a company is to present growth and ideally a growth that eventually will originate more wealth to the shareholders, however sometimes the board needs to analyze the expected profitability in the revenues that will come from growth through M&As and realize if it is worth the cost. If not, perhaps the best solution is to keep the firm at their size and continue to gather enough returns (Sudarsanam, 2003).

Firms that already are successful in one country might think about expanding their horizons to a different one by a merge or an acquisition to increase revenues and perhaps to be more adventurous and enter in a new market. By using this system (M&A) the firm can take advantage of the distribution network, staff and general knowledge of the target company abroad and increase revenues (Weston, Siu, and Johnson, 2001). There are some obstacles to this scenario, starting with the barriers that some countries apply to foreign acquirers which might make it impossible for this to happen in the first place and naturally there must be a study that can testify that a big acquisition in another country might originate proportional profit for the deal to be sustainable. Another big factor that can substantially contribute to the success or failure of an international acquisition is the exchange rates. Considering that the currency of the target depreciates towards the bidder currency, the bidder will be able to afford a higher premium and it will make the target company think twice before rejecting the proposition (Theobald, 2006).

On a final note about international acquisitions, it is important to look at the different successes between international M&As and deals within the same country. It was found that the acquirer firm managers were pleased with the returns when they moved their business to other countries in which they previously had no operations unlike several acquisitions performed in their own country where they had little to no success. Surprisingly the returns were negative when the acquiring companies already had some business in these foreign countries (Doukas, and Travlos, 1988). It is possible to assume that when the firm has already an established reputation in the market, the investors may actually be less optimistic regarding an increase of revenues by investing more in their region. Some other study stated the opposite, showing that between 1985-1992 when 432 deals were analyzed, bidders from the USA that pursued cross boarder deals had lower returns compared to bidders from the USA that choose USA targets (Moeller, and Schlingemann, 2007). Even though the success by going global or staying in the same region is still highly subjective, nowadays the management in general is experiencing a globalized world that puts enormous pressure on firms to become global and the fastest way to do it is definitely by acquiring a company in a new market, which will inevitably come with some risks.

1.9 Synergies

A synergy is the phenomenon when two substances combine together and they originate a bigger effect than which the sum of the two operating by themselves could account for. In M&As this means that a corporate who did a merge with another firm is more profitable than the individual pieces of the companies that were united. This extra profit that the corporate possibly will get will give them permission to cover the expenses of the merge or acquisition process and to award the shareholders of the target company with a bigger premium for their shares. This process is especially good for the combined firm as it allows them to have a positive net acquisition value ($NAV = [VAB - (VA + VB)] - (P + E)$) where VAB is the linked value of both firms, VA and VB is the individual value of each firm, P is the premium that is paid to firm B and E is the cost of the acquisition process (Destri, Minà, and Picone, 2012). In order for a synergy to happen VAB- (VA + VB) must be bigger than P+E, otherwise the acquiring firm is paying more than they should to combine with the other firm.

The two main types of synergies are financial and operating ones. Financial synergy is related with the idea that the cost of capital can be reduced by uniting companies, while operating synergy is about reduction of costs and revenue augmentation. This last concept usually comes from a presented opportunity as an outcome of the merge of the firms. They can show up from sharing marketing circumstances by cross marketing each merger partner products (Weston, Siu, and Johnson, 2001). Cross marketing has the power to increase revenues of each company. Revenue augmentation can be achieved through many ways, per example it can appear with a company that has a really powerful distribution network that will merge with a company that has some products with huge potential but lack of ability to present them to the market and reduce time of response from the competitors (Destri, Minà, and Picone, 2012). Naturally these are all positive points, however it can be hard to achieve in some occasions due to the challenge that it is to put those ideas in valuation models, so that way it is possible to make a good estimate of the cost that will be related to the synergy itself but the potential revenues can be discussed but it is hard to make a perfect prediction and to quantify them and that is the reason why some deals do not show anticipated results (Gaughan, 2005). Most of the times in order to make a synergy the managers that are making the plan are actually focusing on cost reducing synergies that can show up through an economy of scale which would result in a boost on the size of the company operations. This often times will originate a rise in per unit costs and some problems with managing properly a big operation, therefore it can flip the situation around, making it a diseconomy of scale (Sudarsanam, 2003).

An important segment in synergies would be the relationship between acquisition premiums that was discussed previously and the synergies itself. The premium is the overabundance between the market value of the company and what the bidders offer to the shareholders of the target firm in exchange to the control of the firm and naturally its profits as well and curious enough the bidders many times note anticipated synergy and that is the reason why they are paying the premium (Ravenscraft, and Scherer, 1989). It does not always work out and the markets in that cases are putting enormous pressure under the reason why the synergy took place, particularly if the premium was high.

Nonetheless, this like every other business process requires gains, in this case particularly, gains to the bidders so it can offset the premium, and ultimately it reflects on synergy gains that need to be above the premium payment (Jensen, and Ruback, 1983). According to Sudarsanam (2003) the tricky part on this equation is time, as usually the premium is paid upfront, however he gains appear over time, and the longer it takes to collect the gains the lower the present value will be. The discount is also a key factor. When the discount rate is big, it translates that the bidders are not expecting to recover the gains in the short run, meaning that there will be a significant amount of time before they collect the gains, so it will be more challenging to justify a big premium and the pressure will be huge to reach high levels of growth. The ideal situation would be the achievement of revenue enrichment plus a decline in the expenses.

If the synergy is successful it will bring many upsides to the firm like economies of scale, enhanced industry visibility, the market reach will be improved and new talent and technology can be acquired (Schleifer, and Vishny, 1988). With a well-established synergy the company will be bigger, thus it will increase their power and win momentum against the competitors with their purchasing power and ability to find the best suppliers. If the synergy happens with companies of distinguished markets it will combine two markets, meaning a larger economy of scale and the company will have the chance to take advantage of the purchase opportunities as well as the revenues because of the increase of the distribution chains and expansion of supply (Sudarsanam, 2003). With a bigger market reach, the company will have a better reputation and naturally a better position in the industry as the markets are witnessing its growth, which will lead to more business opportunities as most impartial investors are seeing that company as a way to make money (Schleifer, and Vishny, 1988).

1.10 Diversification

Diversification was previously discussed as one of the major reasons of why companies choose to do a merge or acquisition and the goal is to grow beyond the firm`s current industry (Ravenscraft, and Scherer, 1989). Moeller, Schlingemann and Stulz (2004) defend that there are many reasons for corporate managers to choose this path. There might be other industries that are currently more profitable than the one they are currently doing business on. It can also be that the leader company on a certain industry has reached the maturity stage and even that the levels of competitiveness have increased so much that there is the possibility to increase prices on such an abnormal level that makes it easy to win more money. Nonetheless there is uncertainty in the market therefore industries that have better profit opportunities might only have them temporarily so there is a chance that the firm will stop having profit in the future, thus it does not give assurance that the profits will last long (Baldwin, 1995). The rates of return tend to move towards a similar amount across industries through rival pressures, however it does not mean that the rates are equal in every industry at any time. Reason that being is that the forces of competition are exceeded by other elements such as industrial development that will have a singular effect on each industry, therefore the rates of return will necessarily be different (Ravenscraft, and Scherer, 1989). The industries that have rates of return above average that are putting no barriers in the entrance are going to face decay in their rates, turning them into an industry that is not attractive as it once was. The industries that have the most barriers in the entrance are the ones that in the long term will keep generating good returns, but this means that the phenomenon of diversification into profitable returns is not going to be successful in the long term (Gaughan, 2005). Both Andrade and Stafford (2004) are keen to the idea that the company that is looking to diversify is going to have a hard time to enter those profitable industries because of the barriers that they impose at the entrance and they might only be able to enter in industries with lower barriers that subsequently have lower rate of returns. If it happens, they will be forced to compete against other rivals that entered the new industry because it does not possess many barriers and they were attracted by the above average returns, however as discussed, they are only temporary, and the big number of returns will make the rates drop and the diversification strategy will ultimately fail.

According to Gaughan (2005) one benefit that can arise from diversification is what is called the coinsurance effect, and the idea is that a company with imperfectly correlated earnings joins and derive a combined earnings stream that will be much less volatile than both firms individual earnings stream. In case that the covariance between the earnings of two firms that are possibly merging is negative, then there is a chance to have benefits by combining both firms. The real question that the merger partners have to answer is if those benefits can actually contribute to the shareholders wealth in a way that they could not get to that stage if they were doing it by themselves. An interesting fact about conglomerations which is basically when two companies with totally unrelated business merge together is that the returns for the stockholders are greater in conglomerate acquisitions than on acquisitions with companies with the same business activities (Clark, and Elger, 1980). These gains were reported by the seller and buyer firms, but with more gains to the stockholders from the seller company. However, diversification and conglomeration are different concepts, being that said, it is accurate to say that it is plausible to diversify into entries that are connected with the buyer's activity business. There is also a better chance of economies of scale in related diversifications due to the fact that the buyer could be better prepared to increase their present assets if they operate close to their business activities (Pauser, Rottke, and Schiereck, 2007). Morck, Shleifer and Vishny (1990) performed a study and they found out that the shareholders were better off in related acquisitions rather than unrelated ones. They studied over 300 acquisitions between the seventies and the eighties and they have concluded that related acquisitions are in fact the best option for shareholders, whereas unrelated diversification showed bad results.

The most important thing to retain in diversification through M&As is that in order to create value it takes time and naturally not every acquisition will be successful in a way that not all of them will originate big revenues and great profits. In reality many of them never live to their true acquisition value potential. Some firms will never have ability to push a product very far and others may experience limited resources from the parent company (Pauser, Rottke, and Schiereck, 2007). According to Investopedia there are many investors who believe that unrelated acquisitions are the perfect way to reduce risk, that is, two companies with unrelated business and different revenue streams have different problems to face. The big issue is that the parent firm has a key aspect in decorating the investor belief around secondary symbols.

1.11 Valuation methods

A valuation is essentially the price that one side is paying to the other to make the acquisition or merge work. It is a combination of cash flows and time value, in a way that a business is valued in the function of the revenues and how much cash flows they generate and time itself plays a huge factor. It has to be evaluated what should be the interest rate to discount the firm`s cash flows (Gaughan, 2005). Naturally everyone is looking for the best deal possible, so the acquirer company will try to negotiate to the lowest price possible, while the target company will do its best to value their company to the highest price possible. There are several methods of evaluation that are covered in most scientifical articles and books; however, the market multiples approach and the discounted cash flows are the ones that stand out the most (Giddy, 2001).

The market multiples approach is very common among CFOs and the discounted cash flows (DFC) is the most common way to evaluate a public and even private firms (Aydin, 2017). This last one is the most used method to evaluate an investment and it works historically just as good as the multiples approach (Giddy, 2001). Evans and Mellen (2015) believe that the DFC method is reflecting the highest price to an acquisition. If the comparable approach is used instead, there can be used many ratios to reach a value to the target firm that are normally based on current very much alike business dealing. Corporate managers when they use comparable, they mostly use the enterprise value to sales ratio (EV/Sales) or price earnings ratio (P/E). With the first one, the buyer firm makes an offer as a multiple of the revenues, when at the same time they are watching the price to sales ratio of other firms on the industry and in the P/E ratio the offer is related to the earnings of the target firm, while looking at the P/E for the stocks of the same industry to get an idea of the P/E multiple that the company should have. Normally the managers rely on net present value and internal rate of return regarding the methods of investment decision process (Evans, and Mellen, 2015).

The DFC approach need a good estimate of the forthcoming cash flows and a suitable discount rate. The examination and determination are delicate to financial projections and cost of capital, so over half of the companies carry out a sensitivity analysis to take in consideration the effect of adjustments on these variables (Evans, and Mellen, 2015). When the managers have the conclusion of the analysis, they'll make the investment decision.

In order to value the firm, the company first needs to find the most applicable cost of equity, and even though there are some ways to reach a value, the CAPM (capital asset pricing model) approach is the preferred one among firms. The equation is as it follows: $RE = RF + \beta E\ (RM - RF)$ (Aydin, 2017). In the equation RF refers to the risk-free rate, βE represents the leveraged beta, while the market risk premium concerns to the last part of the equation ((RM- RF)). Even though this is defined between communities as the most reliable method to calculate the cost of equity, the methods to reach the variables can change. Robert F., M. Eads, S. Harris, & C. Higgins (1998) established some ideas in order to choose the most accurate values to the variables of the equation above. Regarding the leveraged beta, they should be composed by written sources, through a wide period of equity returns. For the market risk premium, the value does not have much variation and most companies use a value between five point five or six percent. Finally, the risk-free rate is supposed to have a long-term maturity of over a decade.

Now looking at the cost of debt, there are certain ways to get the value for traded firms. For the companies that possess traded bonds, the long-term yield to maturity should be applied as the pre-tax cost of debt. Another useful way it to essentially add a spread to the risk-free rate that is going to vary with the rating of the company that is provided by rating agencies (Thomas, and Mazzariol, 2016).

Another variant in the DFC model is the cost of capital, and in order to avoid a final overvalue over the seller company, the cost of equity should only be used as a discount rate when it is being used free cash flows to equity and not to the firm (Thomas, and Mazzariol, 2016). An interesting fact is that most companies use their own cost of capital as a discount rate when using the DFC method and only very few choose to uses the seller company's one. Over the last years an alternative came to face the WACC as the discount rate, the APV (adjusted present value). The APV model gives a more precise assessment of financial side effects such as bankruptcy costs and it assumes a level of debt that is determined in the beginning and never reviewed again, while WACC on the other hand has a constant adjustment (Luehrman, 1997). The WACC according to Evans, and Mellen (2015) is the most common discount rate that companies are using in DCF model. This discount rate should naturally only be applied in investments of similar risks, but a big majority of firms do not end up adjusting the WACC according to investments of different nature. What they end up doing is that they instead of performing changes in the discount rate, they adjust the multiples and cash flows. The same discount rate can and only must be used when the risk is similar.

As an important not regarding APV it is important to state its limitations. One of them, is that when looking at the interest tax shield, there can be an overestimation in the advantages of debt when income from stocks is different from bonds. Another one, is related to the idea that with high levels of debt, the cost associated with bankruptcy might be bigger than the tax benefit of debt (Luehrman, 1997).

2. Case study

2.1 Solvay SA

Solvay is a Belgian company that was founded in 1863 and originally the main scope was to create sodium carbonate. The company had two main business activities back then plastics and chemicals. It has always been a big player in that industry and it was even the largest multinational firm in the world in the early 1900s.

Accordingly, to Solvay website, this corporation has been active in numerous markets over the last 20 years and they are now a company specialized in chemicals and advanced materials that have a wide portfolio of products in several markets around the world, being present in more than 60 countries with almost 30,000 employees and with the headquarters in Brussels. The main goal of Solvay nowadays is to be able to provide a world class level of chemistry that can support the needs of future generations and to improve efficiency of natural resources. As previously said, this firm focus a lot on diversification and they are constantly trying to adapt their products to the new circumstances of the market and trying to explore new paths that are innovative and potentially sustainable. On this case study there will be more focus on the business activities of Solvay in the past decade and a more detailed financial analysis from the year of 2013 to the year of 2018.

Solvay is well known for being a top-notch chemical company, and they consistently present to their costumers' high value and sustainable products with low levels of energy consuming and minor carbon dioxide emissions. They are serving a large variety of markets such as aerospace, automotive, consumer goods, energy, electronics, construction, health, oil extraction and industrial applications. As of 2014 Solvay was able to originate net sales close to €12 billion, where €10 billion of those came from business activities in which Solvay is one of the biggest players. This is a firm that is particularly active and worried about the impact of manufacturing their products to the environment so they are always looking for sustainable solutions that enhance cleaner transportation of materials, optimization of resources and better ways to improve the use of chemicals to the air and water quality. In the last decade, their website states that they were under some billionaire deals, and they decided to sell their entire division of pharmaceuticals to Abbott Labs at a record value of 4.5 billion Euros in 2009. The company allegedly found that this was an extremely uncertain market, therefore they decided to suspend their activities and sell their entire share in order to invest in other activities that were more in agreement to their business plan, so with no surprise they invested 3.4 billion euros on the acquisition of their main rival Rhodia, a big chemical company, in 2011 in order to eliminate their biggest competitor and to take advantage of their entire costumer and manufactory contacts as well as their entire business knowledge. Ever since the beginning of 2012 Solvay was admitted to NYSE Euronext in Paris and entered the CAC 40 index later that year. After this big acquisition, the board members of Solvay have organized the company in main segments in order to carry the firm closer to the customer needs and to take advantage of the growth opportunities that show up, being advanced materials and specialty chemicals the most important ones.

On the last month of 2015, the acquisition of Cytec industries Inc. took place, by a share issue sent to the shareholders, and it consisted on the issue of 4.7€ billion senior and hybrid bonds and the ongoing 1.5€ billion right issue and it was consolidated within the Solvay group from the 1st day of 2016.

Looking at the year of 2013, based on their annual report, it is stated that it was a year with massive transformations with a portfolio with significant movements that had direct reflects on the accounts of the company. The first big one was the acquisition of US Chemlogics for 1,345$ million, financed with cash that exposed greatly Solvay to the oil and gas market in America, providing important chemical solutions to this segment and the CEO was optimistic regarding synergies. The other major movement in the portfolio was the chlorovinyl situation, in which Solvay signed a deal to sell their stake in Indupa to Braskem. In Europe the company by end of the year was negotiating to complete a joint venture with Ineos, trying to get the approval from the commission of the EU, with Solvay and Ineos really working for the deal to take place.

The main goal of Solvay was achieved that year and it was a proportional global expansion, where the business was mostly divided in equal shares in Europe, Asia and the American continent by the end of the year. The CEO was also pleased that they were able to reduce the energy consumption levels by 10% compared to the previous year. By 2013 Solvay was organized into five operating segments: advanced formulations, advanced materials, performance chemicals, functional polymers and corporate and business activities.

Figure 1: Net sales by segment of Solvay group in 2012 and 2013 including the net income

	Q4 2013	Q4 2012	FY 2013	FY 2012
Net sales by Segment				
Advanced Formulations	644	646	2,432	2,565
Advanced Materials	603	626	2,551	2,743
Performance Chemicals	784	798	3,125	3,162
Functional Polymers	384	427	1,763	1,888
Corporate and Business Services	2	45	67	157
Total Net sales	**2,417**	**2,541**	**9,938**	**10,515**
REBITDA by Segment				
Advanced Formulations	87	103	369	518
Advanced Materials	160	136	646	627
Performance Chemicals	186	179	724	750
Functional Polymers	14	(1)	93	100
Corporate and Business Services	(64)	(10)	(169)	(99)
Total REBITDA	**384**	**407**	**1,663**	**1,896**
PPA depreciation	(29)	(32)	(148)	(132)
Recurring depreciation	(164)	(157)	(603)	(593)
Adjustments of Chemlogics inventories at FV (PPA)	(14)	0	(14)	0
Adjustments inventory step(up PPA Rhodia	0	0	0	(45)
Adjustments RusVinyl (pre operational stage)	(6)	0	(11)	0
REBIT	**171**	**218**	**886**	**1,127**
Non recurring items	(68)	92	(239)	55
EBIT by segment				
Advanced Formulations	15	72	196	388
Advanced Materials	108	76	424	388
Performance Chemicals	126	274	440	663
Functional Polymers	(44)	(30)	(57)	83
Corporate and Business Services	(104)	(80)	(356	(339)
Total EBIT	**102**	**310**	**647**	**1,181**
Net financial expenses	(18)	(86)	(210)	(360)
Result before taxes	**84**	**224**	**437**	**820**
Income taxes	(74)	(66)	(187)	(241)
Result from continuing operations	**10**	**159**	**249**	**579**
Result from discontinued operations	1	(4)	65	2
Net income	**11**	**155**	**315**	**580**

Source: (Solvay website: https://www.solvay.com/en/investors/financial-reporting)

In the figure above it is easy to compare the main results that were obtained in 2013 and 2012. What caught the attention of most people was naturally the decrease in net sales by 5%, registering a value of €9.9 billion that was justified due to volume pricing due to the inflation (2%) in a raw material situation, 3% because of the Forex effect, mostly in the American dollar and Brazilian Real and lastly to scope effect (<1%). Solvay also released the information that the net sales were down in advanced formulations by 5%, 7% in both advanced materials and functional polymers and just one percent in chemicals. REBITDA suffered a decrease of 12% as well. The pricing power was maintained in a deflationary raw material with the decrease of selling prices by 202 million more than offset by accumulations in raw material of 205 million. Looking at the operating division, the assessment of the financial value ability of advanced materials was rewarded for a big limit pressure at advanced formulations, in which Novacare activities unit took damage from the collision in the guar descendant trade. Nonetheless some important actions were taken to assist the mitigation of the inflation in the cost base.

Figure 2: Free cash flow of Solvay group in 2012 and 2013

MEUR	Q4		FY	
	2013	2012	2013	2012
Net income	11	155	315	580
Depreciation, amortization and impairments (-)	298	178	929	794
Equity earnings (-)	(26)	(25)	(93)	(184)
Net financial charges and income / loss from available-for-sale investments (-)	30	239	245	401
Income tax (-)	86	94	232	295
Changes in working capital	164	220	54	54
Changes in provisions	(0)	(245)	(245)	(310)
Dividends received from associates and joint ventures accounted for using equity method	37	5	83	53
Income taxes paid	(45)	(70)	(262)	(179)
Others	(36)	(43)	20	(47)
Cash flow from operating activities	**518**	**508**	**1,278**	**1,457**
Acquisition (-) of subsidiaries	(881)	(2)	(878)	(2)
Acquisition (-) of investments - Other	(58)	(15)	(121)	(39)
Loans to associates and non consolidated subsidiaries	(20)		(23)	
Sale (+) of subsidiaries and investments	50	12	44	191
Acquisition (-) of tangible and intangible assets	(298)	(285)	(810)	(785)
Sale (+) of tangible and intangible assets	8	34	33	109
Income from available-for-sale investments	2	(0)	4	1
Changes in non-current financial assets	16	(7)	18	4
Cash flow from investing activities	**(1,181)**	**(261)**	**(1,732)**	**(520)**
Proceeds from bond issuance classified as equity	1,191	0	1,191	0
Capital increase (+) / redemption (-)	(0)	0	(0)	(28)
Acquisition (-) / sale (+) of treasury shares	6	31	(1)	142
Changes in borrowings	(146)	(141)	(120)	(379)
Changes in other current financial assets	381	230	205	(294)
Net cash out related to cost of borrowings and interest on lendings and term deposits	(25)	(36)	(198)	(176)
Other	6	(5)	(61)	(67)
Dividends paid	(31)	(7)	(343)	(278)
Cash flow from financing activities	**1,382**	**73**	**672**	**(1,081)**
Net change in cash and cash equivalents	**719**	**320**	**218**	**(144)**
Currency translation differences	0	(13)	(53)	(22)
Opening cash balance	1,224	1,470	1,778	1,943
Ending cash balance	1,943	1,778	1,943	1,778
FREE CASH FLOW				
From continuing operations	234	217	290	679
From discontinued operations	13	34	235	108
Total free cash flow	**246**	**251**	**524**	**787**

Source: (Solvay website: https://www.solvay.com/en/investors/financial-reporting)

As a final note it is important to notice that the cash flows that are derived from operating activities decreased in €179 m. Apart from the net income of slightly over €300 m it resides on depreciation, amortization and impairments worth €929m and adjustments in the Working Capital as well with an approximate value of €54m. The cash flow from investing activities is extremely high as it includes the Chemlogics acquisition and capital expenditures.

As far as the results of 2014 the CEO was very pleased with the final accounts showing an increase in net sales of 5%, closing the year with €10.2 billion and an increase of 11% on the REBITDA to €1783 m. Naturally this improvements were reflected on a powerful free cash flow that was established at €656 m that will support future growth. Once again, 2014 was a year with major transformations, with the past acquisition of Rhodia having only after two years strong integration in the group. In 2014 the firm used portfolio upgrade, innovation and smart and sustainable initiatives to get the best outcome in this transformation era. Solvay in 2014 had some surgical movements in disinvestments with the sale of Eco Service in perfect condition, where according to the CEO they were able to "take the market at the right time". Some small businesses have been made as well, with the refrigerant activity, where a special chemical was sold resulting in isolation from the market. Solvay also reported in the final report that they were close to seal the deal with Inovin in which was a very exhausting and long process, only waiting from the approval of the EU commission.

Solvay also reported their success with the acquisition of Chemlogics that was finalized in 2014, showing approximately 30% growth, even though there were some minor changes in the market. The firm encouraged with all the successes they had decided to acquire another two businesses, with the acquisition of Rython for €198 million in the US to improve the segment on the automotive market and provide better materials which is aligned with what specialty polymers has to offer and Flux in Germany for a stronger position on aluminum brazing solutions. All operating segments generated profit, with growth engines making a big statement on those results making 58% of global REBITDA. Looking at all regions, similar to last year there is a proportional distribution again between continents, however Brazil showed close to zero growth and was the biggest challenge by the end of 2014. An important fact of 2014 the automotive market was the one with the most growth, mostly due to the focus that Solvay is inputting to technologies that are the base of the industry growth. The company is really focused on the polymers to replace metals and reduce weight of the car. This market represents 18% of the Solvay's sales and it is increasing more each year. As a last note, the electronic market, especially smartphone had a major growth in 2014 with innovative solutions.

Figure 3: Net sales by segment of Solvay group in 2013 and 2014 including the net income

(in € m)	Q4 2014	Q4 2013	FY 2014	FY 2013
Net sales	**2,574**	**2,364**	**10,213**	**9,715**
Advanced Formulations	731	644	2,854	2,432
Advanced Materials	721	603	2,762	2,551
Performance Chemicals	759	731	2,944	2,902
Functional Polymers	363	384	1,654	1,763
Corporate & Business Services	-	2	-	67
REBITDA	**414**	**375**	**1,783**	**1,611**
Advanced Formulations	109	82	426	347
Advanced Materials	172	155	709	624
Performance Chemicals	190	179	724	682
Functional Polymers	15	13	111	89
Corporate & Business Services	(72)	(54)	(188)	(131)
IFRS depreciation & amortization (recurring) excluding Rhodia PPA	(168)	(167)	(641)	(614)
Adjustments of Chemlogics inventories at Fair Value (PPA) & holdback payments	(2)	(14)	(11)	(14)
Equity Earnings Rusvinyl (financing charges)	(58)	(6)	(65)	(11)
Other elements	5	-	5	-
Amortization of Rhodia PPA on fixed assets	(27)	(27)	(110)	(142)
Non recurring items (-)	(202)	(68)	(308)	(239)
EBIT	**(39)**	**93**	**652**	**591**
Net financial charges	(68)	(20)	(309)	(213)
Result before taxes	**(108)**	**73**	**343**	**378**
Income taxes	64	(71)	(84)	(170)
Result from continuing operations	**(43)**	**2**	**259**	**209**
Result from discontinued operations	183	8	(246)	106
Net income	**140**	**10**	**13**	**315**

Source: (Solvay website: https://www.solvay.com/en/investors/financial-reporting)

2.2 Cytec Industries INC

According to Cytec website, Cytec Industries was formed in 1993 and is currently based in New Jersey, USA and they are an outcome of the spinoff from American Cyanamid Company. It is a company that invests a lot in innovative and creative products with the goal of offering a wide range of new effective assets that can benefit the costumers and the way they operate in their business. They are a specialty chemical and highly technological company that operates with advanced materials and their main revenues come directly from their production of plastics and advanced materials mainly for the aerospace industry, reason why Solvay is now very present and strong in that market. They also operate in the automotive, electronics and structural adhesives. Cytec markets its own goods created through agents, distributers and sales power. They are present in four different continents, America, Europe, Asia and Oceania with approximately 3600 workers. Solvay started to planning the acquisition of Cytec in early 2015 due to their potential and the deal was only finalized later that year in December with a cost of €4,7 billion senior and hybrid bonds as well as €1.5 billion in right issue. From that date onwards, Cytec Industries Inc is operating as a subsidiary of Solvay.

The firm operates as previously stated in chemicals and advanced materials and their goal is to provide and manufacture top quality products that will add value to the industries that they are working with, especially the aerospace, mining and plastic industry as well as industrial materials. Just like Solvay did before and after the acquisition of Cytec, this company operates in segments and they are now working under four specific segments that boosts the revenues of the company: Engineering materials, aerospace market, additive technologies and process separation. The first referred segment provides to the costumers structured materials that enhance the quality of their business, they process materials like vacuum bagging and adhesive tapes. The main one, aerospace materials, has the mission to offer high quality adhesives films, resin infusion systems and carbon fibers. As far as the advanced chemicals, it is included in the process separation segment that is manufacturing and selling chemical assets, that includes among many products, flocculants, biocides, dispersants and depressants. The remaining segment is responsible for providing polymer additives, such as antioxidants, ultraviolet light absorbers and stabilizers and specialty additives.

This case study will focus more on the company's milestones and financial results from the year 2013 until two years after the acquisition, in order to have a better understanding on the value that this acquisition brought to Solvay SA.

Going back to the year of 2013 Cytec, much like Solvay, was a company that invested a lot on portfolio transformation in order to expand their own business. As they presented in their annual reports, in the beginning of 2013 they successfully sold Coating Resigns activities for slightly over $1.1 billion making this the biggest portfolio transformation of the year. The goal was to have a more detailed focus on their main segment business activities like advanced materials and innovative technologies that could provide constant growth over the following years. With the sale, it gave Cytec a much higher freedom that helped them to restate a $400 million five-year agreement to mid-2018 that improved significantly their financial liquidity and provided them less volatility for the earnings, making them more stable which ultimately resulted in a company with better financial results.

Figure 4: Financial highlights, including the net sales of Cytec group in 2011, 2012 and 2013

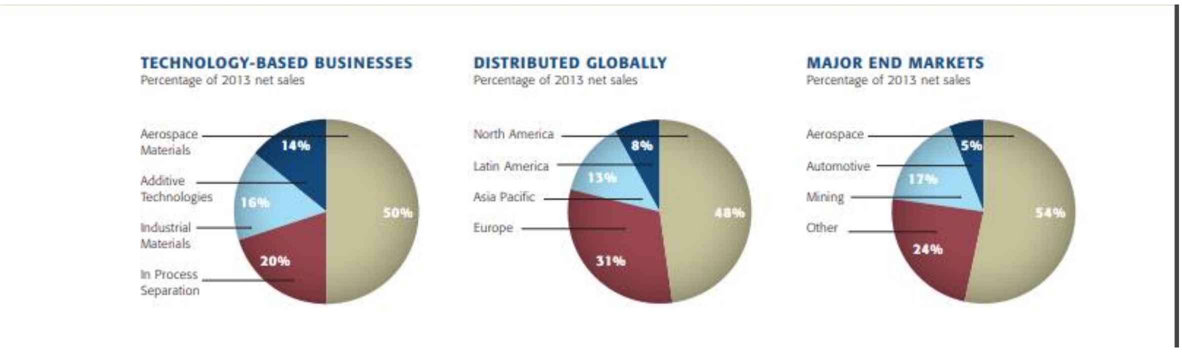
FINANCIAL HIGHLIGHTS

Years ended December 31, (Dollars in millions, except per share amounts)	**2013**	2012	2011
OPERATING RESULTS			
Net Sales	**$1,935.0**	$1,708.1	$1,415.9
Earnings from operations (a)	**$ 293.1**	$ 242.1	$ 167.0
Net earnings from continuing operations (b)	**$ 192.9**	$ 161.5	$ 97.9
PER SHARE DATA			
Diluted continuing earnings per common share (c)	**$ 4.80**	$ 3.45	$ 2.00
Stockholders' equity based on outstanding common shares (d)	**$33.29**	$40.00	$37.21
OTHER DATA			
Capital additions for the year—continuing operations	**$ 300.0**	$ 145.3	$ 78.9
Total assets	**$2,680.5**	$3,924.2	$3,543.5
Total Cytec Industries Inc. stockholders' equity	**$1,181.9**	$ 1,797.7	$1,693.4

Source: (Cytec annual reports website: http://www.annualreports.com/Company/cytec-industries-inc)

The financial growth was noticed in every segment, as Cytec always pursue a path of developing unique technology so they can provide their customers effective and singular products to answer the challenges that they face with great ease. These measures took Cytec once more to the to the leadership of their market, with a great chain supply. As a reflex of this movements from Cytec, they achieved a growth of 13% on operation revenues against 2012, being the aerospace market the segment with most growth along with industrial materials.

Figure 5: Distribution of net sales of Cytec group by segment in 2013



Source: (Cytec annual reports website: http://www.annualreports.com/Company/cytec-industries-inc)

Aerospace materials was the segment that provided the most revenues with a total of 50%, and looking at the tables above we can see that most of the business gains comes from material technology platforms. The revenues increased mostly due to a bigger demand in the transport division. Cytec worked intensively with Boeing in their aircraft model 787, that had a higher built rate and Cytec was the top supplier for LEAP high-bypass turbofan engine. As environment problems are arising more each year in the automotive market, Cytec in 2013 was working with automotive OEM industry trying to produce advanced materials that can decrease the weight of a vehicle, to reduce CO2 emissions and take most advantage of the fuel tank. The other percentage of the revenues came from specialty chemicals, especially the process separation segment, where the products developed by Cytec are developing and recovering targeted metals and minerals. They use the newest technology and by doing so, they are lowering the production costs and more efficiency. The demand in 2013 for metals and more exactly copper was high and was expected to continue, which is good for Cytec as it is aligned with their pretensions. Lastly additive technologies consist of polymer merchandise that can give more stability to the plastic industry and additive products that enhance the adhesive display.

With the sale of Coating Resigns Cytec was able to buy again 10.2 million shares of their stock with a cost of three quarters of a million American dollars, which enhanced the value of their shareholders. The board members also decided to make a shift in the operational structure and upgrading their reportable segments so they could show in more detail the results of each segment to outside investors. As an important highlight the CFO mentioned that Cytec contributed almost $72 million to their own global pension funds, making its fair value $941.3 million by the end of the year. He also stated that the board members have decided to make some changes in the accounting for after retirement advantages, so it provides a better tool to evaluate Cytec`s operating achievements by considering actuarial wins and costs in the operating results of the year in which they happened.

Like in other big company thinking long term is key, therefore Cytec kept a path of investing thinking about long term growth. They invested $300 million in that year in investments directly connected to aerospace materials and process separation since its their most rentable activities. As far as cash flows, the final result of the year was $153 million.

In 2014 Cytec was once again able to keep the constant growth they had been achieving in past years. The CFO presented in the annual report the mission for 2014 that they had proposed early that year and it was to focus more on long term growth especially on the markets of process separation and advanced materials as these are the markets that have the most potential. With no surprise Cytec achieved their main goal and their revenues coming from their business operations increased by 4% mainly from the aerospace and industrial management segment. Their main objective regarding long term was very well enhanced with capital expansions in Canada with a brand new manufacturing train, that increased the capacity of phosphine specialties products by twice the size as before and modern carbon fiber line in one of the American plants to increase the capacity of products that are directly used in the most lucrative segment, the aerospace market.

Looking at the different segments, the aerospace was once more the most rentable business, with 50% of their entire revenues coming from that market, which is curious considering that when Cytec was created, they were a specialty chemical company. Comparing to 2013 it increased 4%, due to the great demand on the commercial transport, more exactly on Boeing`s aircraft model 787 in which Cytec actively works with. The company was able to make the planes more efficient, increased passengers in the commercial traffic and kept a sustained growth in the market. Even though there was growth the CFO stated that the growth could have been much higher, but there was an offset in rotorcraft. In the financial report of the year, the CFO was also extremely optimistic about the future and had great plans for this segment, hoping to witness a big increase in both commercial and military traffic. With all the changes expected to happen with Boeing, Cytec was expecting to increase their revenues in 10% in the years to come. The industrial materials segment is also under a lot of development especially driven with the carbon filter materials that was adopted for the automotive industry to enhanced the sales force of Cytec. With that product it makes the vehicles much lighter and more efficient and naturally reducing toxic streaming to the air. Cytec joined the German firm Dralon GmbH in the middle of the year to enlarge the production of industrial grade carbon fiber as it was in great demand. With all these changes, the tendency is to reach even higher amounts of cash flow, as of 2014 the results increased 12% and 62% if we look at the performing income of the year.

Cytec also had a really strong year when it comes to specialty chemicals, with one third of the company's revenues coming from this industry. This industry has two different segments attached to it, additive technologies and in process separation. The last referred segment had an increase of 7% in their revenues and 11% in operating earnings as a result of the continuous demand in the metal sector, especially in cooper. Additive technologies are composed in polymer additive goods that support light balance resolutions for the plastic sector. This was a segment that was in particular difficulties in that year due to economic issues, nonetheless Cytec always provided the most differentiated products. This segment also generated a really solid cash flow and good returns on invested capital.

As an important regard, in August of 2014, Cytec rewarded Daniel Darazsdi as the new CFO of the group, hoping that his successful background in being a leader of the most various teams in many financial subjects, such as accounting, treasury, international management among others would bring new ideas and behaviors that would enhance continuous improvement and automatization, therefore improving the financial quality of the company. He was no stranger to the company and right off the bat he was able to contribute massively to some successes in the year 2014, which were able to add immense value to the shareholders. That fact made them very pleased with his decisions. One important measure he took to make it possible was the two for one stock split, which permitted the valorization of the dividends, the approval of the board members in a $200 million share repurchase of the firm common stock.

As the interest rates were lower than usual, Cytec took the liberty to refinance the 2015 and 2017 debt maturities in order to save as much money as possible.

As always, Cytec kept in their mindset the use of cash to maintain the capital needed to keep growing the business and reach their goals, and therefore increased the market value in all Cytec's segments. The acquisition market was always attractive to Cytec, especially in 2014 where all possibilities are considered if they increase value to the firm, which will happen a year later when Cytec was acquired by Solvay. As already stated, the happiness of the shareholders is critical, and a good way to please them is also to reward them with generous dividends coming from sustainable cash flow, and obviously buying again shares from excess free cash flow.

2.3 Acquisition

One of the biggest values that Solvay always had is continuous improvement and taking chances on new markets whenever possible and profitable, therefore the company has always been involved in merger and acquisitions with different firms to expand their own business and explore new segments. According to Solvay website in December of 2015 Solvay did the biggest acquisition to the date when they acquired Cytec industries Inc. for $5.5 billion in order for them to win serious market opportunities in advanced materials for the aerospace and automotive market as well as strengthen the specialty chemicals segment. Solvay's CEO was extremely happy with this transaction and stated that with this acquisition Solvay was now the leader in the advanced materials for the aerospace retail. Due to the size of this business, there was months of planning before the acquisition took place, and it was established that Solvay would create two global business units for a better integration. One of the units is composed with the aerospace material and industrial material businesses coming directly from Cytec, entering the advanced materials segment within Solvay and the other unit is related to polymers additives, process separation and formulated resins of Cytec that is now integrated in phosphorus-based intermediates from Solvay and it will become part of the advanced formulations segment.

The values of this operation are high due to the size of each company in their own environment, the total amount was \$5.5 billion with an enterprise value of \$6,4 billion for the total amount of the share capital. Solvay paid \$75.25 per share which represents a premium of 28.9% when compared to the \$58.39 that was the closing price on the markets. This was not a hostile takeover as both of the company's board members have agreed that this was the best path to take. Cytec is company that generated around \$2 billion in sales in 2014 and most of their business came directly from the US. They also are among the world leaders in advanced materials and mining chemicals and most of their sales comes directly under the aerospace market that thorough the last 20 years has been in constant growth. With this acquisition Solvay expected to win great feedback and report in the aerospace market and at the same time help Cytec in the automotive market since Solvay has a really strong position in that market and great relationship with the top suppliers.

This acquisition was expected to enhance Solvay's sustainability as Cytec is also a firm with great concerns over the environment, therefore with this merge, Solvay will reduce the emissions of CO_2 with the light weighting products they will produce as well as cleaner solutions in the mining industry. With this acquisition, Solvay was expected to make annual synergies of more than €100 million and having greater growth, margin expansion and top-notch opportunities in the aerospace and automotive market. Since this was a pricey operation, Solvay got some financing with €1.5 billion in rights issue and another billion euros of hybrid instruments and a senior debt issuance. With this financing strategy Solvay will boost their capital structure and recover some financial elasticity.

2.4 Valuation Process and DCF

2.4.1 Discounted cash flow

On this case study the method used to evaluate if the acquisition added value to Solvay is the Discounted cash flow (DCF). This method basically evaluates the financial value of a given investment based in future cash flows that will originate the present value using a discount rate, which in this case will be the cost of capital. With the present value, then it can be used to evaluate an investment. If the DCF has a higher amount than the cost of the operation, then the acquisition added value and vice versa. The main goal of this model is to make a correct prediction about the cash that an investor can obtain from an operation, with the time value of the money in consideration as it considers that the money is worth more today than it will be worth in the future (Gaughan, 2005).

Even though this is a solid model, it has its own flaws, especially when considering an investment as complex as the one in this case study, as it is very large and with many complications in between that makes the calculations of future cash flows quite challenging, nonetheless Solvay provides in their annual reports all the information required in all detail so it makes it very suitable to use the DFC method. DFC is especially helpful when it is necessary to evaluate projects in which the investor is able to forecast with confidence (Gaughan, 2005).

As mentioned before it is mandatory for this model a discount rate that will take in account the time value of the money as well as a return on the risk, and there are many ways to find one, however in this case the cost of capital of Solvay is by far the best fit in this case study. Since the calculations that were made to retrieve the DFC are from 2015 to 2018, the information was already released in the financial reports of Solvay, so it was relatively easy to make a good estimate about the cash flows, value of the investment and of all assets, being that the reason that this model is the best suit. If it wasn’t the case another model should be employed as this operation is very large and full of minor details.

2.4.2 Cost of capital

Accordingly, to Mellen (2015) the cost of capital is the required return to make a capital budgeting assignment. It is the balance between a firm cost of equity and cost of debt mixed together. It is mainly used as a way of investors to judge an investment to check if the return is worth the risk of investing money, plus it is also commonly used by board members of a firm to evaluate if a capital project is worth the consumption of possessions. As it is a mix of the weighted cost of equity and debt, the value will depend on how the business is financed. It is referred as cost of debt if the business is financed by debt and cost of equity if financed by equity, however most firm use a combination of both and to calculate the cost of capital is it necessary to have in account the weighted average cost of equity and debt, known as WACC (weighted average cost of capital).

The cost of capital is an important tool of evaluating an investment in a business. It can be even described as the opportunity cost of a certain investment, so the board members of a firm should only approve an investment in activities that can provide a return that is greater than the cost of capital so it can generate a good return to the investors. From an investor point of view is the return that is expected by the person who is giving the capital for an activity, so basically it is making a good estimation of the risk regarding the firm equity.

2.4.3 Capex

Capex is basically the capital expenditures, being those monetary amounts that will be used by the firm to acquire or keep physical assets, where those assets can be properties, important materials, buildings among others. It is used in many times to launch a brand-new assignment by the company. The costs related to Capex can be anything related to those assets, like purchasing a new manufacturing plant or upgrade the technology in a building (Aydin, 2017).

This financial expenditure is equally put in practice by firms who wish to upgrade the amplitude of their activities. Capex can also be an expense that a firm capitalizes that is shown on the balance sheet that the firm presents in the line of investments, instead of expenditure in the income statement.

The best way to reach its value is by looking at the capital expenditures in the cash flows on the investment line of the cash flow statement that the firm presents in the annual report. Since it is not always available, another way would be through both the balance sheet and income statement.

Summed up the Capex is extremely valuable in firms that have a big operation network, in order for them to expand technology, build new factory's and to upgrade equipment's and other important materials. The capital expenditure is the purchasing of services that are capitalized on the balance sheet and if a material has a useful life of more than one year it should be capitalized, if not it should be considered as an expense in the income statement.

2.4.4 Net Working Capital

The net working capital is in a general term the accumulated value of the current assets and liabilities. The final value is in most cases used to have a big picture on how efficient are the board members in choosing and using the assets of the firm as well as a way to evaluate the liquidity of a business. The general formula to achieve the net working capital would be the sum of both cash and cash equivalents with inventory, accounts receivable and marketable investments subtracted by the accounts payable.

If the final number is negative it is a bad indicator as it shows that the firm has not enough cash reserve to pay for the current liabilities, which can indicate that the company might be in jeopardy regarding a potential case of bankruptcy. On the other hand, if the value is positive it will indicate otherwise, and the company is able to pay for their liabilities with the funds available from current assets, nonetheless it is important to state that this value should be evaluated gradually over a certain period of time, as it can clearly indicate a steady decline or improvement so that measures can be taken in between (Giddy, 2001).

The author also defends that it can equally be a good indicator on how rapid can a firm grow because if they have a good amount in cash reserves, it makes it easier to scale up the business, whereas a short amount in the net working capital shows that the firm might not have the financial results to have a quick steady growth. Looking at the formula of the net working capital stated above it is a very good sign when the accounts receivable is greater than the accounts payable, meaning that the firm can pay to their suppliers after they extract the cash from the costumers first.

Even though this is a very good indicator, it can be hard to trust for some reasons. Per example it can contain an anomaly, if this value is calculated for a specific date, it can have an anomaly that doesn't show the trend of the evolution of the working capital, and it only takes a big account payable that is not yet paid to create a delusional small net working capital result. There are many ways to have a potential fake final result such as making the costumers pay for the products in a shorter amount of time, being more assertive when collecting large amounts of accounts receivable, though this last two might be more challenging depending on the size and power of the costumers. They can also return inventory that was not used back to the suppliers and extend the period before the accounts payable are paid, so as it is easily observed it is relatively easy to change the net working capital in ways that it can look better or worse than it actually is.

2.5 Calculations

In order to calculate if the acquisition of Cytec added value to Solvay, the DFC system is the best one to use as it is the model that adjusts the best considering all the financial parameters that Solvay provides to the public in their financial reports.

Since Cytec before being acquired had similar segments and activities as Solvay ones, it was considered that all segments of Solvay would have proportional effect with this acquisition, therefore all the calculations are based on that assumption, so it was considered the annual data of all segments summed up and not by each segment.

All the values presented above, both in figures as in text are in € millions.

Looking at the formula of DFC: FCFF=(EBITDA-DA)*(1-T)-VARIATION OF WC-NET CAPEX

All of the variables in the equation are available in the website where Solvay presents their results, therefore it is fairly easy to reach a value that can indicate if the acquisition is contributing to the growth of this chemical multinational. In their website Solvay presents the results of 2015 as the company alone without Cytec and from 2016 to 2018 they present it as Solvay plus Cytec, so it helped in the way of how this calculations were made, especially in the EBIT(1-T) for 2015 and for the rest of the years and then take the one from 2016, 2017 and 2018 and subtract to the 2015 as it was the financial results of Solvay stand alone.

Figure 6: Calculation of EBIT (1-T) for the DCF calculations

	A	B	C	D	E	F	G	H	I	J	K
1	FCFF=(EBITDA-DA)*(1-T)-VARIATION OF WC-NET CAPEX		(EBITDA-DA)=EBIT								
2											
3	2015-2018	1st year	2st year	3st year							
4	Group Solvay+Cytec	2016	2017	2018							
5	Solvay alone	-2015	-2015	-2015							
6	mm										
7		2015	2016			2015	2016	Variation			
8	Net Sales	10578	10884		EBIT	1398	1534				
9	Variation		306		Taxes (T)	32%	28%				
10	EBITDA	2125	2284			68%	72%				
11	Variation		159		EBIT(1-T)	951	1104	154			
12											

Parameters	2017	2018
EBIT	1527	1546
T	27,50%	26,10%
EBIT(1-T)	72,50%	73,90%
	1107	1142
Difference between 2015	156	192

Source: (Excel calculations)

These data were retrieved in Solvay's website where they dispose the EBIT for the year as well as the taxes making the calculations less complex.

For the variation of WC, looking at the balance sheet that Solvay presented annually:

Figure 7: Balance sheet of Solvay by the end of 2017 and 2018

Consolidated statement of financial position *(in € million)*	IFRS December 31, 2018	December 31, 2017
Intangible assets	2,861	2,940
Goodwill	5,173	5,042
Tangible assets	5,454	5,433
Equity instruments measured at fair value through other comprehensive income	51	44
Investments in associates & joint ventures	441	466
Other investments	41	47
Deferred tax assets	1,123	1,076
Loans & other assets	282	346
Non-current assets	**15,427**	**15,394**
Inventories	1,685	1,504
Trade receivables	1,434	1,462
Income tax receivables	97	100
Other financial instruments	101	89
Other receivables	719	627
Cash & cash equivalents	1,103	992
Assets held for sale	1,434	1,284
Current assets	**6,574**	**6,057**
Total assets	**22,000**	**21,451**

Share capital	1,588	1,588
Reserves	8,920	8,051
Non-controlling interests	117	113
Total equity	**10,624**	**9,752**
Provisions for employee benefits	2,672	2,816
Other provisions	883	793
Deferred tax liabilities	618	600
Financial debt	3,180	3,182
Other liabilities	121	180
Non-current liabilities	**7,474**	**7,571**
Other provisions	281	281
Financial debt	630	1,044
Trade payables	1,439	1,330
Income tax payables	114	129
Dividends payable	154	147
Other liabilities	850	848
Liabilities associated with assets held for sale	435	349
Current liabilities	**3,902**	**4,128**
Total equity & liabilities	**22,000**	**21,451**

Source: (Solvay website: https://www.solvay.com/en/investors/financial-reporting)

The best way to calculate a variation of working capital close to reality was to sum up the inventories with trade receivables and subtract that value with trade payables, and leaving other parameters out. The reason for this assumption is because other financial points in the balance sheet are not the most appropriate to use considering that those did not had much impact with the Cytec's acquisition.

Figure 8: Calculation of difference of Working Capital between the years of 2015 and 2018 for the DFC calculations

WC	2016	2015
Inventories	1672	1879
Trade receivables	1621	1833
Trade payables	-1547	-1522
Sum	1746	2190
Difference	-444	

Parameters	2017	2018
Inventories	1504	1685
Trade receivables	1462	1434
Trade payables	-1330	-1439
Sum of WC	1636	1680
Difference WC	-110	44

Source: (Excel calculations)

One important thing to take note in this case is that the variation of working capital is calculated against the previous year instead of always against 2015. As expected, the difference started to be positive in 2018, when it was subtracted the WC of 2018 against the working capital of 2017 showing that the acquisition is starting to paying off as the company is finally able to pay for their liabilities with the funds that are coming from the assets, which indicates that Solvay by 2018 is finally showing good indicators with the Cytec acquisition.

Regarding the Net Capex the information retrieved in the balance made possible to make a good estimate and calculate the best and closest to reality amount. In this case the formula was summing the intangible and tangible assets with goodwill.

Figure 9: Calculation of Net Capex between the years of 2015 and 2018 for the DFC calculations

Net capex	2015	2016
Intangible assets	3919	3600
Goodwill	5840	5679
Tangible assets	6946	6472
Sum	16705	15751
Difference	-954	

Parameters	2017	2018
EBIT	1527	1546
T	27,50%	26,10%
EBIT(1-T)	72,50%	73,90%
	1107	1142
Difference between 2015	156	192
Intangible assets	2940	2861
Goodwill	5042	5173
Tangible assets	5432	5454
Sum of Capex	13414	13488
Difference Net Capex	-2337	74
Inventories	1504	1685
Trade receivables	1462	1434
Trade payables	-1330	-1439
Sum of WC	1636	1680
Difference WC	-110	44

Source: (Excel calculations)

As far as Net Capex, the value was also only positive in 2018 with a good amount spent in physical assets, which directly represents in the financial health of the firm.

To calculate the Discounted Cash Flow, it was used the formula above, and with all the parameters in the equation already calculated, it was calculated the DFC for the year of 2016, 2017 and 2018:

Figure 10: Free Cash Flow to the Firm of Solvay in 2016, 2017 and 2018

	2016	2017	2018
FCFF	1552	2603	74

Source: (Excel calculations)

The company as it was described in some modules ago was bought from Solvay and it had an enterprise value of $6,4 billion, however these calculations above were made in euros, therefore it has to be done a conversion to euros. In the year of 2015 according to PoundSterling live (2015) the average exchange rate between euro and US dollar was 1.15, therefore in order to calculate the enterprise value in euros, the calculation needed is to divide the enterprise value by the exchange rate giving us a value of 5,565€ billion.

Regarding the cost of capital, it was used the one of today as it is difficult to gather entirely accurate information to calculate a good estimate for the cost of capital. According to Gurufocus (2019) the present weighted average cost of capital is 4.05% and this was the value used in the calculations.

With these values it is now possible to calculate if the acquisition added value to Solvay as the only necessary step is to calculate the DCFF and update it to 2015 and compare it to the enterprise value. To calculate the DCFF the rate used is the cost of capital (4.05%) and the values used are the DCF of 2016 to 2018, from the year of 2019 onward an assumption was taken in consideration, and it was the FCFF was always going to be 74 as Solvay did not yet released the financial report of 2019 and of course of the following years, nonetheless, the tendency is for the results to get better, so a more positive assumption was also possible. Doing that step the net present value is 5,584 which is bigger than the 5,565 calculated previously, indicating that the Cytec integration in Solvay was very successful.

Another important fact that shows how successful tis operation was is by looking at the cash flow return on investment (CFROI) that is presented in the financial report of Solvay every year. The CFROI accordingly to WallSteetMojo (2019) is a model that basically evaluates a company’s economic return and it gives the average economic return of all investments that a firm has done in a specific year. The value will posteriorly be compared to the cost of capital in order to check the value that it added to the firm.

This parameter can also help external investors to evaluate and make comparisons between CFROI and stock price, and if CFROI has a big value that is not being reflected in the stock price, the investors can take advantage of the situation (Investopedia, 2019).

In this case in particularly Solvay has the CFROI for all its segments, therefore it is easy to compare its own value to the cost of capital.

Figure 11: CFROI by segment in comparation to the average Cost of Capital of Solvay SA

CFROI	***6.9%***	***6.9%***	**-**
Advanced Materials	*10.0%*	*10.3%*	*-0.2pp*
Advanced Formulations	*6.9%*	*6.7%*	*+0.1pp*
Performance Chemicals	*8.3%*	*8.4%*	*-0.1pp*

Solvay SA Annual Data

	Dec09	Dec10	Dec11	Dec12	Dec13	Dec14	Dec15	Dec16	Dec17	Dec18
WACC %	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.78	7.40	7.66	7.55	7.77

Source: (Solvay website and Gurufocus 2019: https://www.solvay.com/en/investors/financial-reporting)

The first image is from Solvay’s financial data and it shows the CFROI from their segments at the time of 2017 and 2018. The last image is from Gurufocus (2019) and it represents the average cost of capital of the year of Solvay SA from 2014 to 2018.

It is possible to observe that the most profitable business is advanced materials and performance chemicals, which are the areas that Cytec were more present in their core business as well as Solvay prior the Cytec acquisition, as they are above the cost of capital both for 2017 and 2018. The least rentable segment is advanced formulations, that had a smaller percentage than the cost of capital for both years but, nonetheless it had a big amount of net sales, and it is a segment that grew a lot after the acquisition.

Figure 12: Segment review of Solvay group in 2017 and 2018

Segment review	Underlying					
(in € million)	Q4 2018	Q4 2017	*% yoy*	FY 2018	FY 2017	*% yoy*
Net sales	**2,574**	**2,480**	***+3.8%***	**10,257**	**10,125**	***+1.3%***
Advanced Materials	1,093	1,047	*+4.4%*	4,385	4,370	*+0.4%*
Advanced Formulations	764	747	*+2.2%*	3,057	2,966	*+3.1%*
Performance Chemicals	716	679	*+5.5%*	2,808	2,766	*+1.5%*
Corporate & Business Services	1	7	*-83%*	7	23	*-69%*

Source: (Solvay website: https://www.solvay.com/en/investors/financial-reporting)

After all the long negotiations, the successes and unsuccess's in between, the acquisition ultimately paid off, showing that sometimes in order to have a sustainable growth a company must invest in other markets and merge or acquire firms with similar or non-similar business areas. Solvay is an example to follow as they have been successful with this tactic and they stand now as one of the main leaders in all the segments they are present on.

As far as the future holds, the tendency is that this acquisition continues to give more and more revenues as the financial results have shown by now with only three years after the acquisition was made, and possibly Solvay will continue this path of diversification to reach even higher milestones.

Conclusion

This case study was elaborated with the intention to study the impacts on the growth of Solvay with the acquisition of Cytec Inc., and to understand if the transaction was well planned and if it was worthy from a financial point of view as well as establish the possible outcome in the future years to come. To do so it was important to begin with and analysis of all the core principles about a M&A and all of the stages in the middle of it before moving on to the case study.

After the theoretical part of this project where it was shared with the reader about the most important information regarding a M&A, namely valuation techniques, industry and company overview, reasons to merge, and negotiation phases it is possible to understand that an acquisition without a proper study behind these elements can only go wrong. Nonetheless, the conclusion of a study cannot be clear by itself. If all the valuation is done correctly it can still lead to a false result. The scientific articles explained about that situation stating that all the valuation techniques nowadays even though they are correct, all of them are exposed to assumptions that must be made, exposing the situation to a relatively big of subjectivity, especially if the involved companies are important and powerful like in this case.

It is close to impossible to obtain a unanimous result amongst stakeholders, board members and market analysts about the true value of the target firm. The valuation techniques used will not give the absolute true number, but only a reasonable range of numbers in which any in between is possibly a good bid.

About the acquisition history of Solvay, it is notable that they have done so many successful acquisitions in the past especially in the last decade and all of them have worked out well for them, enhancing their business value in all their operating segments. In 2015 they decided to acquire Cytec Inc., which was one of the leaders in their own market and had several similar segments to Solvay and they turned that similarity in a big potential win. The negotiation phase was hard and had many upsets, but it was at the time the most important acquisition of Solvay's history. The goal was to upgrade their portfolio and enhance their business in the segments of advanced materials in aerospace and automotive and to make a more solid statement in the activities of mining chemicals. It was reported to create value to the stakeholders and the final values was up to 5.5$ billion with an enterprise value of 6.4$ billion.

After the acquisition took place, there was an adaption phase that was mirrored in the calculations of the free cash flow to the firm, showing in the first year some challenges in adapting the biggest assets of Cytec Inc. to the reality of Solvay. Nonetheless over the next two years until 2018 the accounts started to bring excellent results, especially regarding the earnings on advanced formulation and advanced materials segments.
Using the discounted cash flow method, from 2016 until 2018 using the cost of capital, the final value reached is greater than the enterprise value of the acquisition showing that the acquisition had a great impact on the finances of Solvay. With that assumption it is possible to say that this acquisition bought financial value to Solvay and it made the firm more of a leader than it was before especially in the most lucrative segments.
The tendency is to keep going as the free cash flow to the firm had dropped significantly on 2018, showing that it took about two years for Solvay to take advantage to the fullest of this acquisition.
To sum up, this acquisition did in fact bring value to Solvay, even though it took a couple years to do so. Solvay took the most advantage of Cytec's connections, costumers and supplier relationships to bring out the best results possible. It also showed that these types of acquisitions take time to be made, and that the results might take some time to finally justify the investment but with a good analysis it is possible to predict the outcome with more guarantees.
In this project it would be interesting to have calculated the discounted cash flow calculations by each segment in order to see in detail the segments that had the most profit related to the acquisition, but due to many complications and too many assumptions that had to be made it was not possible. Also, from 2018 onwards was also considered that the firm would have the same results also once more due to the lack of information to make a good prediction of future years to come.
Some clues to this project would be an analysis of the discounted cash flow by segment to retain in which one the better results are and also making projections for the future to have a better glimpse of what might arise in the near future years.

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