



**Department:** Business and Management    **Course:** Managerial Decision Making

*Limits in Game Theoretic Representations of M&A  
Negotiations: The Influence of Psychological and  
Behavioural Factors*

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## INTRODUCTION

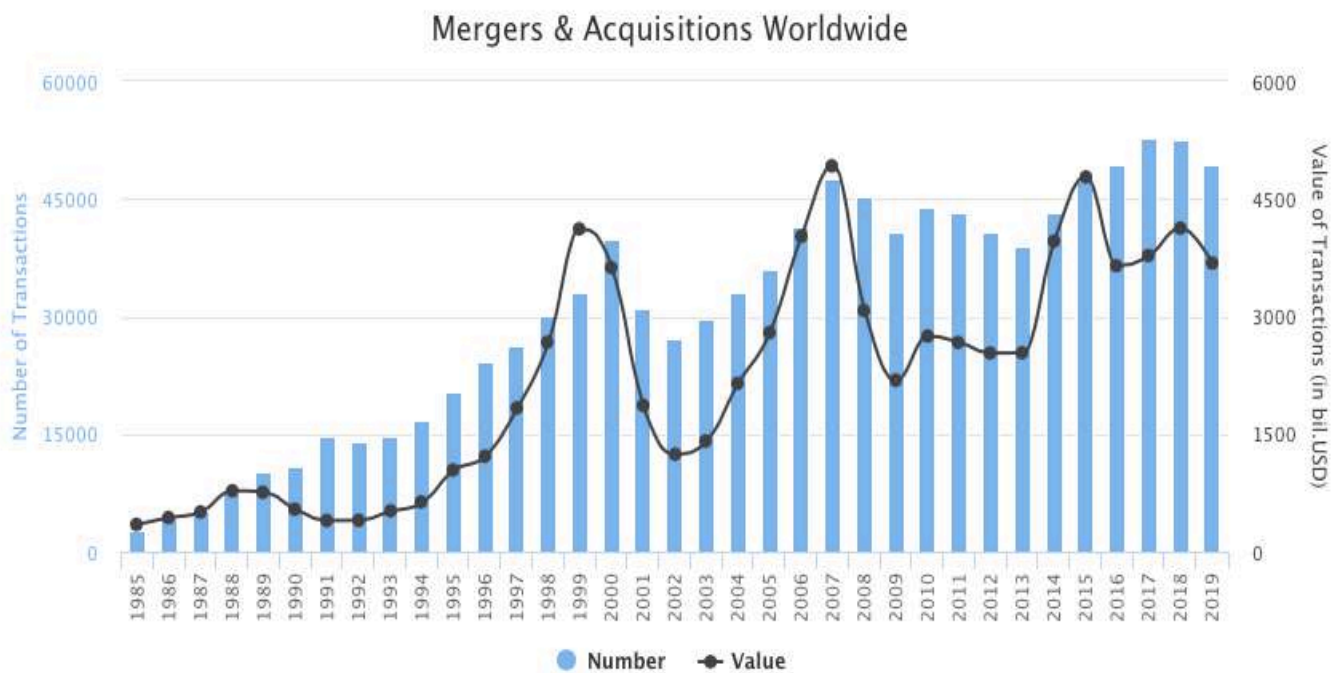
Throughout the five years spent studying economic disciplines, I have always been fascinated by the employment of strict assumptions for theoretical purposes. As my level of competence increased, I started wondering whether or not these assumptions could actually help in the construction of representative theories and models, often reaching ambiguous conclusions and raising additional doubts. The use of such strong constraints concerning information levels, transaction costs, competition and agents' behaviour – these are just examples of the uncountable topics affected by theoretic assumptions - appeared to me as excessively theoretical concepts and their distance with real-life contexts seemed to result in a tough limitation of the descriptive capacity of those models in which these ideas were employed. Progressively, the models and theories under analysis became increasingly complex and I started to accept the fact that some theoretic simplifications needed to be employed in order for general conclusions to be drawn. Nevertheless, the general scope of the derived principles exposed them to frequent critics concerning the lack of direct applicability in practical settings and the necessity of constant refinement. I was still confused. During my first year of Master's, I had the opportunity to attend a course entitled "Managerial Decision Making" and to approach the world of game theory, which fuelled once again my doubts about restrictive assumptions. Especially, the game theoretic discipline identifies one of its founding elements in the assumption of rationality of agents' behaviour, hence embracing the idea that an individual (or entity) makes a decision based on an orderly ranked set of preferences. More specifically, the agent is able to verify the effect of each available option on the level of his personal welfare - a concept that is formally included in the game theoretic discipline under the name of "utility" - and to opt for the most rewarding one. Presented in this form, the idea of rationality does not seem too distant from the attitude of most individuals on a daily basis: recognize the available options; rank them according to the contribution they provide in terms of personal welfare; choose the one offering the highest reward. Going through the game theoretic models treated during the course, though, I found it extremely complex to understand the logic of resolution and I firmly believed that most of the so-called "optimal outcomes" were far from being the ideal choice, appearing a little too irrational for being the result of a rationality assumption. Clearly, something was missing in the structure of these models. Once the course was over and the exam passed, I moved on with my academic path, though I did not abandon this critical attitude towards theoretic restrictions and, most of all, the idea of rationality. One year later, a friend of mine asked for some help with a series of papers concerning the application of game theory in M&A negotiations and I decided to give a look. While reading, the limits of the rationality assumption in such models appeared extremely evident and I started to realize what the crucial missing element could be: the human component. Game theoretic models are built with the intention to schematize real-life situations and decision-making processes, so to simplify their analysis, though completely overlooking the human aspect of each scenario and hence providing insights that must be integrated with complementary information in order to offer valid conclusions. The assumption of rationality eliminates the

influence of subjectivity affecting agent's choices in practical settings and thus reduces the degree of representativeness of the game theoretic models. In the context of M&A negotiations, financial interests are obviously an element of primary importance for the progression of the talks, with the final objective typically being the achievement of value-creating agreements. Nevertheless, the bargaining process is always conducted by human agents and hence is subjected to a series of psychological and behavioural factors affecting their perceptions, attitudes and aspirations. Such factors of influence determine a departure of real-life negotiation outcomes from the predictions of game theoretic models, which describe the negotiation process as a straightforward sequence of decisions based exclusively on strictly financial aspects. The objective of this work is to accompany the reader through a journey that highlights the predictive limits of game theoretic models in their application to M&A negotiation settings, clarifying the influential role played by human psychological and behavioural factors in the dismantlement of the rationality assumption. Starting from an introduction to the basic elements of mergers and acquisitions, the work will continue with the provision of the fundamentals in the domain of game theory and the presentation of examples of game theoretic models describing M&A strategic settings. The last part will focus on the psychology of the negotiation and on the effects of its practical manifestations on the rationality of the agents, with specific attention to the consequence of this influence on the negotiations taking place in the context of a merger or an acquisition. The ultimate goal of this work is not to criticize the game theoretic framework, whose usefulness will be recognized throughout the pages, but instead to shed light on the necessity of giving human psychology the importance it deserves in business environments, recognizing its transversal influence and its potential role as a leverage for successful agreements. Hopefully, the reader will enjoy the topics treated and will appreciate the effort spent to make each concept and opinion as clear as possible. The following pages have not been written for the purpose of convincing an audience, but rather with the intention of reflecting over a topic that has occupied a place in my mind for years, fostering a critical attitude that perhaps will be productive in the future.

## CHAPTER 1 – MERGERS AND ACQUISITIONS: WHAT, WHY, HOW AND WHEN

### WHAT IS M&A?

The importance of Mergers and Acquisitions (M&As) in the global business environment has grown significantly during the last decades: from 2,676 deals in 1985 to 49,386 in 2019, from an aggregate value of \$347.25 billion to \$3,681.38 billion. However, this uncontested growth did not come without ups and downs and researchers have decided to describe this dynamic trend by defining the periods of stronger activity as “M&A waves”, which can be observed in the graph below and will be discussed later in this chapter.

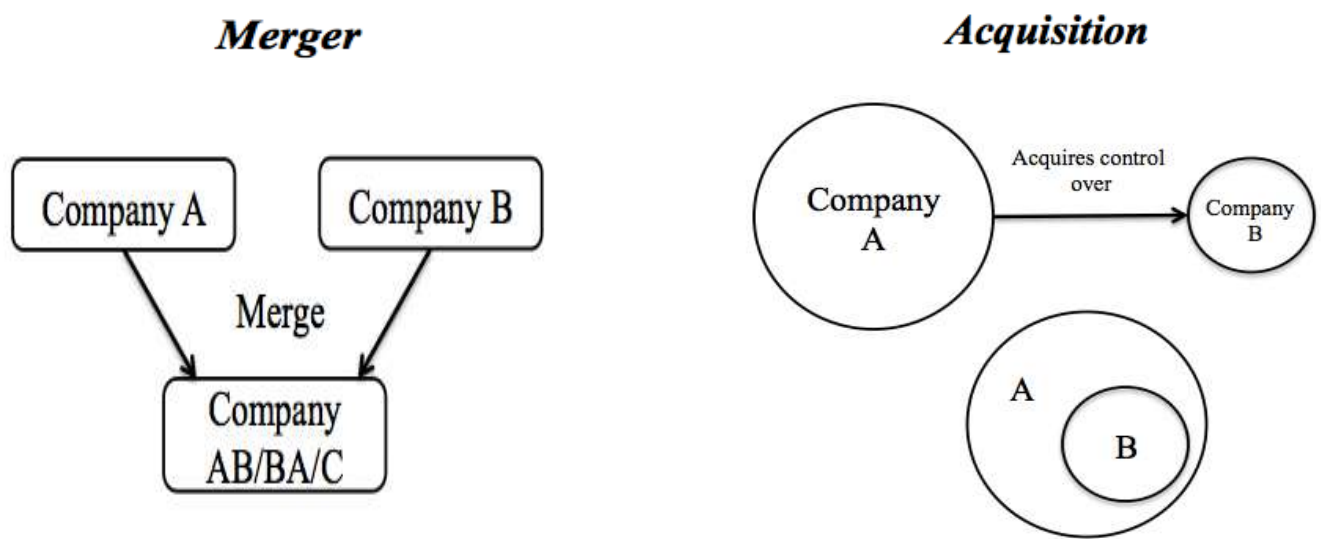


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Researchers have been constantly arguing over the main reasons driving M&A activity, mostly with the objective of getting insights concerning success and failure of the deals. Several are the explanations for undertaking M&A investment projects and the primary one is the achievement of synergy through the integration of two or more business units in a combination with increased competitive advantage (Calipha, Tarba, Brock, 2010). The importance of these initiatives for a firm’s growth and competitive advantage has led business strategists and researchers to refine preparation and execution strategies, aiming at the reduction of failure scenarios in the undertaking of such activities. However, M&A negotiations and processes still present a surprisingly low rate of success, due to the existence of uncountable and distinguished factors in the determination of the outcome. Prior to a deeper analysis of reasons and outcomes of M&A deals, it might appear useful to clearly define what this category actually includes and the major differences among distinct forms of agreement. First of all, there is a wrong tendency in the interchangeable use of the terms “merger” and “acquisition”, which represent two distinct concepts. As David L. Scott describes in “*Wall Street Words: An A to Z Guide to Investment Terms for Today’s Investor*”, a merger is “a combination of two or more

<sup>1</sup> Figure 1 – Source: Institute of Mergers, Acquisitions and Alliances (IMAA), M&A Review 2019

companies in which the assets and liabilities of the selling firm(s) are absorbed by the buying firm. Although the buying firm may be a considerably different organization after the merger, it retains its original identity.”; on the other hand, Scott defines an acquisition as “the purchase of an asset such as a plant, a division, or even an entire company.”. Notwithstanding these academic definitions, both concepts can be explained in a more practical way. In a merger transaction, two or more companies form a new, single entity and become jointly owned; during this process, the stocks of the prior-existing entities disappear and are replaced by the new company’s ones. In an acquisition, one company (buyer) takes over another one (target); the buyer runs the whole block under its identity, while the target loses its independence; the difference with a merger here is the survival of the target’s shares.



Both mergers and acquisitions happen in a variety of forms and are classified following distinguished criteria. An initial distinction for M&A transactions sees three major categories:

- Asset Purchases
- Stock Purchases
- Mergers

As John C. Coates IV writes in “*Mergers, Acquisitions and Restructuring: Types, Regulation and Patterns of Practice*”, the purchase of all assets used in a business and thus the acquisition of its control represents the most primitive form of M&A transaction: the target sells its whole assets and then liquidates the price paid to its shareholders.

A potential obstacle to this practice stands in the possibility of an excessively time- and effort-consuming specification of the target’s assets. In this scenario an alternative is proposed: the buyer can obtain the

control over a business through the purchase of its stocks. This approach is particularly straightforward when ownership is concentrated and the objective is to acquire a stake that is sufficient for controlling the entity. Being the acquisition in the form of an asset or stock purchase, it is useful to specify two other varieties of the process:

- Take Over: the buyer is larger than the target
- Reverse Take Over: the target is larger than the buyer

When the goal of the operation is to obtain 100% of ownership, mergers present some advantages relative to asset and stock purchases. More specifically, mergers offer the opportunity to transfer assets between firms without mandatory specification of individual assets.

Mergers present a more detailed classification and OECD's "*Mergers and Acquisitions (M&A) Type Transactions as a Part of FDI Statistics*" provides some useful insights. An important criteria in the distinction of merger deals is the motivation of involved companies, which leads to the following categories:

- Horizontal Merger: two competitors combine.
- Vertical Merger: two companies with complementary activities combine (i.e. buyer-seller relationship).
- Market-extension Merger: two companies selling the same products in different markets combine.
- Product-extension Merger: two companies selling different but related products in the same market combine.
- Conglomerate Merger: all other types of transactions, especially when companies lack a specific relationship and operate in different businesses.

In addition to this classification, another one can be presented referring to the legal outcome of the operation. In this case the categories are:

- Statutory Merger: the merged (or target) company ceases to exist and the acquiring one assumes its assets and liabilities, with owners of the former often remaining joint owners of the merged entity.
- Subsidiary Merger: the acquired company becomes a subsidiary to the parent company. There is a reverse version of this operation (Reverse Subsidiary Merger), in which a subsidiary of the acquiring company is merged into the target.
- Consolidation: two or more companies cease to exist and join to form a new one. Their shareholders become shareholders in the new entity. Similar to a pure merger, the term consolidation is used when the firms involved have similar size.
- Reverse Merger: the acquiring company ceases to exist and merges into the target company.
- Merger of Equals: a type of merger when companies involved are of similar size.

The specification of the above-mentioned categories helps to understand the depth of the expression M&A, which includes a wide variety of opportunities to be applied in different scenarios and resulting in different outcomes.

Following a clearer comprehension of what M&A actually stands for, it may be appropriate to analyse what major motives encourage corporations to undertake operations of this kind and what are the main consequences in both positive and negative scenarios.

## **REASONS BEHIND M&A TRANSACTIONS**

Despite the previous distinction of M&A categories, it might be concluded that the net result of these transactions is often the same: two companies with separate ownership get to operate together, with the main ambition of achieving some strategic or financial objective (Duskaitė, Tamošiūnienė, 2009). For any corporation, alignment with its shareholders' expectations requires growth and this can be achieved internally (organic growth) or externally (inorganic growth). Internal growth refers to the possibility of hiring additional human capital, developing new products, expanding geographically; it is often a long and exhausting process. External growth refers instead to the opportunity of leveraging on third-party contractors, strategic alliances and/or M&A to gain access to new markets, customers and technologies; more specifically, external growth may take place through: M&A, franchising, licensing, joint ventures, strategic alliances, overseas distributors. Taking into consideration that companies have the opportunity to choose whether to grow in their industry or in other business categories, there are some variables which may prove helpful in the definition of a right balance between organic and inorganic growth strategies (Sherman, Hart, 2006):

- Competitiveness, fragmentation and pace of marketplace and industry
- Access to and cost of capital
- Specific capabilities of management and advisory teams
- Strength and growth potential of current core competencies
- Volatility and loyalty of distribution channels and customer base
- Extent to which speed to market and scale are important
- Extent to which a company operates in a regulated industry

In broad terms, growth is undoubtedly the most important reason driving M&A activity. However, the pursuit of more specific outcomes is what eventually leads to growth and in these it is possible to find the actual reasons for mergers and acquisitions. As mentioned in the first paragraph, the primary reason for M&A is the achievement of synergies that refer, in business terms, to the higher profitability delivered by the combination of separate corporate realities, relative to the one reached when operating individually.

Synergy can be distinguished in two major categories:

- Operating Synergy: it refers to economies of scale and/or scope.

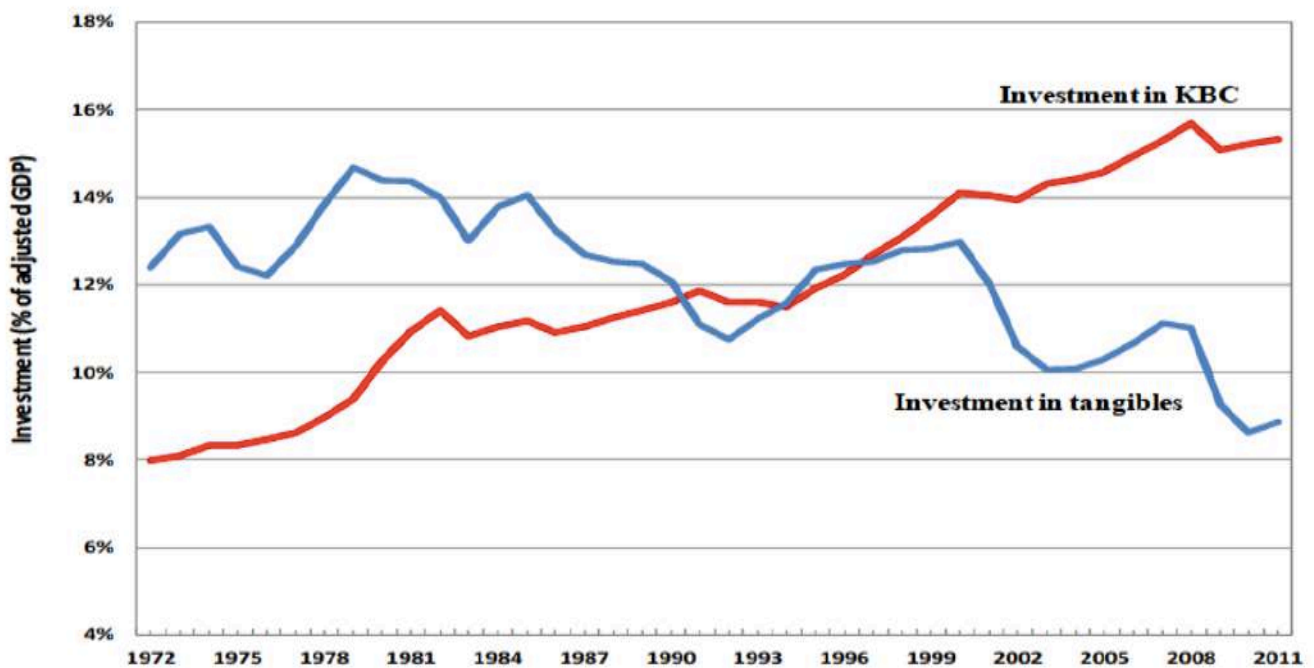
- Financial Synergy: it refers to the impact on the cost of capital for the acquiring firm or the new-formed entity, which could be reduced by the operation if the involved corporations fulfil specific requirements.

Along with synergy, the second reason for undertaking M&A operations is the opportunity to gain access to valuable intangible assets. More specifically, these elements are often knowledge-based resources and have gained extreme importance during the 21<sup>st</sup> century as basis for the development of organizational capabilities.

Intangible assets include three sub-categories<sup>2</sup>:

- Human Capital: it refers to the sum of capabilities of everyone working in a company.
- Structural Capital: it refers to strategies, structures, processes and leadership that combine into a company's core competencies.
- Customer Capital: it refers to the sum of all customer relationships.

Elements from these three categories interact to create “knowledge value capital” (Duskaitė, Tamošiūniene, 2009), which finds part of its high value in the opportunity to develop certain competencies at a cost which will not be incurred again once these skills are reused. Today, intangible knowledge-based assets register a higher strategic value with respect to physical and/or financial assets, as shown in the graph below by the growth of investments in intangibles relative to tangible assets:



<sup>2</sup> Beyond the Deal: Mergers & Acquisitions that Achieve Breakthrough Performance Gains – H. Saint-Onge, J. Chatzkel, 2009

Of course, this second motive for engaging in M&A activity is strictly linked with the idea of synergy treated above: merger and acquisition operations open up multiple scenarios and alternatives for the combination of resources belonging to the entities involved, but can only be considered effective when they produce increased value-creation capacities relative to the previous situation.

Together with synergy and access to intangible assets, which can be ranked as the most critical reasons driving M&A activity, there are several other objectives behind these operations. In their paper “*Why Companies Decide to Participate in Mergers and Acquisition Transactions*” Duskaitė and Tamošiūnienė list some additional factors with responsibility over M&A operations. What appears interesting in this work is the distinction between buyer- and seller-side factors, allowing the examination of the perspectives of both parties in these deals. From the buyer’s perspective we find:

- Horizontal and Vertical Integration
- Improved Management, R&D, Distribution
- Tax Benefits
- Changes in Markets
- Changes in Technology and Industry
- Cost Reduction
- Obtaining New Customer Base

On the other hand, from the seller’s perspective we have:

- Absence of resources to foster growth
- Maximized growth in own market and necessity to expand into new ones
- Belief to have reached peak valuation
- Lack of viable replacement for founder of the company who approaches retirement
- Lack of access to capital
- Desire of investors to cash out
- Emergence of new competitors

To conclude, it is possible to say that M&A activity finds its main driver in the research for growth, which itself can be achieved through a multitude of minor strategic goals. Leveraging on the resources it can offer, each player seeks the most suitable partner for engaging in a synergic relationship that fosters growth and strengthens competitive advantage.

## **WHAT DETERMINES A POSITIVE OUTCOME?**

Up to this point, it is possible to understand the importance of M&A deals as growth strategies for corporations. Anyway, despite this awareness, most firms are still unable to effectively manage the process and to obtain a positive ROI: out of three acquisitions, two tend to destroy value (PWC, 2017).

Several measures help in the assessment of outcomes from M&A operations, but ROI is considered one of the best and most intuitive since it allows to relate the net profit of the target company to the sum invested in its purchase. In its “*M&A Integration Survey Report 2017*”, PWC creates two categories of dealmakers based on the achievement of ROI expectations:

- Successful Deal Makers: they achieved or overachieved ROI expectations.
- Unsuccessful Deal Makers: they only partially achieved or failed to achieve ROI expectations.

M&A literature strived in the attempt to produce a clear set of success factors for these operations, but still tens of them are considered critical and researchers fail to agree on how to narrow the list down. The first important distinction to be made is the one between pre- and post-deal phases, which require focus on different strategic aspects. The pre-deal phase concerns elements of strategic planning and screening of potential targets, thus it has a broader scope and offers higher degrees of flexibility, due to the significant number of available opportunities. However, this phase is as critical as the post-deal one for the success of M&A operations. Calipha and Brock, in their “*The Pre-M&A Stage: Understanding the Phases and Success Factors*” (2019), investigate those that can be considered as crucial aspects to be taken into consideration in the pre-deal phase of M&A transactions and provide an intuitive list.

These factors are:

- Acquisition experience: it is considered a critical factor in M&A success, but some research found reverse correlation between experience and performance.
- Financial power of the acquirer company
- Strategic motive
- Clear M&A objectives: a company needs to elaborate objectives considering its competitive status, strengths, weaknesses and top management competencies.
- Selection criteria: it is important for buyers to establish and follow screening criteria for their targets.
- Strategic fit: it allows merging firms to find synergy with ease.
- Type of managers involved: it appears useful to have the deal supervised by a business development unit and to include specialists from different operational areas; this helps in the assessment of the value of relevant departments.
- Culture: it is often considered as a post-deal factor, but it plays a critical role in the selection and evaluation of potential targets.
- Compatibility of organizational structure and control systems
- Resistance of any stakeholder
- Analysis of subsidiaries’ future funding requirements: it is important to understand if these financial requirements will lead to the payment of a higher-than-planned price.

To generalize over this list, it is important for acquiring corporations to have clear strategic intentions when undertaking M&A operations, to establish compatibility criteria with the target entities and to analyse potentially hidden financial burdens deriving from the deal. Following the conclusion of the deal, post-merger integration (PMI) becomes the key for a successful performance of the operation. As PWC highlights in its survey, successful deal-makers have excellent abilities in four major areas:

- Achieving synergies: powerful synergies do not come from simple integration of support functions, but from a deeper process involving core functions.
- Completing integration within an ambitious time frame: quickly integrating the target entity (within 1 year after closing the deal) offers the opportunity to return to the management of daily business without generating frustration.
- Successfully managing culture and change: when an integration fails, mistakes in culture and change management are often to blame; companies that give importance to these factors have higher probability of performing better in the post-deal phase.
- Implementing strong project governance: as in pre-deal phase, it is important to involve top management; in the post-deal phase it is also important to give responsibilities to employees from both the acquiring and target companies.

PMI activities present a deep connection one with another and excellence in one of them often determines optimal performance in the others. This, together with the necessity of a more qualitative approach, makes PMI tasks potentially harder than pre-deal activities and vulnerable to a larger number of interrelated factors. Undoubtedly, an excellent conduction of pre-deal analysis simplifies the post-deal activities and increases the chances of a positive outcome.

These three paragraphs had the objective of providing the reader with a general introduction to the world of M&A deals, with the hope of opening the way to a deeper understanding of concepts that will be presented and analysed throughout the paper.

Following this theoretical start, the subsequent pages will provide historical insights on M&A operations and will analyse their evolution in terms of volume, value and nature. The goal is to develop a path that helps the reader to understand what have been the passages that have brought these deals to play such a critical role in today's business environment.

## **M&A THROUGHOUT HISTORY**

M&A operations have acquired notable importance in the last decades, as witnessed by a huge increase in the volume of transactions between the middle of 1980s and present times (+ 1,845%). In the previous pages, an analysis of motives for the undertaking of these operations has been conducted from a strategic perspective, allowing the investigation of the specific reasons lying under the decision of completing a

merger or an acquisition. However, in order to examine the phenomenon from a more historical point of view, it is critical to present some more generic reasons that have led to the explosion of M&A waves throughout the 20<sup>th</sup> and 21<sup>st</sup> centuries. In general, M&A waves appear to be determined by shocks: economic, regulatory, technological. Economic shocks are usually linked to the concept of economic expansion, which fosters companies' motivation to expand with the objective of meeting a growing aggregate demand. As mentioned in the paragraphs above, external growth offers the opportunity to corporations to expand their operations at faster pace relative to organic (or internal) growth. Shocks in policy are another decisive factor in the birth of M&A waves. These regulatory shocks might assume the form of deregulation in certain industries, allowing corporations to combine after a period of prevention. This opportunity is often caught by players in highly regulated industries, who seek to allocate their excess capacity efficiently. Finally, technology is a well-known disruptive factor in business environments and it often works as the spark for change. For what concerns M&A operations, technological changes can determine shifts in existing industries and/or the creation of new industries, forcing corporations to rely on different competencies to maintain their competitive advantage and/or to establish a competitive position in a new competitive environment. These competencies could either be developed internally or acquired externally through M&A deals, depending on the speed with which they need to be employed. Notwithstanding the importance of the three categories of shocks described above, there is a fourth determining factor in the occurrence of M&A waves, this time more related to the financial situation of companies: capital liquidity. The presence of liquid funds allows corporations to invest in M&A activities. However, it must be recognized that none of these factors alone is usually strong enough to drive a wave and there must be alignment in the verification of these events for it to take place<sup>3</sup>.

Now that a contextual figure has been drawn, it is possible to engage in a more historical examination of the M&A phenomenon and to investigate its most representative waves. More specifically, seven M&A waves can be distinguished starting from the last decade of the 19<sup>th</sup> century until the end of the 2010s.

The first wave occurred between 1893 and 1904 and mostly took place in the U.S. market, since the rest of the world engaged in the M&A practice only later during the 20<sup>th</sup> century. Operations during this wave typically happened in the form of horizontal mergers, with companies operating in the same industry combining with the objective of achieving higher economies of scale and establishing market dominance. Industries involved were mainly in the areas of manufacturing and transportation: mining, oil, railroads. An example is given by the United States Steel Corporation, formed in 1901 by the consolidation of several steel corporations: Carnegie Steel Company, Federal Steel Company, National Steel, National Tube, American Steel and Wire, American Steel Hoop, American Sheet Steel and American Tinplate. Through this operation, the United States Steel Corporation became the largest steel producer and corporation in the world.

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<sup>3</sup> History and Causes of Merger Waves - M&C Partners - 2019

The second wave occurred between 1919 and 1929 and saw a change in the dynamics of M&A, mostly due to the intervention of governments in the prohibition of giant consolidations potentially determining forms of anticompetitive behaviour. This evolution in the regulatory frame led companies to approach M&A differently and to idealize the establishment of a stronger competitive advantage through vertical mergers, instead of horizontal ones. Vertical mergers act on the value chain of a corporation and thus are more efficiency-oriented, involving entities that are related by a collaborative relationship and not a competitive one. An example of vertical integration is given by Standard Oil, which conducted acquisition transactions to enter downstream operations in the oil industry such as oil refining, storage and transportation of refined products. The second M&A wave was blocked by the financial crisis of 1929.

The effects of the financial crisis and the following WWII created some obstacles to the development of business environments and, consequently, to M&A activities.

A new wave, the third one, started a decade after the end of the second global conflict, in 1955. The driver of this renewed interest in expanding was not the desire to establish or strengthen competitive advantage, but rather the idea of diversifying revenue streams. Companies started to understand the importance of being involved in different industries, so to avoid the risk of facing financial distress following industry-related crisis. This strategic decision led to the diffusion of conglomerate mergers and acquisitions, involving companies belonging to different businesses. An example of the M&A operations of this time can be found in Ling-Temco-Vought, one of the largest conglomerates in the 1960s: it started as an electric company in 1947 and, through acquisitions, got to be involved in several industries ranging from aerospace to pharmaceuticals. As for the second wave, a crisis and its subsequent impact on the stock market led to the end of this third era of M&A events. More specifically, it was the oil crisis of 1973 to determine the end of this wave: the OPEC proclaimed an oil embargo towards countries supporting Israel in the Yom Kippur War; in March 1974, the price of oil had risen by 400%.

The oil embargo came to an end in 1974, thus encouraging a fourth wave of M&A activity. Again, the dynamics of these operations were different with respect to the previous ones and saw the development of “hostile takeovers” and “congeneric mergers”. The first concept refers to the decision of an investor to take control over a company by acquiring a controlling interest without the consent of owners, shareholders or management (unfriendly approach). The second concept, on the other hand, refers to a form of merger that takes place between two or more companies operating in the same industry or in related industries, thus allowing the presence of strong synergies, but not offering the same products or services. During this phase investment banks played a critical role, as they were crucial in lending large sums to corporate raiders – investors involved in hostile takeover operations -. Exactly this excessive involvement of financial institutions led to the closing of the fourth M&A wave, in the last years of 1980s, since this conspicuous

lending trend was endangering their capital structures. Together with this, the capital markets suffered a heavy shock in October 1987 and this contributed to a temporary stop in M&A activity.

With the start of the 1990s, a different trend in M&A came to light: mega deals. Starting from 1993, a fifth period of M&A activity saw the signing of some of the biggest deals in history, mainly driven by the intent of reaching larger economies of scale. Moreover, the M&A market began to acquire an international perspective, as witnessed by the increase in the number of cross-border mergers, due to the growing importance of market dominance outside a company's home country. Examples of M&A deals occurred in this phase are: the merger of Exxon and Mobil to form ExxonMobil, the merger of Daimler and Chrysler, the acquisition of Volvo by Ford. Factors determining the closing of this fifth wave, around 2000, can be identified in the bankruptcy of some big corporations of the time and in the explosion of the dot-com bubble.

As for every crisis, recovery was necessary for operations to restart at an acceptable rhythm. In the specific case of the dot-com bubble, M&A activities experienced a stop during the first years of the 21<sup>st</sup> century and a renewed interest in operations of this kind only appeared in 2003, when the sixth wave is considered to have its beginning. Two main factors characterized this period of activity, namely globalization and private equity. The fifth wave saw the birth of cross-border M&A and this trend was maintained, with the objective of widening market reach to a more global scope. Support for this kind of operations also came from regulatory evolutions, more specifically through a simplification of international law in matter of foreign mergers and acquisitions. For what concerns the second characterizing aspect of this wave, private equity, there was a huge growth in the volume of Leveraged Buy-Outs (LBOs); these are mergers or acquisitions in which the acquiring company borrows financial resources to complete the operation, in order to avoid the commitment of large sums of capital. As for globalization, this practice is not totally innovative and was already put in practice during the fourth wave; the difference in this case stands in the low level of interest rates and high involvement of private equity firms, which collect money from institutional and/or accredited investors to invest directly into corporations. The value of deals during these years is huge, as witnessed by one of the biggest acquisitions in history: AOL purchased Time Warner for \$164 billion. However, the sixth wave was one of the shortest and tragically ended in 2007 as a consequence of the subprime mortgage crisis and the following global financial crisis, considered the biggest financial shock since the Great Depression (1929)<sup>4</sup>.

What the financial crisis determined was a radical change in the business mindset: investors started to show a higher degree of risk aversion and companies decided to focus on organic growth, rather than external one through M&As. It was not until 2014 that external growth returned to its prior-to-crisis levels, overcoming them during that same year. Today, in the first half of 2020, the seventh wave is still active and is not giving

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<sup>4</sup> A Historical Analysis of M&A Waves – Cleverism – A. Belyh, 2016

any signs of stopping. Despite the late start, the 2010s saw the closing of almost 465,000 deals (+25% from 2000s) for a value of \$34.3 trillion (+26% from 2000s)<sup>5</sup>.

This brief recap concerning the evolution of M&A activity throughout the 20<sup>th</sup> and 21<sup>st</sup> century was elaborated with the intention of providing the reader with a hopefully useful contextualization of the role these operations had in the transformation of the international business environment. Mergers and acquisitions have helped corporations in the achievement of efficiency, in the upgrading of competencies and in the development of a more international market presence. Thus, these operations have proved critical in allowing companies to efficiently and effectively provide goods and services to final consumers, to perfect their offerings and to develop new ones at affordable costs. On the other hand, however, M&A present a potentially huge drawback in the form of an increase in market power of involved companies. This higher degree of market dominance in the interested industries is often traduced in a reduction of competition and thus a weaker encouragement to improve efficiency and quality in the provision of goods/services. More precisely, a typical effect of reduced competition is an increase in prices with no parallel increase in the quality of the offering; a 2016 paper by Bruce Blonigen and Justin Pierce, specifically analysing the effects of mergers on market power and efficiency, indicated an increase in the average markup, following an M&A event, of 15 to 50%, with “no statistically significant average effect on productivity”<sup>6</sup>. It is important to understand that this is an average effect and that not all mergers produce an outcome of this kind, being some of them positive for the economic environment. Anyway, this is a realistic perspective and should be actually taken into consideration by policymakers and regulators when judging the feasibility of certain M&A operations.

To conclude, mergers and acquisitions have been and keep on being fundamental components of the global economic reality, taking place for a variety of reasons and producing several different outcomes with both positive and negative resonance. As witnessed by the previous historical overview, M&A operations have evolved throughout the decades and it is hard to suppose that no further evolution will happen. Following the behaviour of the global economy, new waves will probably arise and will present distinguished dynamics with respect to those firms have become used to. Furthermore, the arousal of new and highly specialized industries in which strong economic interests are concentrated will certainly push powerful companies to establish a position as fast as possible, thus fostering the engagement in measures of external growth and hence creating the right conditions for new deals to be closed.

Now that this introductive journey across the reality of M&A deals is concluded, it is time to move on with the work and to present the second fundamental piece of this paper: game theory. In the following pages

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<sup>5</sup> 7 M&As that Defined a Decade of Dealmaking – and Reshaped the Economy – Fortune Magazine - K. Kelleher, 2019

<sup>6</sup> Evidence for the Effects of Mergers on Market Power and Efficiency - Finance and Economics Discussion Series, Federal Reserve Board – B.A. Blonigen, J.R. Pierce, 2016

game theory will be briefly presented in its main characteristics and forms, so to provide the necessary tools for understanding its application in the reality of M&A operations.

## **CHAPTER 2 – GAME THEORY AND APPLICATIONS IN M&A: EXAMPLES OF GAME THEORETIC REPRESENTATIONS OF M&A NEGOTIATIONS**

### **PART 1 – GAME THEORY**

#### **INTRODUCTION TO GAME THEORY**

Game theory can be broadly defined as the formal study of conflict and cooperation. Its concepts and tools offer useful frameworks to "formulate, structure, analyse and eventually understand different strategical scenarios" (Hotz, 2006) and can be applied in every situation presenting interdependency among the actions of several agents. Interdependency implies that the outcome for one player is not only dependent on his own decisions but also on the behaviour of other players. As the name of this field of study may suggest, "games" are the focus of the discipline. More precisely, a "game" is a formal model for representing an interactive situation and typically involves more than one player. This does not mean that single-player games are inexistent, on the contrary these scenarios are analysed in specific games called "decision problems". The adjective "formal" in the description of the model highlights its clear definition of players, preferences, information, strategic actions available, influence of each action on the outcome. To conclude, a "game" presents several players interacting through specific strategies, respecting given rules and being aware of the interdependency of their actions.

Historically, game theory as it is known today first appeared in its mathematical formulation in a work by John von Neumann and Oskar Morgenstern, titled "*Theory of Games and Economic Behavior*" (1944). Here, the authors write with the purpose to find "an exact description of the endeavor of the individual to obtain a maximum of utility, or, in the case of the entrepreneur, a maximum profit" and "the mathematically complete principles which define "rational behavior" for the participants in a social economy, and to derive from them the general characteristics of that behavior". Despite the undoubted role of these authors as fathers of modern game theory, it appears necessary to acknowledge the presence of game-theoretic insights in far more ancient fragments. To analyse some of these passages might prove useful in the attempt to provide a wider contextualization of the game theoretic approach to strategic problems.

Going back to Ancient Greece, Plato's "Symposium" includes Socrates describing a situation from the Battle of Delium (424 B.C.): a soldier at the front is in charge to defend the land from an enemy's attack, together with his comrades; if the defense is successful, it is not much likely that his individual contribution proves essential and if he stays he risks his life; if the defense is not successful, he risks his life with even higher probability and his individual contribution would be even less important since the enemy is going to win anyway; in the light of this reasoning, the soldier apparently has no reason for staying and fighting, but if each of them reasons this way then the battle will be lost before even starting.

Throughout the centuries, this conceptual approach began to influence strategies in real-life events. Historical literature reports an interesting episode in this perspective: the Spanish conqueror Hernán Cortez

sailed from Spain to Mexico with a small army, relative to the military strength of the Aztecs; soldiers were aware of their numeric disadvantage and thus Cortez needed to find a way to avoid escape; his solution was to burn Spanish ships, in order to force his soldiers to fight as hard as they could; in addition, he decided to use the fire as a psychological weapon against the Aztecs, who would fear a commander confident enough to eliminate his only way out of the battle; in the end, the Aztecs were worried and decided to try avoid direct conflict, opening the way to Cortez and his men.

As the Stanford Encyclopedia of Philosophy highlights, modern political philosophy is another field highly contaminated by the study of the logic governing interrelationships among incentives, strategic interactions and outcomes. The founding work of this discipline is believed to be Thomas Hobbes' "Leviathan", where the author reasons on the role of the state as follows: the best situation for everyone would be the one in which there is total freedom to act; in this context, people would cooperate in projects that are impossible to be completed individually; however, there might be immoral agents who benefit from cooperation without offering it back; individuals who cooperate and do not receive a return might become hostile and thus impose to immoral agents the use of resources in the form of protection against dangerous behaviours; alternatively, immoral agents might want to get rid of the hostile cooperative individuals so to avoid adversarial conduct; being aware of this possibility, cooperative agents might think of acting against immoral agents before they put in practice any immoral conduct; for all of this to happen, nothing is necessary but a tiny doubt concerning other agents' behaviour and the main consequence is the complete avoidance of cooperation. Hobbes's solution to this problem is tyranny, intended as the hiring of an agent who works to punish everyone breaking promises. The threat of punishment here works as an incentive and thus fosters cooperation and peace. Presented with the two alternatives of tyranny and anarchy, agents will choose the first as the minor evil. Notwithstanding the political and social implications of Hobbes' framework, his game of doubt, cooperation and incentive uses concepts that will later become fundamental in the definition of modern game theory and he sets the foundations of what game theorists will call "social dilemmas".

These three episodes help to understand how, in interactive contexts, the most critical aspects for the achievement of agents' preferred outcomes are expectations and possible reactions to their strategies by other agents (non-parametric influences). Nevertheless, it was not until the publishing of von Neumann and Morgenstern's work that these non-parametric factors found a mathematical representation and started to be recognized as critical elements in decision-making problems. This also changed the approach to economic analysis, which was previously limited by the singular presence of parametric factors and thus found proper application for its models only in a restricted class of circumstances. The 1944 framework, however, still presented strong limitations and restricted the application of the theory of games only to specific scenarios. Since then, the theory has been constantly evolved and refined, with the objective to obtain a deeper and more generalized structure<sup>7</sup>. Thanks to this generalization, today game theory finds application in a wide

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<sup>7</sup> Game Theory - The Stanford Encyclopedia of Philosophy (ed. Winter 2019) – R. Don, 2019

array of disciplines: economics, politics, biology, psychology, philosophy, resource allocation and networking, artificial intelligence, computer science.

## **FUNDAMENTAL CONCEPTS OF GAME THEORY**

### **Preferences and Utility**

In its economic applications, game theory identifies economic agents as entities with preferences. To give this statement a proper context, it might be said that economists found most of their theories on rationality and thus imply that individuals will act consistently with their set of circumstances, also in making decisions. This means that, in order for choices to be made, an economic agent must have clear preferences concerning its options. To be classified as economically rational, preferences must fulfil four criteria:

- Completeness: an agent must always be able to rank one possibility, or set of possibilities, as either better, worse, equal or at least as good/bad as another.
- Transitivity: an agent must be able to order his preferences in a logical way: if A is preferred to B and B to C, then A must be preferred to C.
- Continuity: for preference theory to have a mathematical sense, there must be no jumps in people's preferences; this means that, if we prefer point A on a preference curve relative to point B, then points very close to A will also be preferred to B.
- Reflexiveness: this criterion is often overlooked, as it imposes that an agent must value an option as at least as good as itself.

To be effectively used in game theory, or in economics more in general, preferences must be described using a more abstract concept called “utility”. It refers to the use of a specified scale in the ranking of the subjective welfare or change in subjective welfare that an agent derives from an object or event<sup>8</sup>. The attribute “subjective” wants to indicate how an agent's relative welfare is evaluated considering his own implicit and/or explicit judgements. Nevertheless, researchers have been arguing over the psychological component of this concept and have tried to fix a theoretical problem derived from the necessity to apply utility to any kind of agent, not only those with human minds. More specifically, the initial concept of utility was developed by an English philosopher and economist, Jeremy Bentham, who intended it as a representative measure of satisfaction, in the most subjective way possible; the main problem with this idea was the difficulty in the quantification of this measure and thus its limited applicability. Paul Samuelson, in a work from 1938, decided to redefine utility as a purely technical concept (Revealed Preference Theory) and offered a different perspective for the analysis of rational decision-making that avoided the consideration of human inner states, hence allowing its use in the analysis of preferences belonging to agents different from human beings. In the words of Don: “economists and others who interpret game theory in terms of Revealed Preference Theory...should regard game theory as part of the body of mathematics that is

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<sup>8</sup> Game Theory - The Stanford Encyclopedia of Philosophy (ed. Winter 2019) – R. Don, 2019

used to model those entities who consistently select elements from mutually exclusive action sets, resulting in patterns of choices, which [...] can be statistically modelled as maximization of utility functions.”. For utility to be maximized in a formal mathematical model, it is necessary to use a specific device called “utility function”. The possibility of representing preferences using a numerical function is based on the assumption that agents seek optimal behaviour and hence they choose the optimal option among the ones available, given their preferences and constraints. The problem with the absence of a numerical representation of preferences was the difficulty in determining a clear optimal solution, now simplified by the fact that a numerical function can be easily maximized through different analytical techniques that also take into account various agents’ constraints. However, a certain degree of specification is necessary in the description of utility functions. These mathematical elements can appear in two forms: ordinal and cardinal. A utility function is “ordinal” when it simply represents an agent’s preferences on an ordinal scale: considering a set of options, an ordinal utility function describes how one is preferred to another, but fails to consider the extent to which this preference takes place (by how much A is preferred to B?); practically, this consists in assigning real numbers to preferences in correspondence of their ranking, with the magnitudes of numbers being irrelevant and hence with the best option presenting the largest number and the worst the smallest; from a more mathematical perspective, an ordinal utility function is such if it can be subjected to any positive strictly monotonic transformation without altering the preferences it represents<sup>9</sup>. The utility function is called “cardinal” when the magnitudes of assigned numbers begin to gain importance, as satisfaction (or utility) is believed to be actually measurable through numerical values called “utils”; this view and theory would make it possible to compare utility among different options in different domains, but it is believed to be realistically unachievable and thus is limitedly applied to economic analysis under specific assumptions.

## **Rationality**

In game theory, as it is more generally in economic analysis, the maximization of utility is subject to the assumption that agents (or players) are characterized by rationality in their actions. Nevertheless, what does the term “rationality” actually stand for? In the Cambridge Dictionary, rationality is defined as “the quality of being based on clear thought and reason, or of making decisions based on clear thought and reason”. Twenty-one words trying to give the most neutral representation of a widely debated and critically important concept, on which numerous theories in a vast array of disciplines base their conclusions. Being the objective of this work that of highlighting the limits of rational game theoretic representations of M&A negotiations, there is an evident necessity of spending some lines in the definition of what the assumption of rationality actually implies and what its pitfalls are. In its most standard interpretation, rational choice is defined as “the process of determining what options are available and then choosing the most preferred one according to some consistent criterion” (Levin & Milgrom, 2004). Through the translation of this “criterion”

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<sup>9</sup> A Dictionary of Economics - Oxford Reference

in a mathematically formal utility function, this approach has become remarkably trusted in the description of decision-making scenarios and this happened as a result of some specific characteristics:

- Many predictions of the choice theory tend to be confirmed by empirical studies.
- It has an extremely wide scope and can be applied to matters not only of consumption and savings but also marriage, education, business, crime, etc.
- It offers the opportunity to make decision-making predictions using a simple description of the agent's objectives and constraints.

Game theory uses a very technical concept of rationality, closer to the idea of “economic rationality” and based on a series of specific assumptions. To be clear, it is important to define the characteristics of an economically rational player and Don, in his “*Game Theory*”, offers some useful insights about the concept. Players who belong to this category:

- Rank outcomes with respect to their contribution to personal welfare.
- Calculate paths to outcomes and recognize which sequence of actions is probabilistically associated with each.
- Select actions from sets of alternatives that deliver most preferred outcomes, given the actions of the other players<sup>10</sup>.

Being applied to game theory, these three concepts result in each player having to choose among different strategies, each one representing not a single action but a programme of actions being taken in response to other players' strategies.

The importance of rational choice theory for experiments and discoveries in several fields is impossible to contest, but it must be recognized that it presents flaws and this is witnessed by multiple empirical failings. Researchers and academics identified a multitude of elements missing in the model and potentially determining for the agent's decision-making process, for example: learning processes, boundaries in rationality, peer imitation, heuristics, influence of emotional states. To generalize, what this rational choice model appears to miss is the fact that real-life decisions tend to be situational and context-dependent, but it does so with the purpose of maintaining a certain degree of stability in agents' preferences and thus derive appropriate empirical content<sup>11</sup>. An interesting perspective on this is given by Berry Schwartz in “*What is Rationality*”, where he points out how the use of the single adjective “rational” for both decisions and persons might drive misleading conclusions, as “it is perfectly possible for rational persons to make irrational decisions.”. In his analysis over the theme of rationality, Schwartz interestingly discusses over the actual possibility of applying utility maximization as a criterion for real-life decisions, arguing that the knowledge of exact probabilities related to outcomes and thus the computation of relative expected utilities

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<sup>10</sup> Game Theory - The Stanford Encyclopedia of Philosophy (ed. Winter 2019) – R. Don, 2019

<sup>11</sup> Introduction to Choice Theory – J. Levin, P. Milgrom, 2004

is something barely employable in everyday choices. In addition, most real-life situations hardly present clearly dominant alternatives and hence impose trade-offs. Attempting to provide a solution to a practical problem of this kind, Schwartz introduces the idea of “good enough utility”, rather than maximization, and describes it as the opportunity to choose the most suitable alternative to the widest set of circumstances, in order to reduce the possibilities for regret. From this point of view, the main limit of rational choice theory appears to be the fact that it identifies utility maximization as the only and most reasonable motive for a certain decision to be made, hiding from the possible presence of alternative appropriate reasons. In the words of Schwartz: “Maximization – whether of expected value, of utility, or of preferences – has its place, but that place is not every place.”.

Being these some introductory paragraphs concerning game theory and its fundamental elements, it might appear inappropriate to reach an excessive depth in the discussion over the theme of rationality, which would actually require a more detailed treatment in the attempt to clarify its major controversies. Nevertheless, this introduction into the concept and its implications for decision-making was written with the objective of highlighting how a certain degree of attention might be necessary in the valuation of conclusions derived from models strongly relying on rationality in its most theoretical definition. More specifically, the idea of rationality in its utility-maximization perspective has proved undoubtedly useful in the simplification of an otherwise complex reality, hence allowing economic theory to progress in the analysis and formalization of agents’ behaviour. Throughout the years, however, researchers have started to raise doubts over the assumption of perfect rationality in decision-making and to attempt the development of more comprehensive model in which a more realistic and “irrational” behaviour could find acceptance and a potential explanation. Among the main critics to perfect rationality, Herbert Simon deserves a special mention for its contribution to the development of a concept called “bounded rationality”. In extremely broad terms, the idea was based on the belief that agents are unable to exercise perfect rationality and thus are endowed with a limited (or bounded) rationality. Two are the main restrictions to perfect rationality identified by the theory of Simon:

- Limited access to information
- Limited computational capacity

For what concerns the first, Simon argues that the state of information is something strictly depending on the individual characteristics of the decision-maker and of the environment he acts in. As an example, in his “*A Behavioral Model of Rational Choice*”, he describes the eventuality in which the gathering of information is a costly process and thus imposes limits to the agent’s possibility of refining the context in which the decision is made. This, of course, creates a situation where the agent may have no opportunity to complete his decision-making process in a state of perfect information. Simon also believes in agents’ limited computational capacity and in this perspective he states: “The capacity of the human mind for formulating

and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behaviour in the real world – or even for a reasonable approximation to such objective reality.”. From this he derives that human rationality, in its realest form, can be nothing but an approximation of the perfect rationality implied by theorists, among which he explicitly cites game theorists.

## **Information**

While human computational capacity is not specifically taken into account by game theory, the concept of information is a fundamental aspect for the specification of games. Two are the situations in which a game can take place: perfect information and imperfect information.

Perfect information implies that players start playing with the same exact information that would be available at the end of the game. More practically each player, when situated in a decisional stage of the game, can implement an action with complete awareness of what has happened up to that point. Imperfect information, on the other hand, takes place when decisions have to be made simultaneously and players must take into account all possible outcomes when making their move. This information imperfection can take different forms and an interesting one is “asymmetric information” (or private information), intended as a situation in which a player knows something that other players do not observe. Information asymmetry is often described in the context of players’ actions, though it may also concern each other aspect (i.e. emotional attachment). When involving intangible items, asymmetric information is incorporated in games in the form of random events and through the use of nature: it is a non-strategic player (Player 0) whose actions are defined by a fixed probability distribution and not by incentives<sup>12</sup>. The presence of nature may also determine the development of another informational context, known as “incomplete information”. Here asymmetric information is created by nature itself and its moves, which are privately observed by a single player. Incomplete information is a typical condition in trading environments: bargaining, competitive markets, contract environments, auctions, etc.<sup>13</sup>.

## **ELEMENTS, STRUCTURE AND REPRESENTATION OF GAMES**

Before entering the domain of games and analysing their main features, it might be important to specify the area of focus for the entire work. To do so, the major aspect to be considered is the distinction of game theory in “Cooperative Game Theory” (CGT) and “Non-Cooperative Game Theory” (NCGT). CGT focuses its attention on situations where agents can cooperate to create value by joining coalitions, but also compete to capture value. NCGT, on the other hand, builds models to describe the actions of agents who seek to maximize their utility in a defined procedure, relying on a detailed description of moves and information available to each agent<sup>14</sup>. It results of extreme importance to specify how the terms “cooperative” and “non-cooperative” are in any way referred to the degree of cooperation among agents in different models: a

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<sup>12</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 326)

<sup>13</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 326)

<sup>14</sup> Cooperative and Non-cooperative Game Theory - The Palgrave Encyclopedia of Strategic Management – O. Chatain, 2016

cooperative game can describe competitive situations as much as a non-cooperative one can describe cooperation. CGT proves more useful in the description of situations where players can form coalitions and in the analysis of what these coalitions can achieve as outcome. NCGT finds a more purposeful application in the modelling of interactions among individual agents. M&A negotiations can be interpreted as an interaction between two individual agents, a buyer and a seller, but also as a bargaining problem in which the two negotiate over price. Being the context that of individual agents seeking to maximize the utility deriving from a transaction, Non-Cooperative Game Theory seems the best alternative to model interactions of this kind. In addition, Von Neumann and Morgenstern identify NCGT as the ideal approach to resolve bargaining problems<sup>15</sup>. For these reasons, the following pages will have their main focus on Non-Cooperative Game Theory and its applications in the description of M&A negotiations.

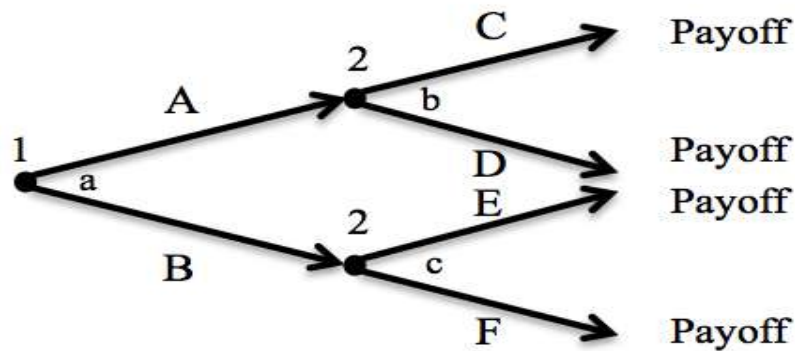
Games can be represented using different approaches, but they must always be described according to five fundamental elements:

- List of players
- Description of players' possible actions
- Description of players' knowledge
- Specification of how players' actions lead to outcomes
- Specification of players' preferences over outcomes

Once these elements are carefully and clearly defined, it is possible to represent games using several forms. For what concerns non-cooperative games, the most common approaches to their representation are two: extensive form and normal (or strategic) form. The extensive form uses a graphical tool called “tree” to represent strategic settings, which in mathematical terms is known as “directed graph”. A tree is built around nodes and branches: nodes represent places where an event happens, often a decision by one of the players; branches indicate the paths of action among which each player can choose.

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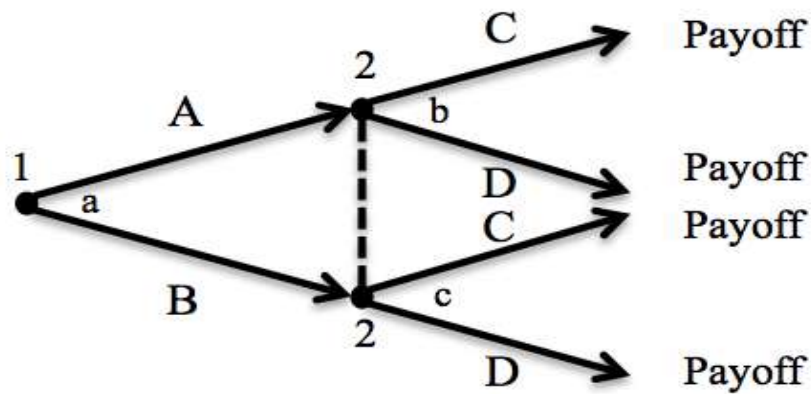
<sup>15</sup> Theory of Games and Economic Behavior (ed. XVI) – J. Von Neumann, O. Morgenstern, 2004



Black dots are used to represent nodes and are identified by lowercase letters (a, b, c). Each node is also accompanied by a sign indicating the player who is taking an action at that stage of the game; the choice of the sign depends on the names given to the players: in the tree above, players are identified as “Player 1” and “Player 2”, thus each node is characterized by the presence of the number 1 or 2, respectively; players, however, might be called with proper names and hence identified using the initial letter of their name.

Capital letters used in correspondence of the branches indicate the available actions for each player at that specific node (A, B, C, D, E, F). Node “a” is commonly referred to as the “initial node”, being it related to the decision that starts the game. The initial node is also part of another category, that of “decision nodes”, classified as those nodes where a decision is made (a, b, c) and distinguished from the “terminal nodes”, identified as those stages where the game ends and an outcome is obtained (Payoff). Interestingly, each terminal node corresponds to a unique path through the tree.

One interesting aspect of the extensive form is the opportunity to represent the information each player has when making a decision. This particular possibility is easily achieved through the description of players’ awareness about their position in the tree. Taking into consideration the graphic example provided above, it is clear that Player 2 could find himself in node “b” or “c” as a result of Player 1’s decision in node “a”; by observing this decision, Player 2 knows his exact position in the tree and his available actions. Nevertheless, there might be a different decisional context for Player 2, under the assumption that he is not given the opportunity to observe Player 1’s action. To make this clearer, the advice is to let the previous game behind and pay attention to the new one in the following page:

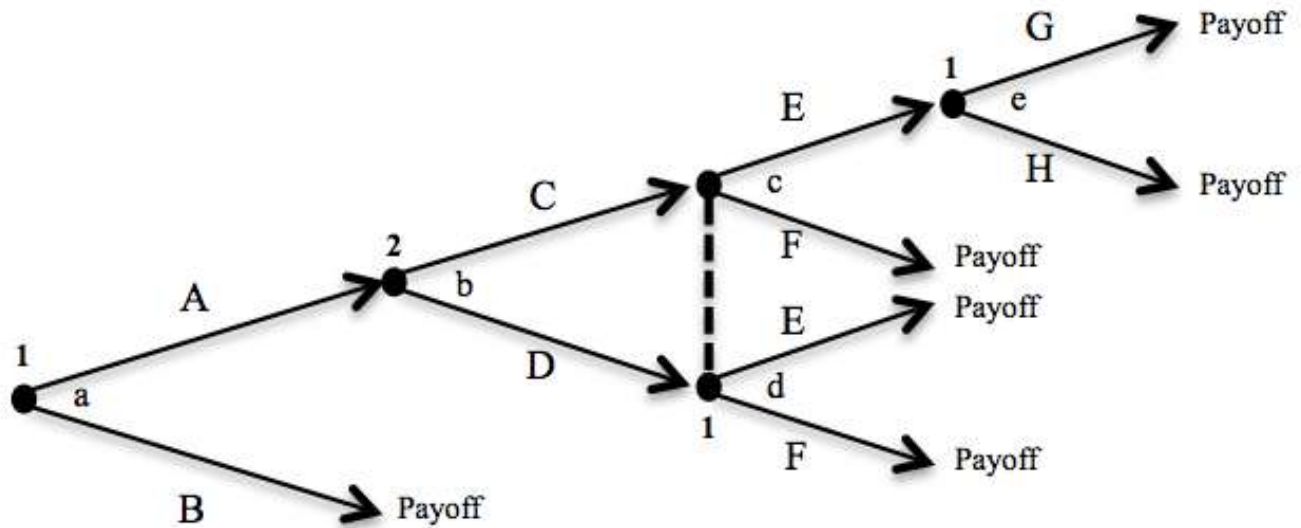


Here, the situation is the following: Player 1 chooses an action between A and B, then Player 2 does the same with actions C and D without knowing what Player 1 has chosen before. This unawareness determines the impossibility for Player 2 to distinguish between nodes “b” and “c”, with the dotted line used to represent this exact situation. Strictly related to the concept of information is the notion of “information set”, intended as a set describing the group of decision nodes connected by dashed lines and thus impossible to be distinguished by the interested player. However, information sets may also consist of a single decision node, as it is for node “a” in both trees. In the second tree, on the other hand, nodes “b” and “c” are contained in the same information set. Only one decision is made at each information set and hence the number of information sets in a game precisely reflects the number of decisions each player has to make. Information sets containing multiple nodes typically appear in situations of simultaneous decision, where players contemporarily make a choice and hence there is no possibility for one of them to distinguish among the various decision nodes he might be occupying.

The positive aspect of the extensive form stands in the opportunity to represent each game using a step-by-step approach, giving the representation not only a more chronological sense but also a higher clearance in its logical passages.

Before introducing the second approach to game representation, namely the “normal form”, it is useful to dedicate some lines to define the concept of strategy in the context of game theory. The formal definition of strategy identifies it as “a complete contingent plan for a player in the game”<sup>16</sup>, where complete contingent plan is intended as the extensive description of a player’s behaviour and hence the specification of his actions throughout each existing decision point. A practical example might prove useful in the attempt to clarify how strategies work in a game theoretic context. Consider the extensive form below:

<sup>16</sup>Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 22)



A strategy for Player 1 must specify actions that would be taken at nodes “a”, “c”, “d” and “e”. What is most interesting about this strategy specification is that it is necessary even when the idea of the player is that of choosing action B at node “a”, hence ending the game in its early stages. Strategies are usually written by referring to the labels of different actions. In the example above, Player 1 would have the following strategies available: AEG, AEH, AFG, AFH, BEG, BEH, BFG, BFH. As it is possible to see, each and every strategy takes into account each and every information set, thus specifying actions even for decision nodes that will never be reached according to a certain decision path. In the context of game theory, the concept of strategy is expanded through a couple of important formalisms, namely the “strategy space” and the “strategy profile”. The strategy space (or set) is a set comprising each of the possible strategies of a certain player in the game<sup>17</sup>: take a player  $i$ , the strategy space “ $S_i$ ” is the set of all possible strategies for this player. The strategy profile is instead a vector of strategies, one for each player in a game; more precisely, it describes strategies for all the players in a game: take a game with  $n$  players, a strategy profile is a vector  $s = (s_1, s_2, \dots, s_n)$ , where  $s_i$  is the strategy of player  $i$ , for  $i = 1, 2, \dots, n$ .

In this specification around the concept of strategy and some of its formalisms it is possible to understand the essence of its definition. The idea of “complete contingent plan” is founded over the necessity of specifying one player’s moves in every possible information set, not only for analytical reasons but also for rationality purposes: when choosing a strategy, a player takes into consideration beliefs over other players’ strategies and this implies consideration of actions that will be implemented at future decision nodes. To conclude this digression over the meaning of strategy and its completeness, there is another important reason to consider: a strategy must be complete and describe a player’s actions in every decision set because human nature implies mistakes, thus imposing awareness of what actions to take even in stages that should have never been reached.

<sup>17</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 23)

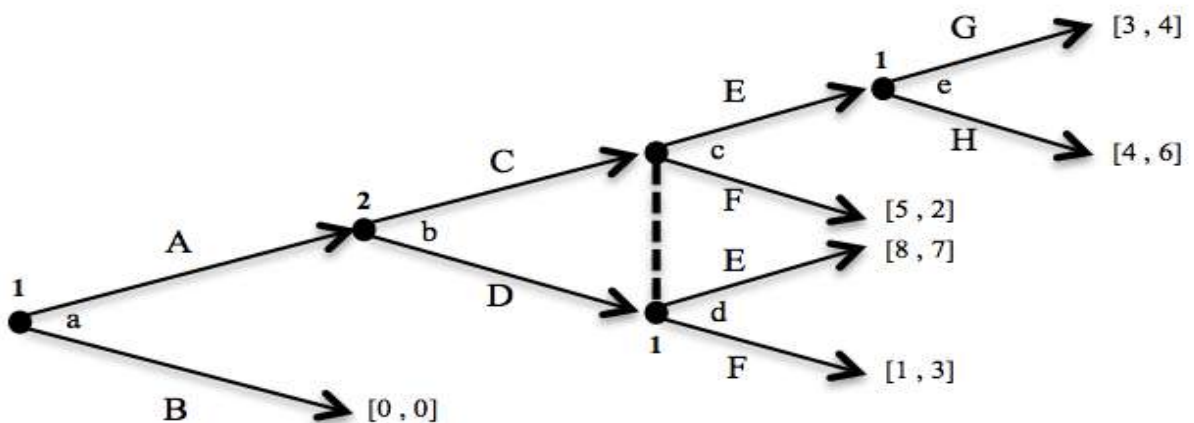
Strategies are a critical element in the context of game theory and their importance stands in their descriptive power concerning players' behaviour in cooperative and competitive contexts. As specified above, this descriptive capacity is perfectly put in practice in the normal form representations that will be presented below.

This insight into the game theoretic idea of strategy does not end in itself and proves instead helpful to approach the second method for representing games. This alternative procedure, commonly known as the “normal form”, is entirely built around the concept of strategy and for this reason is often renamed as “strategic form”. While the extensive form is more intuitive, this representation works on dimension and presents a more compact layout. In his book “*Strategy*”, Joel Watson clearly describes the structure and functioning of normal form games and starts from the above-mentioned concept of strategy profile. In extensive form games, any strategy profile describes a specific path that will be followed across the tree and hence the terminal node that will be reached; this means that each terminal node is associated with a payoff vector for the players and, consequently, that each strategy profile implies a specific payoff vector.

From a strictly mathematical standpoint, taken a single player “i”, it is possible to define a function  $[u_i: S \rightarrow \mathbf{R}]$ , whose domain is the set of strategy profiles and whose range is the set of real numbers, such that for each strategy profile  $s \in S$  available to the player,  $u_i(s)$  represents his payoff. According to this description, this function gets the name of “payoff function”. Considering the extensive form game presented above, the set of strategy profiles would be as follows:

$$S = \left\{ (AEG, C), (AEG, D), (AEH, C), (AEH, D), (AFG, C), (AFG, D), (AFH, C), (AFH, D), (BEG, C), (BEG, D), \right. \\ \left. (BEH, C), (BEH, D), (BFG, C), (BFG, D), (BFH, C), (BFH, D) \right\}$$

The set “S” is the starting point for the definition of players' payoff functions. More precisely, as previously stated, any strategy profile has a related payoff function  $u_i(s)$  and its value is easily obtained by tracing the relative path through the tree and then observing which terminal node is reached. For this process to be more intuitive, it might be useful to propose the former tree once again and to give its terminal nodes numerical payoffs:



To make a practical example, consider the strategy profile (BEG,D) and identify the terminal node it reaches: since Player 1 chooses action B, the game ends immediately and provides both players with a payoff of 0; this is translated in, using payoff function terms,  $u_1(BEG, D) = 0$  and  $u_2(BEG, D) = 0$ .

The same reasoning applies to all the remaining strategy profiles.

All of this above can be considered as the founding core of the normal form representation, but there is still one element missing: compactness. In a two-player game, strategy profiles and relative payoff functions can be combined in an intuitive representation through the use of a matrix: rows refer to strategies of one player and columns to those of the other; each cell in the matrix is filled with the payoff vector related to the strategy profile composed by the strategies in the corresponding row and column.

To clarify how a matrix is built, it might be helpful to translate the previous extensive form in a matrix representation:

<i>P1/P2</i>	<b>C</b>	<b>D</b>
<b>AEG</b>	3,4	8,7
<b>AEH</b>	4,6	8,7
<b>AFG</b>	5,2	1,3
<b>AFH</b>	5,2	1,3
<b>BEG</b>	0,0	0,0
<b>BEH</b>	0,0	0,0
<b>BFG</b>	0,0	0,0
<b>BFH</b>	0,0	0,0

To conclude this introduction over normal form (or strategic) games, it must be said that they constitute a synthetic representation of strategic contexts, undoubtedly useful for analytical purposes, whereas a little weak in terms of descriptive power. Presumably for this reason, Watson uses the expression “fundamental representation of a game” when referring to the normal form. An important consequence of the lack of descriptive power is the difficulty in the conversion of normal form games in the extensive form: while the passage from extensive to normal form is straightforward and there is a single way of doing so, the reverse assumption is not sustained and a single normal form may be represented extensively using different structures. This has led theorists to doubt the informative content of normal form representations. However, it must be recognized that this second approach offers a more easy-to-handle structure for the analysis of strategic settings. To be more specific, these forms are perfectly suitable for settings hosting players that act simultaneously and independently, hence making all of their decisions before observing what other players do (one-shot or static games).

## SOLUTIONS AND EQUILIBRIUM

As games are built, solutions must be found and multiple methods in different settings are helpful in the achievement of this final goal. However, prior to dealing with these techniques, it might prove useful to give a more precise definition of what a solution represents in game theoretic contexts: solutions describe the strategies that will be played and thus the outcome of the game; these are searched with the intention to identify each player's best strategy when other players are playing their best responses, intended as the strategies that produce the most favourable outcomes given other players' actions. Solutions are found according to some concepts, commonly known as "solution concepts", that work as models or rules to determine how a game will be played: Dominant Strategy Equilibrium, Pareto Optimality, Nash Equilibrium, etc.. The choice and application of these concepts varies according to degree of dynamism presented by the strategic setting under analysis. More precisely, game theory is applied to situations of two kinds: static settings and dynamic settings. The first category refers to games where the actions of all the players are taken simultaneously and independently (one-shot or static games). The second category refers to games in which actions are taken sequentially and players have different degrees of information as the game evolves.

### Dominance

A fundamental concept in static settings is dominance. Formally, one player's pure strategy is dominated if there is a strategy (pure or mixed) such that the payoff (utility) of the second outclasses that of the first, for all the strategy profiles of the other players. The procedure for the identification of dominated strategies inside a game is initially straightforward and requires the analysis of pure strategies only. This task is easy to complete when the game is represented in its normal form. Take the matrix below:

<i>P1/P2</i>	<b>C</b>	<b>D</b>
<b>A</b>	2,3	5,0
<b>B</b>	1,0	4,3

Suppose the goal is to check the presence of dominated strategies for Player 1. The only thing to do is to compare payoffs on the different rows and see if one row presents larger ones relative to the other. In this specific case, it is easy to detect how strategy B is dominated by A, thus leaving the latter as the only rational choice for Player 1. For settings of this kind, the identification of dominated strategies is a fast and simple process. Things get a little more complex when dominance does not happen in the field of pure strategies, but requires instead the analysis of mixed strategies. To clarify, mixed strategies take place when a player selects his strategy according to a certain probability distribution. As a consequence, a player choosing a mixed strategy is not able to define a payoff with certainty and thus uses the concept of

“expected value” (or expected payoff): it is the weighted average payoff that the player would get if he played according to a certain mixed strategy and its related probability distribution; each weight is equal to the probability assigned to the relative pure strategy. Going back to the search for dominated strategies, when mixed strategies are involved the solution is harder to be identified and some tricks are needed, though the discussion of these techniques is not appropriate in this context. For dominance to take place there must be strict inequality among the payoffs delivered by different strategies, with one delivering strictly more than another. This means that dominance is compromised even in the case of one strategy delivering the same payoff as another against one strategy from other players. Nevertheless, an additional concept in the field of dominance exists under the name of “weak dominance” and takes place when a player’s strategy delivers payoffs at least as large as those from another strategy, for all the strategy profiles of other players, and delivers a strictly higher payoff against at least one move from the other players. For a deeper understanding, take the matrix below:

<i>P1/P2</i>	<b>C</b>	<b>D</b>
<b>A</b>	3,5	3,5
<b>B</b>	7,0	1,1

In this strategic setting, Player 2’s strategy D weakly dominates strategy C: if Player 1 chooses B, D delivers a strictly higher payoff than C; if Player 1 chooses A, then C and D deliver the exact same payoff; hence, Player 2 has no rational reason to choose strategy C. Despite making sense, the concept of weak dominance presents some problems: first, according to the rationality of a player’s beliefs, it may be rational to choose a weakly dominated strategy as a best response; second, weak dominance implies some disturbing technicalities in the attempt to create a general theory of behaviour.

### **Best Response**

Dominance is an undoubtedly powerful concept in the analysis of static games, but one of its major issues concerns the fact that a single game might present more than one undominated strategy for a single player. How do players select a strategy in settings of this kind? To answer this question it is important to understand that rational players build beliefs about other players’ potential moves. Technically, a belief determines the use of a certain probability distribution over other players’ sets of strategies to assess which strategies will be selected. In its formal mathematical representation, a belief appears as a probability distribution  $[\theta_{-i} \in \Delta S_{-i}]$ , with  $\Delta S_{-i}$  being the set of probability distributions for strategies of all the players except player “i”. Clearly, a player’s belief may be totally inaccurate. Since the previous paragraph introduced the concept of mixed strategy, it might be appropriate to clarify that beliefs are strictly related to mixed strategies: for a certain belief, a player will select his strategy according to the probability distribution

it implies and hence will form his mixed strategy. Rational behaviour implies that a random player will choose his strategy with the goal of maximizing the expected payoff. In the presence of a certain belief, the player's most rational move would be that of selecting the strategy delivering the highest possible payoff against this belief, also known as his "best response". In the attempt to link the two concepts of best response and belief, the formal definition of the first concept appears useful: given player  $i$ 's belief  $[\theta_{-i} \in \Delta S_{-i}]$  about the strategies played by the other players, player  $i$ 's strategy  $s_i \in S_i$  is a best response if  $u_i(s_i, \theta_{-i}) \geq u_i(s'_i, \theta_{-i})$ , for every  $s'_i \in S_i$ <sup>18</sup>. Any player's belief is associated with a best response, without implying the singularity of the latter; more precisely, a single belief might be associated with more than a single best response, depending on the related expected payoffs. For this reason, each and every belief  $\theta_{-i}$  has a corresponding set of best responses  $BR_i(\theta_{-i})$ .

The concepts of dominance and best response have a relationship that differs based on the characteristics of the strategic setting being considered. In a finite two-player game, best responses can only be strategies that are not strictly dominated. For the generalization of this concept to games counting more than two players, it is required to define the concepts of correlated and uncorrelated beliefs: in a very simplistic view, uncorrelated beliefs imply that strategies of players different from player "i" ( $S_{-i}$ ) are independent, from a probabilistic perspective; a correlated belief for player "i", on the other hand, is any general belief from the set  $\Delta S_{-i}$  of the probability distributions belonging to each player except "i". Generally, players are assumed to detain uncorrelated beliefs and, for any finite game, this determines the same conclusion as above: strictly dominated strategies cannot represent best responses. Whenever games allow the presence of correlated beliefs, a situation closer to reality, then any strategy is undominated only in case it represents a best response to some belief. In this context, the set of strategies potentially adopted by a player as a rational response to his belief is nothing but the set of undominated strategies.

### Rationalizability and Iterated Dominance

The ideas of dominance and best response can be extended in their application and combined in a more rational approach to the solution of a game. Taking a two-player game, the starting point of this analysis is the assumption of common knowledge between the players: they both know they act rationally and understand the game being played; they both know each one knows that and so on and so forth.

Considering a game in its normal form, it is possible to undertake a process of this kind:

$P1/P2$	X	Y	Z
A	4,4	1,6	1,5
B	1,1	4,2	2,3

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<sup>18</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 54)

Player 1 does not present strictly dominated strategies, hence it appears rational for him to play both A or B. For what concerns Player 2, strategy X is strictly dominated by Y and thus it is rational to assume that will not be played in any situation. This assumption changes the situation for Player 1, since the awareness of strategy X not being played makes A strictly dominated by B. The result is the following:

<i>P1/P2</i>	X	Y	Z
A	4,4	1,6	1,5
B	1,1	4,2	2,3

The process has another step: now that Player 2 is sure that Player 1, guided by rationality, will not play strategy A, he can rationally choose to play strategy Z with certainty, being it the option delivering the highest payoff.

<i>P1/P2</i>	X	Y	Z
A	4,4	1,6	1,5
B	1,1	4,2	2,3

In the end, the game is simplified to a single strategy profile rationally played in this setting (B,Z).

This procedure is typically referred to as “iterated dominance” and can be applied, with different rates of success, to any normal form game. It consists of simply eliminating all the dominated strategies in a game, thus leaving a reduced game and set of strategy profiles; in this new setting, dominated strategies must be cancelled again and hence result in further reduction of the game and set of strategy profiles; this reduction goes on until no more dominated strategies can be identified and a final set of rationally acceptable strategy profiles is identified.

The founding idea of this technique stands in the common acceptance of human rationality: one player will select a strategy that represents a best response to a certain belief about the behaviour of the other player, hence he will rationalize his move. For this reason, the set of strategies that resist through the process of iterated dominance are called “rationalizable strategies”. It must be said that this procedure works effectively in finite games, while it requires some refinements for application in infinite games. Furthermore, the assumption of common knowledge is hardly found in real-life contexts and this complicates the use of a procedure of this kind. Finally, it must be observed that the process of rationalizability does not always result in a single final strategy profile and, since the course of iterated dominance is concluded, multiple profiles might be rationally played. In this context, players will have beliefs concerning the behaviour of their fellows and will presumably act accordingly. However, the presence of beliefs does not imply their accuracy and thus coordination for an optimal outcome is complex. This situation is commonly labelled as “strategic uncertainty” and its description proves useful in the conclusion of a paragraph over

rationalizability to highlight the limits of this solution concept and to understand how its theoretical simplicity actually faces some practical obstacles.

## Nash Equilibrium

The major consequence of strategic uncertainty stands in the possibility for players to achieve less-than-optimal outcomes, as a result of their lack of coordination. For this reason, there is a strong tendency to solve situations of strategic uncertainty and, based on the context in which the setting takes place, different approaches are implemented: communication between players, social norms, historical behaviour. All of this results in a greater coherence between players' belief and actual decisions, hence allowing the achievement of optimal outcomes through coordination. What happens is that a certain degree of coordination increases the accuracy of players' beliefs and offers them the opportunity to play a best response. Being this the situation for both players, the preferred strategy profile contains actions that appear as "mutual best responses" and that create a situation of equilibrium, as John Nash defined it. Thanks to his studies, the field of game theory was enriched of a concept of critical importance: the Nash equilibrium (NE). Formally, a Nash equilibrium is defined as a strategy profile  $s \in S$  for which  $s_i \in BR_i(s_{-i})$ , for each player "i"; this coincides with saying that  $u_i(s_i, s_{-i}) \geq u_i(s'_i, s_{-i})$  for every  $s'_i \in S_i$  and each player "i"<sup>19</sup>.

From this definition, it is possible to understand how the ideas of equilibrium and mutual best response survive when players attain to what coordination has designed as the optimal strategic path. When beliefs about one player's actions are not strong enough to support his trustworthiness, then the other player will be easily discouraged to play according to the optimal strategy profile (or Nash equilibrium).

The Nash equilibrium also has a stronger version, commonly known as "strict Nash equilibrium", which implies that: a certain strategy profile  $s$  is a strict NE when  $s_i$  is the only best response to  $s_{-i}$  [ $\{s_i\} = BR_i(s_{-i})$ ], for each player "i".

In terms of identification, Nash equilibria can be easily individuated inside the matrix of a normal form game. To understand how the procedure works, the most important thing to keep in mind is that NEs are best responses. Consider the game below:

<i>P1/P2</i>	D	E	F
A	6,7	4,8	1,5
B	9,4	4,2	6,3
C	8,6	5,5	6,7

The first step consists in identifying Player 1's best responses to strategies of Player 2, easily found by looking at the payoffs in each cell: for example, Player 1's strategy "B" is the best response to Player 2's

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<sup>19</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 97)

“D”. The exact same thing must be done for Player 2: for example, Player 2’s strategy “E” is the best response to Player 1’s “A”. This said, all of the best responses are highlighted in the following matrix:

<i>P1/P2</i>	D	E	F
A	6,7	4, <u>8</u>	1,5
B	<u>9</u> , <u>4</u>	4,2	<u>6</u> ,3
C	8,6	<u>5</u> ,5	<u>6</u> , <u>7</u>

As it is possible to see, some cells present a couple of best responses or a set of mutual best responses, to recall what mentioned above. These cells and the relative strategy profiles are Nash equilibria. In this case there is also the presence of a strict Nash equilibrium, namely the strategy profile (B,D), since both strategies are unique best response one to the other. In order to insert the concept of Nash equilibrium in the context of what has been treated before, it is important to say that NEs are always rationalizable strategies. As a consequence, their identification might also start with iterated dominance, hence simplifying the procedure. Also, it is useful to remember that a single game can present more than a single NE, but might also present none of them. Settings containing no Nash equilibrium are defined as strictly competitive games, where each outcome implies the presence of a winner and a loser. The absence of a single or multiple Nash equilibriums, however, might be assessed through a further step. Up to this point, NEs have been analysed and considered as pure-strategy profiles and thus a void has been left in the research, not taking into account the domain of mixed-strategy profiles. Actually, mixed strategies present the necessary traits to be Nash equilibriums and, as previously stated for pure-strategy NEs, their main characteristic stands in the impossibility for any player to increase the payoff by selecting an alternative strategy. Formally, the definition of a mixed strategy Nash equilibrium shows some slight differences from its pure strategy version: considering a strategy profile  $\sigma = (\sigma_1, \sigma_2, \dots, \sigma_n)$ , with  $\sigma_i \in \Delta S_i$  for each player “i”, profile  $\sigma$  is a mixed-strategy NE if and only if  $u_i(\sigma_i, \sigma_{-i}) \geq u_i(s'_i, \sigma_{-i})$ , for each  $s'_i \in S_i$  and each player “i”; consequently,  $\sigma_i$  is a best response to  $\sigma_{-i}$  for every player “i”<sup>20</sup>. For this last statement to be true, the mixed strategy  $\sigma_i$  must put positive probability only on pure strategies that are best responses and absolutely not on dominated strategies.

The concept of Nash equilibrium concludes the analysis concerning the identification of solutions in static strategic settings and helps to set the basis for the next step. Following this first approach to solution concepts, it is now time to face the second category of strategic situations: dynamic settings.

Previously in this chapter, the discussion concerning the differences between normal and extensive form underlined how some researchers believe in the latter as a more informative tool. While in static settings the focus was on normal form games, dynamic settings imply the analysis of games in their extensive form and believe in the ability of this representation to provide improved versions of the concepts of rationalizability

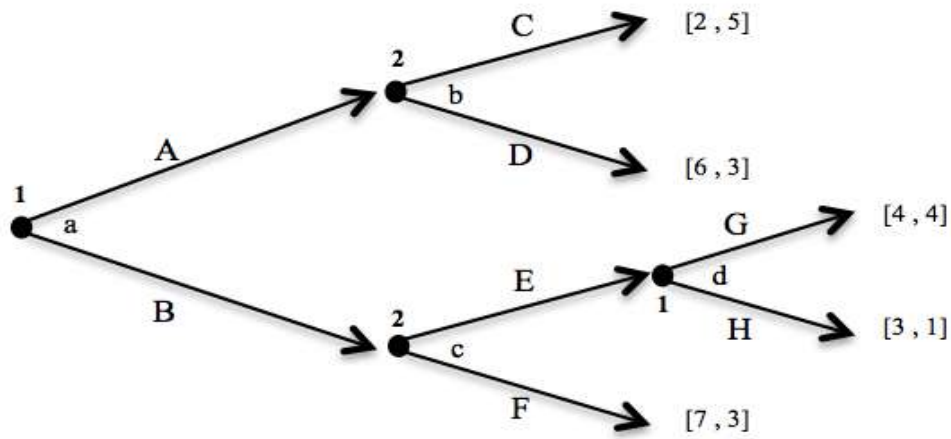
<sup>20</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 133)

and Nash equilibrium. Again, the role of information in players' decisions and outcomes will be discussed as one of the main elements of dynamism in this settings, together with players' assessment of the consequences each action might deliver. As stated in the previous pages, the objective of the following lines will be that of analysing how solutions to games can be obtained directly from the extensive form, in settings where sequential decisions are made and where players show different degrees of information.

### **Sequential Rationality and Subgame Perfection**

The problem with normal form games and their equilibriums stands in the possibility of having a solution that specifies an absolutely irrational action. This often happens in the context of ex ante decisions, with game plans designed as unique actions and thus avoiding the consideration of single decision nodes for their actual relevance. The desire to overcome the pitfalls of ex ante decisions led to the introduction of a different concept in the field of rationality, namely "sequential rationality": while common rationality supported the idea of players opting for best responses ex ante, this new element was based on the belief that players must act rationally in each and every decision node individually. More formally, the founding element of this concept is the idea that a player's optimal strategy implies the maximization of the expected payoff for each and every of his information sets, even those that might be potentially never reached according to his best-scenario game plan.

Sequential Rationality can be observed and analysed, with no specific obstacles, in extensive form games. The procedure requires the acceptance of payoff-maximization goals by the players, whose rational actions should move in this case towards the highest-paying outcomes. Given this contextual information, it is possible to understand how a sequential rationality analysis might reasonably start from the observation of a game's payoffs, which in extensive forms can be individuated at the terminal nodes of a tree. Each terminal node is directly related to an action and it is logical to believe that, given the assumption of rationality, the deciding player will opt for the payoff-maximizing one. The analysis does not stop and proceeds backwards, analysing decision nodes that are predecessors of those already evaluated and doing so in a condition of awareness concerning future behaviour. This process continues until the initial node is reached. As it is clear, this procedure moves from the end of the game to the beginning and hence is commonly known as "backward induction". With the risk of appearing redundant, backward induction might be described more simplistically as the process of analysing a game from the end to the start by eliminating, at each decision node, actions that are dominated according to a payoff-maximizing perspective. To give the procedure concreteness, consider the example in the following page:



Starting from the end, Player 1 has a choice between actions G and H and will choose the first in a payoff-maximizing intention, since it pays 4 against the 3 of action H. In this part of the game, Player 2 can select either E or F, but he does so under the awareness of Player 1's future choice; this encourages Player 2 to opt for action E which, combined with Player 1's action G, will pay him 4 against the 3 of action F. Nevertheless, Player 2 also presents an upper decision node with actions C and D; he will clearly select C, as it is possible to assess directly from the tree. There is one last node to analyse, the initial one, and Player 1 has enough information to select between actions A and B according to his payoff-maximizing intentions; selecting A, he faces Player 2's selection of C and consequent payoff of 2; on the other hand, the selection of B is followed by Player 2's action E, after which Player 1 will opt for G and hence guarantee a payoff of 4; as a logical consequence, Player 1 will go for action B.

The outcome of the backward induction procedure applied to this specific case is a rational strategy profile (BG,CE) which, using the normal form representation of the above tree, can be identified as the Nash equilibrium of this game:

<i>PI/P2</i>	<b>CE</b>	<b>CF</b>	<b>DE</b>	<b>DF</b>
<b>AG</b>	2 , <u>5</u>	2 , <u>5</u>	<u>6</u> , 3	6 , 3
<b>AH</b>	2 , <u>5</u>	2 , <u>5</u>	<u>6</u> , 3	6 , 3
<b>BG</b>	<u>4</u> , <u>4</u>	<u>7</u> , 3	4 , <u>4</u>	<u>7</u> , 3
<b>BH</b>	3 , 1	<u>7</u> , <u>3</u>	3 , 1	<u>7</u> , <u>3</u>

The matrix shows how the strategy profile (BG,CE) is a Nash equilibrium, despite not being the only one. This is another important feature of backward induction, when applied to finite games of perfect information: it provides a subset of strategy profiles, at least one of which is a Nash equilibrium. Furthermore, the Nash equilibrium identified through backward induction is an advanced version of the concept mentioned in the previous pages and is indeed named differently. Specifically, the name used for

this solution is “subgame perfect Nash equilibrium” (SPE). The expression “subgame perfect” is something unknown up to this point in the text and needs further explanation. First step is to define what a subgame is: in an extensive form game, a node “x” initiates a subgame if neither “x” nor any of its successor nodes belong to an information set that contains nodes different from the successors of “x”; consequently, the subgame is a tree structure defined by node “x” and its successor nodes. To make this definition clearer, consider the extensive form presented before: node “a” initiates a subgame represented by the entire game; node “c” initiates what is called a “proper” subgame which includes successor node “d” and a terminal node. With the definition of subgame now in mind, the concept of subgame perfect Nash equilibrium can be made clearer by describing it as a strategy profile that specifies a Nash equilibrium for every subgame in the original game<sup>21</sup>. This idea and concepts are founded over the previously observed idea of sequential rationality, according to which a player should choose rational actions throughout each and every decision stage of a certain game. As a consequence, one proper solution concept should work when applied from whatever part of the game and a SPE does so by holding true in every single subgame.

All of this can be clarified through a practical example. In the extensive form game described above the backward induction procedure offered a SPE, namely the strategy profile (BG,CE). Observing the normal form representation of the same game, it is possible to identify two additional Nash equilibria: (BH,CF) and (BH,DF). According to what was described in the previous lines concerning subgame perfect Nash equilibria, one might expect the strategy profile (BG,CE) to contain Nash equilibria for every existing subgame. To assess the truthfulness of this statement, consider the subgame’s normal form below:

<i>P1/P2</i>	<b>E</b>	<b>F</b>
<b>G</b>	<u>4</u> , <u>4</u>	<u>7</u> , 3
<b>H</b>	3 , 1	<u>7</u> , <u>3</u>

The matrix shows two Nash equilibria for the subgame: (G,E) and (H,F). This result is perfectly aligned with our SPE, which apparently contains NEs for all of the subgames included in the tree and thus is coherent with the definition presented above. Also, this proof is in line with the result expected from the procedure of backward induction, precisely the identification of a subgame perfect Nash equilibrium.

These last pages were written with the intention to complete a general introduction to the world of game theory. More precisely, the last part was dedicated to the analysis of some basic solution concepts for static and dynamic settings. The adverb “some” is not randomly chosen, but wants instead to highlight how the set of solution techniques presents an undoubtedly larger scope relative to the few alternatives presented. However, the goal was to provide the reader with some insights into the most powerful and founding concepts and to leave space for further development in the following chapters, attempting to proceed in full

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<sup>21</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 189)

coherence with the central topic of this work. That said, indeed, the second part of this chapter will bring the reader closer to a more direct application of game theory in M&A contexts and deals. Through a detailed analysis of the strategic settings, the next pages will try to clarify how game theoretic concepts can be applied to the representation of M&A negotiations, what assumptions they require and how far these go from real-life conditions.

## **PART 2 – APPLICATION OF GAME THEORY TO M&A SETTINGS**

Each and every concept encountered in the previous pages can be applied, together with a wide variety of additional game theoretic elements, to settings describing M&A operations. Several game theoretic models are developed in an attempt to analyse strategic contexts of this kind and to answer multiple questions surrounding these deals, especially those concerning the actual relevance of M&A operations in the context of typical corporate value-creation goals. To undertake such a complete analysis, scholars and researchers in the field must start by recognizing how a merger and/or acquisition deal might represent a value-creation operation both in the limited context of the single event and in the wider perspective of a platform-like action, where the final goal is to create the right base for a series of further mergers and/or acquisitions. In the context of a single event, M&A operations can create value as the result of the materialization of one or multiple motives driving M&A activity in the first place (see Ch. 1, p. 10-12). Nevertheless, whatever the underlying reason to conclude the deal is, one of the major determinants for the achievement of a positive outcome in terms of increase in shareholder value is the price paid by the acquirer for the target firm. For this reason, game theoretic models in the field of M&A transactions often focus on the pricing stage of the operation and hence will be treated in detail throughout the following pages. As explained above, however, the analysis of M&A operations in the context of the single event might sometimes drive misleading conclusions concerning the appeal of a certain deal, hence imposing the examination of certain transactions in relation to their role as platforms for further internal development or external growth through other mergers and/or acquisitions. These “buy-and-build” strategies can be conceptualized in the form of option games, where an acquisition strategy is presented as a series of real options for the firm in a context of competitive responses and changing market conditions<sup>22</sup>.

In the following pages, the work will proceed by showing how analysis of the kinds described above can be conducted through the use of game theoretic models and how the founding elements of these frameworks combine to create a valid tool for the valuation of M&A investment opportunities.

## **GAME THEORETIC MODELS IN M&A PRICING**

To introduce the idea of pricing in mergers and acquisitions transactions, it might be reasonable to start by quoting some lines from the “*International Journal of Economics, Commerce and Management*” and more precisely from the work of Abraham Moskovicz: “[...] successful transactions should show a reasonable

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<sup>22</sup> Acquisition Strategies as Option Games - Journal of Applied Corporate Finance – H.T.J. Smit, 2001

proportion between the return/gain likely to incur and the investment amount. Mergers can be successful when the price to be paid by the acquiring company to the target firm is based on a realistic amount that is in viable proportion to the tangible and intangible returns as well.”<sup>23</sup>. The importance of concluding the operation at a reasonable price, including future expenses that may be required for the union to work (i.e. post-acquisition integration), led an increasing number of scholars and researchers to place the problem of overpayment in the top ranks for what concerns the major causes of failure in M&A operations. Before advancing to the analysis of game theoretic applications in the process of M&A pricing, a clear understanding of what this procedure actually involves might later prove useful for a deeper comprehension of the treated concepts. Nevertheless, not being the procedure of pricing a central topic in this work, the following elements will only be subject to a superficial coverage and hence might require the reader to consult the studies of others for more complete insights.

As a starting point for this discussion over price one could take the concept of “Fair Market Value”, defined as “the price, in terms of cash or equivalent, that a buyer could reasonably be expected to pay, and a seller [...] to accept, if the business were exposed for sale on the open market for a reasonable period of time, with both buyer and seller being in possession of the pertinent facts and neither being under any compulsion to act.”<sup>24</sup>. The problem with fair market value lies in the obstacles encountered by parties in real-life negotiations, of which some examples follow:

- Payment with neither cash nor cash equivalent, hence subject to variations.
- Private negotiations not exposed on the open market.
- Acquisition opportunity on the market for an excessively long time and thus pressure on the seller for reducing the asking price.
- Parties in the transaction might not possess all the pertinent information and emotions could drive misaligned offers.

Clearly, a wide array of alternative causes might drive negotiations away from the fair market value and these above are examples of the most common obstacles to a perfectly balanced deal. However, this is nothing but the essence of M&A negotiations: buyers and sellers sit to the table with the objective of obtaining the best available bargain and take advantage of these obstacles to achieve such a goal. An important factor during negotiations is the choice of a valuation method for assessing the value of the target firm. Both the buyer and the seller need a number, in order for them to conduct the negotiations on a solid numerical base. Unfortunately, several valuation techniques are available and rely on distinguished data, hence often providing different values for the same entity. A simple distinction classifies valuation methods in “Direct Methods” and “Indirect Methods”, further separating these two categories in four subsets: direct

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<sup>23</sup> Proper Target Firm Valuation: The Must Do on a M&A Process – International Journal of Economics, Commerce and Management (Vol. VI, Issue 12, December 2018) – A. Moskovicz, 2018

<sup>24</sup> M&A Viewpoint: The Value, Price and Cost of Acquisitions (Part 2) – The Journal of Applied M&A Theory – R.B. Machiz, 2005

methods relying on cash flows, direct methods relying on other variables (i.e. revenues, earnings, etc.), indirect methods relying on cash flows, indirect methods relying on other variables. Direct valuation methods provide an estimation of the company's fundamental value, whereas indirect ones provide information relative to the fair pricing of the company with respect to a benchmark or to peers<sup>25</sup>. Once valuations have been completed and bidders have a reasonable base for negotiating, the process evolves according to individual aspirations and concludes when parties identify a commonly satisfying deal. Sometimes, as highlighted above for the seller, bidders might agree on less-than-optimal deals as a result of secondary objectives underlying the negotiation. This might be the case of the “buy-and-build” strategies discussed earlier in this chapter, where buyers might accept disadvantageous deals with the intention of taking advantage of the operation for future gains that will eventually cover the previous loss.

The translation of the pricing procedure in a game theoretic context requires the introduction to a new category of strategic settings, namely the “bargaining problems”. In an extremely simplistic perspective, bargaining refers to nothing but a competitive negotiation process where individuals claim value by seeking positions of advantage and obtaining favourable agreements. The process often has its main focus around the element of price, though that not being its exclusive lever. As for most concepts in the field of economics, the founding elements of bargaining can be identified in the renowned idea of resource scarcity: assuming that the world does not offer resources in a suitable amount for the satisfaction of everyone in the desired measure, agents negotiate over the resources they own aiming to exchange them with something they lack, in order to reach a higher degree of satisfaction. Deals that make both parties better off are said to create value and this is essentially what negotiations try to achieve, but there must be attention when considering this particular aspect: the creation of value as a consequence of a bargaining process does not imply its fair distribution among the agents, which is instead subject to a force known as “bargaining power” and precisely describing the value division scheme among players involved in a negotiation.

To fully understand bargaining problems, their solutions and their potential application to M&A negotiations, it might be useful to enter a more formal dimension and to discover how these strategic situations are analysed and interpreted. For the following concepts to be more intuitively comprehended, an applied example will be presented.

A typical two-player bargaining setting might concern the decision to undertake or not a certain task. For this action to take place, the perfect deal will be an element of a set of infinite options. Prior to understanding how to optimally analyse this vast amount of opportunities, one thing can be clarified and is the utility outcome for both players in a take-place vs. non-take-place scenario. This specification occurs through the use of payoff vectors, which in this example are described as follows: if the task is undertaken, Player 1 (Manager) gets 5 and Player 2 (Operator) gets 3; if the task is not undertaken, both players get 1. Once described, these payoff vectors form what is called the “bargaining set” or  $V = \{(5,3), (1,1)\}$ . The

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<sup>25</sup> Proper Target Firm Valuation: The Must Do on a M&A Process – International Journal of Economics, Commerce and Management (Vol. VI, Issue 12, December 2018) – A. Moskvicz, 2018

payoff vector (1,1), resulting if the task is not undertaken, is appropriately called the “default outcome” and represents the outcome when an agreement cannot be reached. Formally, this default outcome is written as  $d = (1,1)$ . Now, in the context of bargaining, players can introduce transfers that work as complements to the final outcomes and constitute the real essence of negotiation. These elements can have different forms, though in most of the cases they are represented as monetary transfers and are added to each player’s payoff, both in a negative (for who transfers the sum) and in a positive (for who receives the sum) way. A formal representation of payoff vectors with the inclusion of monetary transfers requires an alignment between the two measures. This means that, with a random monetary transfer being indicated as “ $t$ ” and under the assumption that its value will be positively added to the payoff of the receiver while negatively added to that of the giver, the new payoff vectors will take the form of:

$$\begin{aligned} u_1 &= v_1(z) - t \\ u_2 &= v_2(z) + t \end{aligned}$$

with  $v_i(z)$  representing the monetary value of the non-monetary payoff items. More specifically, the element “ $z$ ” functions as a descriptive item for identifying the scenario being considered when computing players’ payoffs: in a double-scenario situation as the one being considered here, the descriptive function of “ $z$ ” can be implemented by giving it a value of, for example, 0, if the task is not undertaken, or 1, if it is. As a consequence,  $v_i(z)$  for  $z = 0$  will indicate the necessity of considering players’ payoffs in a no-task scenario, hence 1; on the other hand,  $v_i(z)$  for  $z = 1$  will indicate the necessity of considering players’ payoffs in a task-undertaking scenario, hence  $v_1(1) = 5$  and  $v_2(1) = 3$ . Furthermore, following the logic of the applied setting described above, the payoff functions present a negative monetary addition to the payoff of the manager and a positive addition to that of the operator, as it would typically be. Everything written above determines that the payoff functions of the considered bargaining problem will be written as:

$$\begin{aligned} u_1 &= v_1(1) - t = 5 - t \\ u_2 &= v_2(1) + t = 3 + t \end{aligned}$$

in case the task is undertaken, or:

$$\begin{aligned} u_1 &= v_1(0) - t = 1 - t \\ u_2 &= v_2(0) + t = 1 + t \end{aligned}$$

in case it is not.

For any value given to the monetary transfer  $t$ , the resulting payoff vector will belong to the bargaining set and this can be intuitively understood by considering the starting payoff vectors  $[(5,3), (1,1)]$  as special cases with  $t = 0$ . The possibility to choose an arbitrary value for  $t$  leads to the decision of avoiding its consideration when discussing over the efficiency of each payoff vector. To be clear, the efficient outcome in a bargaining problem is considered to be the one maximizing players’ “joint value”, which is nothing but

the sum of their payoffs according to a specific payoff vector. Intuitively, the payoff vector (5,3) will be more efficient than (1,1), as the total payoff is 8 in the first case and 2 in the second. Formally, this joint value is obtained as  $[v = v_1(z) + v_2(z)]$ . Starting from the concept of joint value, it is important to treat the idea of “surplus” and to link it to what was discussed above concerning the opportunity for agents to create value through the process of bargaining: the surplus of a deal is the difference between the joint value in case of mutual agreement and the joint value in case of absence of agreement; formally, it can be written as  $[v_1(z) + v_2(z) - d_1 - d_2]$ . In the specific case analysed above, the surplus is  $[8 - 2 = 6]$ . It is the concept of surplus itself that allows to recall an important notion introduced a few lines above: the bargaining power. To understand what bargaining power is actually about, it must be made clear that agents involved in a bargaining situation have the opportunity to induce the default outcome if they want to. As a consequence, the assumption of rationality leads to sustain the idea that no agent will ever accept a deal offering less than the default outcome. This means that agents actually conduct their negotiations on nothing but the surplus and the concept of bargaining power relates to how they will divide it. To indicate the division scheme, the bargaining power of each agent is represented through the use of a bargaining weight  $\pi_i \geq 0$ , with  $i = 1,2$  and  $\pi_1 + \pi_2 = 1$ .

The whole set of concepts presented in the context of bargaining problems can be grouped into a unique solution scheme for this settings, also known with the expression “Standard Bargaining Solution”: the idea is that each player will obtain, as a result of the bargaining procedure, his default outcome plus his share of the surplus<sup>26</sup>. To give this concept a proper application, it might be useful to go back and take the previous example, simply adding some arbitrary bargaining weights  $\pi_1 = \frac{2}{3}$  and  $\pi_2 = \frac{1}{3}$ . Each player’s payoff function will then be written as follows:

$$u_1 = d_1 + \pi_1(v - d_1 - d_2) = 1 + \frac{2}{3}(8 - 1 - 1) = 5$$

$$u_2 = d_2 + \pi_2(v - d_1 - d_2) = 1 + \frac{1}{3}(8 - 1 - 1) = 3$$

Since  $\pi_1 + \pi_2 = 1$ , the sum of the payoffs gives back the exact amount of the joint value (8). Now, the standard bargaining solution does not stop here and offers the opportunity to compute a crucial element in the analysis of a bargaining setting, namely the money transfer. The procedure is extremely simple in mathematical terms and starts from the equivalence below:

$$u_i = d_i + \pi_i(v - d_i - d_j) = v_i(1) + t$$

$$u_j = d_j + \pi_j(v - d_i - d_j) = v_j(1) - t$$

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<sup>26</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p.237)

from which:

$$t = u_i - v_i(1)$$

$$t = v_j(1) - u_j$$

Before advancing with the standard bargaining solution, it must be highlighted that each player has a proper equation for identifying the value of the money transfer and this is the result of the above-mentioned positive and negative addition to players' payoffs: for one player who transfers money, the other one will receive it. Now, to move on, a correct solution requires the money transfer to be the same whatever equation is solved, being it the one for Player 1 or 2. For this to be more intuitive, both equations will be solved for the money transfer:

$$t = v_1(1) - u_1 = 5 - 5 = 0$$

$$t = u_2 - v_2(1) = 3 - 3 = 0$$

In this case, the money transfer is absent and equal to zero. This result shows that the parties will agree to get the task done without introducing any money transfers and will thus enjoy payoffs in the amount of  $u_1 = 5$  and  $u_2 = 3$ .

Essentially, this is the procedure for solving a simple bargaining problem. Nevertheless, a further specification is needed for this explanation to be useful and it concerns the coherence of this model with real-life situations. As it might be already clear, this kind of solution is far from an actual approach to real negotiation problems and it lacks a huge percentage of the complications a setting like this should include. However, the real objective of this example is that of giving the reader a first insight into the world of bargaining and its formal representation, in order for the main elements of these settings to be identified and the underlying logic to be understood. The intention now is to progressively apply these ideas and concepts to the field of M&A pricing and to introduce the necessary complications for bringing the work as close as possible to real-life representations.

Among the various concepts presented in the introduction over bargaining games, one is particularly important in the context of mergers and acquisitions: agents negotiate over the surplus produced by their agreement. The relevance of this aspect can be comprehended by recalling something introduced in the first pages of this work in relation to the role M&A operations have in corporate growth. More precisely, the distinct objectives these transactions are set to achieve usually aim all to the single final goal of increasing shareholder value. In terms of bargaining games, a deal is good when its joint value is greater than the default outcome and thus value is created, making the involved parties better off than if no underwriting took place. However, the example presented above lacked a clear and valid negotiation phase between the agents

and thus failed in showing where the actual bargaining eventually happened. For this reason, without leaving the world of bargaining games, it appears necessary to unveil more advanced settings to understand how a negotiation is portrayed in the context of game theory.

The first and simplest scheme is that of “ultimatum games”, where two players must divide a certain amount  $x$  according to a proposal advanced by one of them. Hence, Player 1 offers Player 2 a certain portion  $y$  of  $x$  and the latter decides whether to accept or reject the deal: if the offer is accepted, Player 1 takes  $[x-y]$  and Player 2 takes  $y$ ; if the offer is rejected, both players get zero. Here comes an old friend, the assumption of rationality, to highlight a curious scenario and solve this bargaining problem in what game theory would consider the most efficient way: starting point of this reasoning might be that both players would avoid ending up with zero, thus being prone to accept a small sum  $\varepsilon > 0$ ; Player 1 is aware of this and exploits his knowledge to obtain the highest possible payoff from this bargaining, hence offering Player 2 exactly  $\varepsilon$ ; Player 2 has now two options, accepting a small sum or getting a payoff of zero, and will rationally choose the first alternative. Some theorists go even further and assume that the most efficient solution for this bargaining setting sees Player 2 accepting an offer of zero advanced by Player 1, since this would make him indifferent between underwriting the deal or not and would increase the payoff for Player 1. Nevertheless, this work will use the first approach and thus will assume that the receiver will only accept offers strictly greater than the default outcome. Researchers working on the application of these concepts to M&A negotiations identified the value of synergies deriving from M&A operations to be the surplus on which agents can negotiate the price of an operation, with this sum representing the money transfer met before in the bargaining game example. Despite the ultimatum game being intuitive and theoretically applicable to scenarios involving take-it-or-leave-it offers, its design is too simplistic to explain inter-company negotiations and its results are far from representing real outcomes. This is also demonstrated by Güth, Schmittberger and Schwarze in their “*An Experimental Analysis of Ultimatum Bargaining*”, an experimental work from 1982 in which the authors analyse real-life outcomes of a two-stage ultimatum game and show how negotiations are absolutely far from theoretic representations. More precisely, the receiver only accepts the deal when the offer is perceived as fair and decides to “punish” the proposer when he seems to be retaining an excessive portion of the amount<sup>27</sup>.

To move a little closer to realistic settings, the next step would be that of introducing a more complex game theoretic bargaining model: multi-period alternating-offer games. Here, several rounds of offers and counteroffers by the agents take place until one is accepted or no deal is agreed. A first interesting feature of these settings can be identified in the value they give to the time factor and how this is formally represented. According to one of the pillars of the economic theory, time and money have a strong relationship and the real value of the latter is subject to the moment in which it actually becomes available: most people would value an amount  $x$  in the present more than an equivalent sum in the future, often as a consequence of the

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<sup>27</sup> An Experimental Analysis of Ultimatum Bargaining – Journal of Economic Behavior and Organization (vol. 3, is. 4) - W. Güth, R. Schmittberger, B. Schwarze, 1982

possibility to immediately invest the amount and hence to produce interests<sup>28</sup>. Multi-period, alternating offer take into consideration this economic concept and introduce a discount factor with the intention of allowing the comparison between payoffs received in different moments. The important thing about discount factors is that they are “personal”, meaning that their value on an equivalent time period varies according to the individual expectations of the agent. Patience is the key in the reasoning, since more patient agents will accept future payments with a higher degree of satisfaction and will thus present a smaller discount factor, whereas the opposite is true for less patient subjects. In general a discount factor  $\delta_i$ , whatever its value, works as a multiplying factor for a monetary sum  $x$ , so that  $[\delta_i x = y]$  with  $y < x$ . Without a doubt, this is an important aspect to consider during negotiations and, in M&A contexts, the procedure of discounting cash flows deriving from the operation is typical for assessing the value of the transaction, especially when considering the importance of continuity in business activities and hence the potential damage deriving from an extension of the dialogue. This condition of protraction is often labelled as “deal fatigue” and can be the result of several obstacles during the negotiation, usually deriving from difficulties in aligning the interest of the parties and sometimes ending up in the abandon of the deal by one of them. Here, the concept of patience becomes extremely relevant when thinking about the complexity of bargaining over corporate entities and thus about the time required for adequate offers to be advanced and revised. Patient agents will accept prolonged negotiations in order to exploit a condition of deal fatigue and hence increase their share of surplus, not being concerned about an eventual retard in the conclusion of the talks; on the other hand, agents with a lower degree of patience will try to close the deal in the shortest time interval possible, sometimes falling into a “urgency-trap” and hence risking to accept unfavourable conditions. It seems like patience is a key trait for prosperous negotiations in the context of M&A operations, given the renown complexity of deals involving financial, human and cultural resources. Returning to game theory and specifically to multi-period alternating offer games, the application of the discount factor works as follows: in the first period nothing changes with respect to the ultimatum game and hence Player 1, having the amount  $x$  available, offer a portion  $y$  to Player 2, keeping  $[x-y]$  for himself; differently from the previous game, here Player 2 rejects the offer and advances a counterproposal in which he offers a portion  $w$  of the sum  $x$  to Player 1, claiming  $[x-w]$  for himself; time has passed between the two offers and this requires the application of discount rates to payoffs from the second bargaining round in order for a comparison to happen; the resulting writing will see the payoff for Player 1 becoming  $\delta_1 w$  and that of Player 2  $\delta_2(x - w)$ . As it is possible to observe, each player has an individual discount factor that reflects his level of patience and other characteristics that might influence the extent to which he discounts future cash flows. Now, if the game is a two-period setting, Player 1 can accept this offer or determine a zero payoff for both players, otherwise the game goes on with an alternating offer scheme until the last chosen period and the discount factors are computed for each interval according to classic financial rules:  $\delta_i^{t-1}$ . Critical observation in the

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<sup>28</sup> Reference to investment activity is a typical financial approach to the concept of “time value”, but reality is that the concept might be applied to each and every productive activity through which the agent increases his utility.

context of multi-period alternating offer games is that the player having the role of allocator in the last bargaining period finds himself in the same position of advantage seen in the ultimatum game, where the receiver accepts a small amount  $\varepsilon > 0$  to avoid a situation of disagreement that would yield a zero payoff<sup>29</sup>. This predicted outcome simplifies the identification of an optimal strategy for the to-be allocator, who will reject any offer by his opponent that does not satisfy the condition  $[y \geq \delta_i(x - w)]$ , where  $y$  is the portion the opponent offers and  $\delta_i(x - w)$  is the payoff the to-be allocator would receive in the following period. If no agreement is reached before the last bargaining period, the allocator will have access to almost the entire surplus, precisely  $[x - \varepsilon]$ . In the light of this reasoning, the equilibrium of this game sees Player 1 offering Player 2 an amount  $\delta_2(x - w)$  and keeping for himself the sum  $[x - \delta_2(x - w)]$ . To be more precise, the equilibrium of a multi-period alternating offer game requires the agreement to be found in the first bargaining period, in order for the players to obtain from their deal a joint value equal to the entire sum available.

Unfortunately, the hope of reaching an agreement in a single round of bargaining is quite remote and obstacles in the negotiations are around the corner, as specified above relative to the deal fatigue. This happens because no agent has clear thresholds as the ones being presented in theoretical settings and this imposes a series of attempts before identifying the most suitable value for an offer, without forgetting how conditions might change in bargaining contexts and hence lead to variations in the aspirations and goals of each agent. As a consequence, almost all of real-life deals would be considered inefficient if analysed according to the norms of game theory.

As it is typical in the passage from pure theory to real-life application, most concepts require a refinement or need to be complemented for the purpose of a valid representation of a given phenomenon. Up to this point, most game theoretic principles have been presented in their natural context and their use has been limited to an abstract application. To be faithful to what previously mentioned across this chapter, it appears necessary to present a real example of a game theoretic M&A model. In line with the path followed, a proper alternative seems to be a work titled “*A study on the significance of game theory in mergers & acquisitions pricing*”, by Yonus Ahmad Dar and Dr. Yogesh Sharma from Jodhpur National University (India)<sup>30</sup>. The authors divide the paper in two main parts: in the first one, they build a two-person M&A model as an incomplete information game between the acquirer and the target, with the intention of identifying the optimal price for the target company; in the second one, they take into account the presence of psychological factors affecting the negotiation and analyse the optimal combination of players’ psychological characteristics for the outcome of the bargaining.

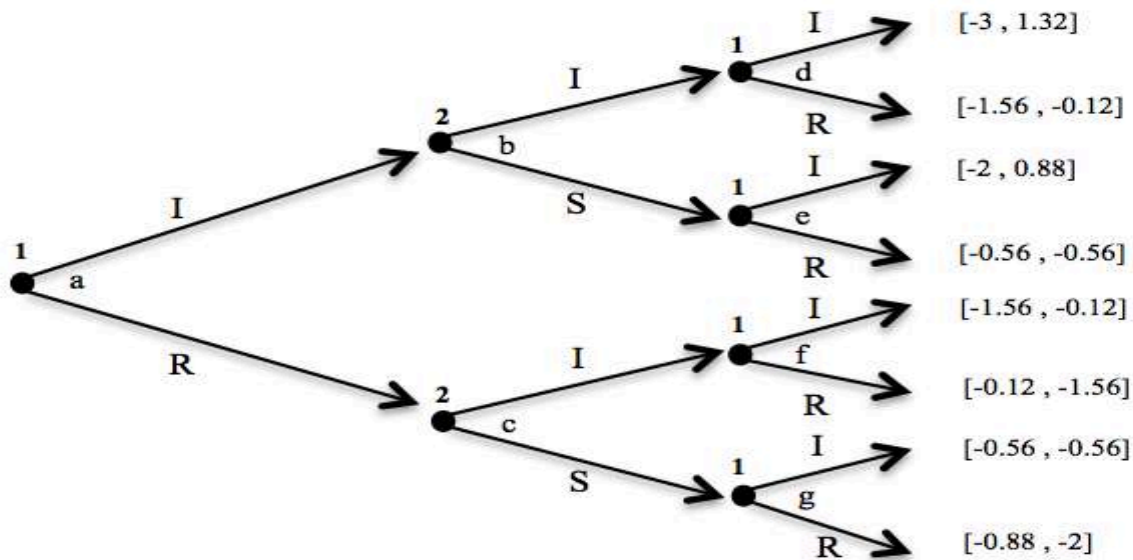
The setting is a three-stage alternating offer game, but the focus is maintained on a more qualitative analysis of the bargaining process rather than a quantitative one. This means that both players are given the

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<sup>29</sup> A default outcome of zero is an assumption to simplify the writing, though a disagreement point might be different from zero  $[d > 0]$ .

<sup>30</sup> A study on the significance of game theory in mergers and acquisition pricing – International Journal of Applied Research – Y.A. Dar & Y. Sharma, 2016

opportunity to choose between two actions in their decision nodes: the acquirer can either “Increase Bid” or “Reduce Bid”; the target, on the other hand, can either “Increase Bid” or “Stable Bid”. For each strategy a certain payoff is implied and, interestingly enough, the authors decided to give it a more realistic perspective by applying the proportions from Khaneman and Tversky’s “Prospect Theory”, according to which an agent values positive events at least twice as much as negative events<sup>31</sup>: considering an “Increase Bid” action, its effect on the payoff can be interpreted in the perspective of a zero-sum game and hence would deliver a -1 on the payoff of the acquirer, forced to pay more, and a +1 on that of the target, who will receive a higher counter value for his company; the application of Prospect Theory determines that the target’s +1 becomes a +0.44<sup>32</sup>. This specification provides all the necessary elements for building the strategic form of this game, which will prove useful for a more intuitive comprehension of the setting under analysis. For clearance, it must be said that the strategic form below follows the one being presented by Dar & Sharma, but changes its payoff in accordance with what indicated by the Prospect Theory.



In the tree, “I” stands for “Increase Bid”, “R” for “Reduce Bid” and “S” for “Stable Bid”.

The negotiation process can be understood quite intuitively by looking at the strategic form and works as follows: the assumption is that the acquirer has already advanced an offer to the target and that the latter has rejected, paving the way for further negotiation starting from node “a”; here the acquirer can either increase or reduce its bid, leading the target to play in node “b” or “c”, where he can either agree with the proposal or ask for a higher price; for each choice being made, the acquirer will find himself in node “d”, “e”, “f”, “g”, where he will decide once again whether to increase or reduce his bid; the game then does not have a natural end, but it is left to further theoretic continuation until the target accepts the acquirer’s offer or the acquirer decides not to go on with the negotiation.

<sup>31</sup> Prospect Theory: An Analysis of Decision Under Risk – Econometrica: Journal of The Econometric Society (vol. 47, no. 2) - D. Khaneman & A. Tversky, 1979

<sup>32</sup> Since positive events are valued “at least twice as much as negative events”, Dar and Sharma decide to apply a factor of 2.25 as a weighting factor for balancing the two scenarios.

As for every strategic form, there is the opportunity to traduce it in a normal form. Again, Dar & Sharma build the matrix differently from what it was shown in the previous pages, thus there will be some modifications with respect to the one presented in their work, despite the founding concepts remaining unchanged:

<i>Player 1/Player 2</i>	<b>II</b>	<b>IS</b>	<b>SI</b>	<b>SS</b>
<b>III</b>	-3 , 1.32	-3 , 1.32	-2 , 0.88	-2 , 0.88
<b>IIR</b>	-3 , 1.32	-3 , 1.32	-0.56 , -0.56	-0.56 , -0.56
<b>IRI</b>	-1.56 , -0.12	-1.56 , -0.12	-2 , 0.88	-2 , 0.88
<b>IRR</b>	-1.56 , -0.12	-1.56 , -0.12	-0.56 , -0.56	-0.56 , -0.56
<b>RII</b>	-1.56 , -0.12	-0.56 , -0.56	-1.56 , -0.12	-0.56 , -0.56
<b>RIR</b>	-1.56 , -0.12	-0.88 , -2	-1.56 , -0.12	-0.88 , -2
<b>RRI</b>	-0.12 , -1.56	-0.56 , -0.56	-0.12 , -1.56	-0.56 , -0.56
<b>RRR</b>	-0.12 , -1.56	-0.88 , -2	-0.12 , -1.56	-0.88 , -2

Interestingly, the matrix shows how Player 1 (Acquirer) can only achieve negative payoffs, whereas his counterpart obtains positive outcomes in a multitude of occasions. Now this might lead the reader to think that the target finds himself in a situation of advantage during a negotiation of this kind, which is exactly what Dar and Sharma write in their paper: “Based on the strategies and pay-offs [...] you will notice that the acquirer is at greater disadvantage than the target as he can lose 3 units if the price is increased by both the acquirer and target [...] compared to when the price is reduced.”<sup>33</sup>. According to the numbers portrayed in the matrix, a conclusion of this kind might be said to make sense and to properly represent a situation in which the acquirer is facing a counterpart who, driven by rationality, will never opt for a reduction of the bid and hence does not have it among its alternatives. However, what might be discussed here is that the whole game above lacks a reasonable perspective from which to be analysed: the application of prospect theory to what are considered positive and negative events for the agents only considers the raise and reduction of a theoretical bidding price, with no reference point to help a potential reader understand whether and to what extent a player would eventually be affected by one decision or the other. As it is common practice in M&A negotiations, both parties start bidding with a clear valuation in mind and tend not to disclose it for avoiding the counterpart to take advantage of the information. This starting valuation is a fundamental reference point for the assessment of the effects specific bidding actions have on the utility level achieved by each party: the acquirer might advance a first bid way lower than its valuation, thus making increases in this price still in line with its payment objectives and hence less dramatic than a negative event considered in a free-of-context perspective.

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<sup>33</sup> A study on the significance of game theory in mergers and acquisition pricing – International Journal of Applied Research – Y.A. Dar & Y. Sharma, 2016 (p. 49)

With the intention to provide the model with a higher level of realism, the authors decided to evaluate agents' moves in the light of some psychological profiles they might present: the acquirer is presented as risk averse or risk taking, two alternatives that might be actually useful in a primary evaluation of his reaction to increases or reductions in the bid; the target, on the other hand, can be optimistic or pessimistic and this too is a useful perspective from which to analyse his reactions to increases or reductions in the bid. The effects of these traits inside the game are represented through the use of multiplication factors applied to the value of base-case payoffs, which refer to the situation in which the acquirer is risk taking and the target is pessimistic. More precisely, the other three combinations affect the payoffs as follows: a decrease by 50% in the payoffs for a risk averse acquirer and a pessimistic target; an increase by 50%, for a risk averse acquirer and an optimistic target; an increase by 100%, for a risk taking acquirer and an optimistic target. Now, two different categories of settings can emerge from the application of these traits to the agents: in the first one, both players know exactly what kind of agent they are negotiating with (complete information games); in the second one, players are not perfectly aware of their opponent's traits and hence apply probability distributions in order to select their strategies, or better to apply probability distributions to different strategy profiles, coherently (incomplete information games). The conclusion reached by the authors, after the analysis of different scenarios and the use of mathematical calculations - not presented here because way beyond the scope of this work -, is that the optimal outcome is achieved when the acquirer is risk taking and the target is pessimistic, since "the acquirer will be willing to provide a higher offer and the target will be more open to accept a reasonable offer"<sup>34</sup>. Interestingly enough, the analysis shows how players will tend to adopt the same optimal strategies in both categories of settings: the acquirer will mainly reduce the price and sometimes insert an action of increase (RRR, RRI, RIR), while the target will mainly opt for increases but will also play the "Stable Bid" card (II, SI), if necessary to avoid the failure of negotiations.

In the end, the simplicity behind this model proves helpful in demonstrating how the concept of "optimal price" in a M&A negotiation might be something quite abstract and strongly dependent on the psychological characteristics and background influences of the agents involved. Here Dar and Sharma try to include basic personality traits for the players and the result should undoubtedly be considered as an important step in the application of game theory to the description of M&A transactions, but it must be recognized that the actual complexity of human personality and mind might be way too far from being represented in statistical or mathematical terms, hence imposing a huge limit to the description of agents' behaviour in a bidding context.

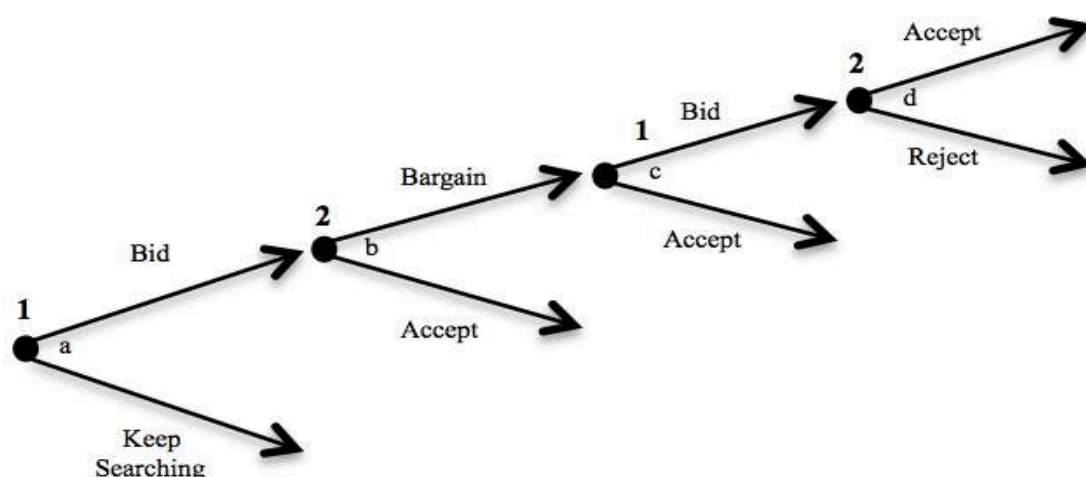
Discussing over Dar and Sharma's work, the use of the expression "incomplete information games" was directed towards the description of the extent to which players knew their opponent's psychological traits in the context of bargaining. However, this incompleteness of the information available to the agents can also

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<sup>34</sup> A study on the significance of game theory in mergers and acquisition pricing – International Journal of Applied Research – Y.A. Dar & Y. Sharma, 2016 (p.52)

describe a lack of exact knowledge concerning the characteristics of the target firm and hence an impossibility to precisely define a fair acquisition price. In their “*A Game Theoretic Study of Enterprise Mergers and Acquisitions: The Case of RJR Nabisco Being Acquired by KKR*”, Jiang & Co.<sup>35</sup> argue that most game theoretic M&A studies erroneously focused their attention on complete information static games, without properly understanding how a higher level of coherence with real-life situations would be achieved through the analysis of incomplete information dynamic games. While their colleagues, Dar and Sharma, centred their work around the features of bargaining processes and some basic psychological traits of the agents, the authors here pay closer attention to the aspects of pure pricing and to the characteristics of an alternating-offer bidding based on differences in agents’ target valuations, determined by partial information disclosure.

Both Dar/Sharma and Jiang/Jian/Zheng research teams agree on the dynamics of a M&A negotiation, assuming that it takes place in a series of bargaining rounds that end when an agreement is reached or one of the parties believes there is no room for it anymore. According to this view, the extensive form of the game is more or less the same as the one seen for the prior research, incorporating slight modifications for what concerns the alternative available to the agents:



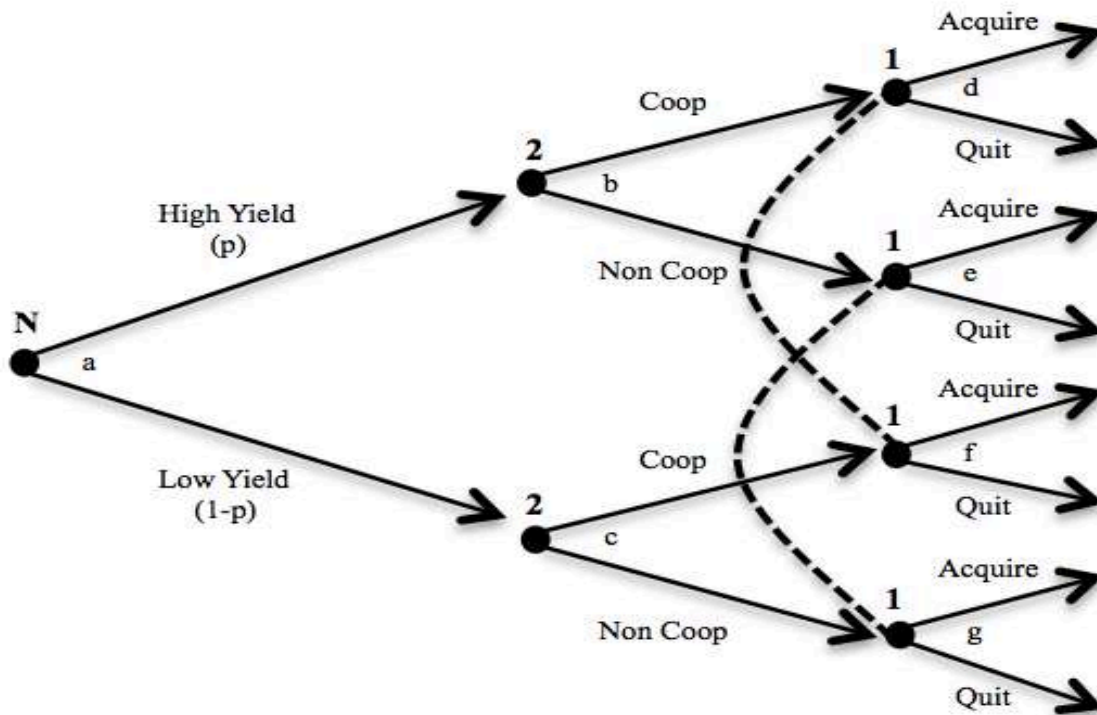
Player 1 is the acquirer, who presumably has clear goals for his M&A operation and seeks the best partner among different alternatives available on the market; Player 2, on the other hand, represents the target firm. Jiang, Jian and Zheng believe the transaction has a positive outcome when parties manage to negotiate their way up to an equilibrium price  $P^*$ , meeting the condition  $P_2 < P^* < P_1$ , according to which the equilibrium price must be included in an interval between the target’s minimum acceptable offer ( $P_2$ ) and the acquirer’s highest affordable bid ( $P_1$ ). They further specify this condition, in order to include a more plausible feasibility requirement for the bidding process: using the notations  $V_i$  and  $\mu_i$  the authors identify, respectively, a bid by the acquirer and a bargain from the target in the  $i$ th round of negotiation; for the agents to accept these actions, it is assumed that every bid ( $V_i$ ) must be greater than the target’s minimum

<sup>35</sup> A Game Theoretic Study of Enterprise Mergers and Acquisitions: The Case of RJR Nabisco Being Acquired by KKR – Business and Management Studies (vol. 2, no. 2) - Y. Jiang, Y. Jian, M. Zheng, 2016

acceptable offer ( $P_2$ ), whereas every bargain ( $\mu_i$ ) must be smaller than the acquirer's highest affordable bid ( $P_1$ ), otherwise the “target enterprise can figure out that this acquirer's intention is not sincere and then refuse the acquirer's offer to end the game” and/or the “target enterprise's bargaining is far higher than the acquirer's affordable highest price, [hence] acquirer will give up the offer”<sup>36</sup>. As a consequence of this specification, the final pricing condition appears as  $[P_2 < V_i < P^* < \mu_i < P_1]$ . In the end, however, the negotiation takes place upon the difference  $[P_1 - P_2]$  and this recalls a concept previously mentioned in this chapter: agents bargain over the surplus produced by a M&A operation. In this case, it could be accurate to say that the upper limit  $P_1$  might include the value the acquirer gives to the target in the context of the advantages it might deliver to his firm through synergies or “platform effects”, hence creating bargaining space for the identification of an equilibrium price  $P^*$  that is judged fair by both parties. Also, the authors recognize the presence of different bargaining powers and their role in the process of splitting up the surplus. The authors' definition of a realistic strategic setting does not end here and further specifications are provided relative to some critical concepts in the context of bargaining. First of all, it might be useful to specify that  $P_1$  and  $V_i$  are the result of the acquirer's assessment of the target's value: the paper simplifies this valuation to a dual scenario, with the target firm judged as high or low yield on the basis of information disclosed. Though data proves helpful for creating valuation opinions, it is typically not enough for reaching certainty and thus the two scenarios are analysed according to a probability distribution: the target firm is high yield with probability  $p$  and low yield with probability  $[1-p]$ . Of course, this is a valid starting point for a proper valuation of the target and it is a central criterion in most corporate finance valuation methods, but it is certainly harder to say than to do since it strongly depends on the availability of useful information. For this reason Jiang, Jian and Zheng decided to focus their attention on incomplete information dynamic games and introduced an additional element in the description of their bargaining setting: the target firm can act cooperatively or non-cooperatively towards the acquirer, making the latter's information costs higher or lower, respectively, and hence changing the outcome of the bargaining process. However, the authors define this different degree of openness to acquisition by the target firm as a useful, though not determining, factor in the assessment of the firm's value, still dependent on the probability distribution connected to its earnings expectations. This, together with all the additional complications introduced above, is reflected in a new extensive form, which might be intended as an attempt to describe the sole process of target valuation in the light of a relationship between acquirer and target:

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<sup>36</sup> A Game Theoretic Study of Enterprise Mergers and Acquisitions: The Case of RJR Nabisco Being Acquired by KKR – Business and Management Studies (vol. 2, no. 2) - Y. Jiang, Y. Jian, M. Zheng, 2016 (p.23)

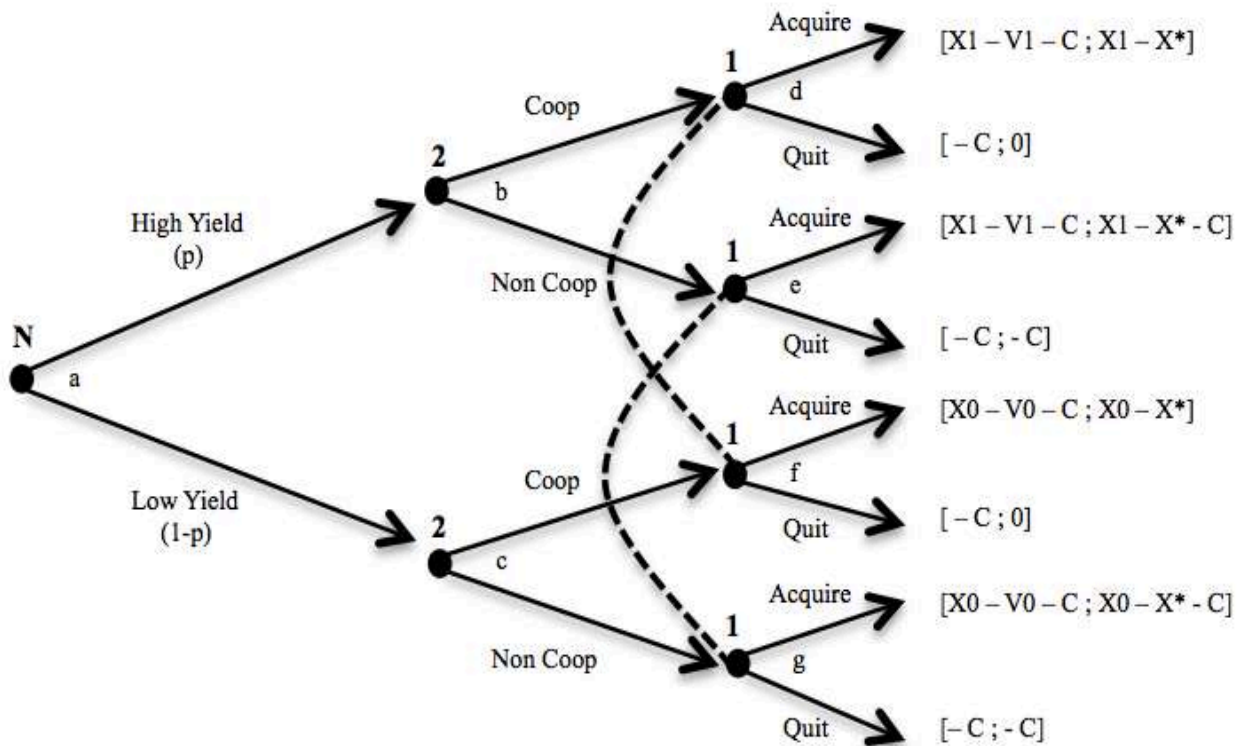


In node “a” Player N makes the decision, but who is Player N? Well, in game theory the use of Player N refers to the role of nature in choosing something out of the agents’ control (random events). This happens throughout the game in what game theorists call “chance nodes”<sup>37</sup>, as node “a” can be defined in this setting. Games in which Nature is present are typically called “Bayesian Games” and present some slight complications relative to the classic settings analysed up to this point, especially in the translation of the extensive form into the normal form. In this specific case, the firm is high or low yield according to its performance over the years, its investment projects and the return it will provide to its investors over the future years, hence depending on a multitude of factors which are not in direct control of either the acquirer or the target. As it was said above, the target firm can decide to cooperate or not towards the acquisition and this behaviour will be acknowledged by the acquirer. Nevertheless, the latter will not be able to distinguish whether he finds himself, for instance, in the low yield cooperative node or in the high-yield one, a situation clearly represented by dashed lines connecting the couples of decision nodes. To understand how the acquirer would behave in his decision to acquire or to quit, it is necessary to analyse how his valuation and bidding process would work in a context of this kind. Given the dual scenario presented by the authors, the acquirer will have two valuations for the target firm:  $X1$ , in case of a high-yield firm (probability  $p$ ), and  $X0$ , in case of a low-yield firm (probability  $1-p$ ). On the other hand, the target firm will have a self-valuation of  $X^*$ . It is important to remember that valuations, mostly for what concerns the acquirer, are strongly dependent on the available information and that this information can come at different research costs  $C$ . More specifically, if the target firm welcomes the acquisition and decides to cooperate, information costs

<sup>37</sup> Strategy: An Introduction to Game Theory (ed. III) – W.W. Norton & Company - J. Watson, 2013 (p. 327)

can be assumed to be  $C = 0$ ; if the target firm opposes to the acquisition, then information costs for the acquirer can be assumed to be  $C > 0$ . With all these elements being defined, the only missing piece for obtaining the payoffs at every decision node is the potential offer advanced by the acquirer, specifically  $V1$  (high-yield scenario) or  $V0$  (low-yield scenario).

The result is as follows:



The authors also specify a condition for the target firm's decision to be cooperative or non-cooperative, apparently based on a comparison between the valuation it establishes for itself ( $X^*$ ) and the valuation established by the acquirer ( $X1$  or  $X0$ ): if  $X1, X0 > X^*$ , then the target will accept the acquisition and will cooperate for it to happen.

This model takes the game theoretic description of M&A negotiations a bit further with respect to the Dar and Sharma's model encountered above. The introduction of precise conditions for different scenarios to happen helps in the inclusion of some behavioural rules that bring this theoretic description closer to realistic deal-valuation procedures. Furthermore, the presence of Player N (Nature) and its relative probability distribution provides additional detail to the theoretic representation, since it offers the opportunity to represent a condition of uncertainty which is typical in the context of business valuation and, even more, M&A negotiations: as every corporate finance course teaches, even the most powerful valuation tools make mistakes and hence can lead to poor business decisions; the main issue consists in the necessity of complete information for this techniques to provide the most accurate results, a condition barely achievable in real-life contexts; the target and the acquirer might experience the highest imaginable level of cooperation and still

miss useful data for developing totally reliable forecasts on the firm's value, being it dependent on such a wide array of factors that it would be unconceivable to pretend perfect knowledge. Finally, the presence of a probability distribution linked to different scenarios in the game is also reflected in the computation of the payoffs: all the outcomes presented at the terminal nodes of the analysed tree must be converted into weighted values, with the probability of each scenario used as weight; this means that the players' payoffs will be computed as expected values based on the probability with which each event might take place.

The two models analysed throughout the previous pages constitute nothing but two simple examples of the wide variety of available alternatives for the representation of the M&A negotiation process under a game theoretic perspective. Undoubtedly, game theory has made huge steps towards the implementation of more realistic models and its exponents are constantly at work to provide the field with innovative tools and theories, but something might still be missing. As it was discussed in both this chapter and the previous one, the number of factors involved in a single M&A transaction is surely higher than what most people think: parties involved, interests at stake, economic trends, geo-political tensions, payment alternatives, anti-trust legislations and much more. For instance, the single aspect concerning the parties involved in the operation might generate endless issues, ranging from the financial objectives of these agents to the characteristics of their personalities. The result of this incredible multiplicity might stand in a plausible impossibility of representing a M&A interaction as a sum of alternative scenarios: for a model to work and to produce acceptable insights, several simplifications in the description of reality are necessary, hence implying the achievement of conclusions that might prove useful in the context of academic/scientific study, though standing far from reality.

In the specific context of M&A pricing, it must be recognized that the analysed models are extremely effective and accurate in the description of the bargaining procedure, its central dynamics and the logic behind different behaviours, thus representing a reliable tool for a deeper comprehension of the negotiation process and of the expected outcomes. The multi-period alternating offer scheme is an accurate simplification of the actual negotiation dynamic, with parties involved in an exchange of bids that attempts to provide each of them with the largest share of value. To be honest, even the basic psychological profiles introduced by Dar and Sharma (risk taking/averse, optimistic/pessimistic), with the relative modifications in the amount of payoffs, provide an interesting perspective from which to analyse how differences in the personal characteristics of the agents might affect the outcome of a negotiation. The same could be stated for Jiang, Jian and Zheng's cooperation/non-cooperation behaviour on the side of the target, which represents an interesting and appropriate alternative to take into consideration the role of information costs in the wider context of bidding, thus adding an important element in the attempt to build a more realistic representation of M&A negotiations. What should be considered and understood, though, is that, accepting the idea that operations of this kind imply the involvement of human beings at the core, the use of assumptions to describe human behaviour from a mathematical perspective actually imposes constraints that often fail in the

accurate description of actions that might be implemented by the agents. As it will be discussed in the following chapter, for example, human behaviour is extremely different from the assumption of rationality that is typically used to describe it and this implies that real-life strategic situations might have a totally different ending relative to the one expected by the theory. This creates some serious obstacles for the development of models that accurately describe settings in which human behaviour is involved and, in this specific case, for the development of models that describe the achievement of a merger or acquisition deal. Before moving to the next chapter and analyse some of the actual reasons behind the emerging of these obstacles, the following pages will introduce a different typology of game theoretic M&A models. This time, the objective will be that of using game theory for describing “buy-and-build” acquisition strategies and hence to show the possibility of agents accepting less-than-optimal deals in order to obtain an entity that will guarantee them advantages in future M&A operations.

## **APPLICATION OF GAME THEORY IN “BUY-AND-BUILD” ACQUISITION STRATEGIES**

As it was discussed in the initial pages of this second part, M&A operations can be valued in the perspective of both a single transaction and a multistage strategy. In the first case, the deal is analysed in the light of the advantages and disadvantages it is believed to deliver in absolute terms, hence considering how the integration of the two involved entities might work out. When investment projects are examined, including mergers and acquisitions, the first perspective tends to receive a higher relevance due to both a greater simplicity in the analysis and a widespread inclination to adopt a short-term view. The problem with this attitude is that analysis of this kind might miss several critical aspects in the valuation of a M&A deal, especially those related with the role of an operation as a “platform” for future profitable transactions. Among the various motives presented as catalysts for M&A activity, a relevant space was devoted to the value of synergies that might derive from the combination of separate businesses: the synergistic effect, which happens in the form of cost advantages or market share increase or other benefits, is an undoubtedly fundamental aspect for the valuation of a deal and is often the most researched feature in a merger or acquisition. In the last decades, however, two major global trends forced corporations to start thinking about M&A differently: the fast emergence of new and highly profitable industries; the economic growth of underdeveloped countries. For what concerns the evolution of the business environment and the emergence of new industries, it can be easily stated that the technological progress has reached unprecedented levels of speed and scope, offering revolutionary discoveries in the most varied fields quite frequently. Though it is renown that changes, especially revolutionary ones, take time for adaptation, this increase in the pace of technological progress was in some way forecasted during the 1960s: Gordon E. Moore, co-founder of Intel, described a law in 1965, according to which the number of transistors on integrated circuits would double approximately every two years, determining an exponential progress in the capabilities of many electronic devices; this law was expected to work over a short period of time - Moore believed at first in a ten-year horizon -, but was later demonstrated valid up to present times and is now thought of having reached its

end<sup>38</sup>. As highlighted by the World Economic Forum in its paper “*Technology and Innovation for the Future of Production: Accelerating Value Creation*” (2016), this exponential technological advancement “is exerting profound changes on the way people live and work. It is impacting all disciplines, economies and industries, perhaps none more so than production, including how, what, why and where individuals produce and deliver products and services”. As older industries reach their peak and enter a saturation phase, firms understand that growth and the ability to meet the goal of shareholder value creation can come from, among other options, the access to new profitable industries. One of the issues in these recently established markets is fragmentation, intended as the presence of a multitude of players, and hence the absence of scale economies and of a clear market leader. Without entering the dark world of market potential analysis, a critical assessment for a company that plans to access a new industry, it can be briefly said that no firm would purposely enter a market without the intention of obtaining a profit. However, a new and fragmented market might require more than a single M&A operation for establishing a profitable presence, thus imposing the exploitation of a so-called “platform effect”: the entering firm values a target entity not only in the light of its synergistic prospects and profitability forecasts but also as a valid starting point for future mergers or acquisitions in the same industry, hence fostering a process of consolidation and potentially gaining the position of market leader. This perspective determines a complete change in the valuation of a M&A deal, with the integration benefits now complemented by the platform benefits. More precisely, this view pushes acquiring companies to judge an operation on a longer-term horizon and, as it was already discussed above, to potentially accept less-than-optimal deals as a honest sacrifice for future profits.

The decision to start this discussion from technological progress is not random, but is the result of a desire to proceed logically in the description of the process that led managers and firms to change their approach towards M&A activity. More precisely, technological progress can be considered a critical driver in the economic growth of underdeveloped countries, since it widened the access to productive technologies and hence allowed weaker economies to start participating in the international trade landscape. To give an idea of how the global economy has changed over the last two decades, it might be useful to consider two groups of countries and the evolution of their relative share of global GDP. The first group is the G7, namely the group of advanced economies (Canada, France, Germany, Italy, Japan, U.K., U.S.A.), while the second one is the E7, namely the group of emerging market economies (Brazil, China, India, Indonesia, Mexico, Russia, Turkey). According to PWC’s “*The Long View: How will the global economic order change by 2050*” (2017), in 1995 the E7 countries were half the size, in economic terms, of the G7 countries; exactly twenty years later, in 2015, these emerging economies approximately reached the size of the advanced ones; forecasts for 2030 see six out of seven E7 economies in the global top ten of the countries with the highest GDP (at PPPs), with Turkey placing 12<sup>th</sup>; extending the views to 2050, E7 countries might increase their share of the global GDP to around 50%. These changes in the global economic landscape forced and still force companies to redirect their investments and to organize a rapid and effective geographical expansion,

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<sup>38</sup> Technological Progress – Our World in Data – M. Roser & H. Ritchie, 2020

in order to exploit the huge market potential these emerging economies can offer. Among several alternatives, M&A has long been considered an extremely valuable option for accessing a new market. As Deloitte specifies in its “*Mergers and Acquisitions for growth: Trends in the US consumer product sector*” (2018), 56% of the M&A deals in the time interval 2010-2018 took place with the goal of improving firms’ geographical presence. This process can take place either through a single high-value operation or through a well-designed plan that involves smaller steps over a larger time horizon. A recent example of the first alternative is found in the beer industry, which in 2016 experienced the merger of two giants: Anheuser-Busch InBev and SABMiller. The deal, worth over \$100 Billion, had the double objective of helping AB InBev’s protection of its position in mature markets and improving its geographical presence in emerging economies thanks to SABMiller’s notable market share in valuable prospect markets<sup>39</sup>. The other alternative implies instead starting with a softer approach, usually consisting of a smaller M&A transaction that is mostly selected for its potential role as a platform for future mergers and/or acquisitions that will progressively help the acquiring firm to build a solid position in the new market.

From a game theoretic perspective, the AB InBev/SABMiller operation would represent a perfect setting for the application of models that share features with the two presented above, in the context of pricing. Being it a single transaction, most of the strategic value stands in the ability of the acquiring firm to reach an agreement at a reasonable price that enables the exploitation of benefits without imposing a financial burden on the operations. Furthermore, considering the size of the two players involved relative to others in the beer industry and the value of the merger, it might be righteous to believe that no competitor attempted to take part in the bidding, hence eliminating the necessity for a game theoretic representation of more-than-two-player competitive bargaining. Different is the situation for what concerns buy-and-build strategies, where game theoretic models are implemented with the objective of portraying long-term strategic settings that the acquiring firm is set to encounter and which will work as complementary tools in a decision-making process that is often conducted through a revisited use of renown corporate finance techniques (i.e. NPV). More specifically, this approach sees a more balanced and coherent use of the different means at hand: the financial side of the operations tends to be left outside the game theoretic analysis, which focuses instead on more strategic aspects such as the various decisional stages and the potential interference of competitors. An interesting work concerning the use of game theory in buy-and-build strategies can be found in Smit’s “*Acquisition Strategies As Option Games*” (2001), where the author clearly explains this approach to M&A and describes its progressive stages as options that a firm can choose whether to exercise or not depending on the strategic convenience of each decision, proposing the use of game theory to build a framework that might help to model the alternatives and to understand some of their strategic consequences. To start, Hans T. J. Smit provides a definition of buy-and-build strategy, specifying how it implies an equity investor undertaking an initial “platform” acquisition in a certain industry so to later exploit the acquired

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<sup>39</sup> Mergers and Acquisitions for growth: Trends in the US consumer product sector – Deloitte Insights – B. Renner, C. Fedder, S. Joshi, 2018

competencies and efficiencies in order to complete follow-on acquisitions on a wider geographical scale<sup>40</sup>. One of the issues with this approach stands in the difficulty of understanding how much a strategy of this kind is worth, an aspect that is not only dependent on the expected cash flows but also on the acquisition opportunities that each operation opens up and that are not easily captured by traditional NPV analysis. To this purpose, an interesting solution appears to be the combination of a revised NPV calculation with the creation of a “real options” framework and the modelling of strategic/competitive situations under a game theoretic perspective. Presumably all of this does not make much sense, hence the objective of the following pages will be that of clarifying how this solution is intended to work and what are its implications.

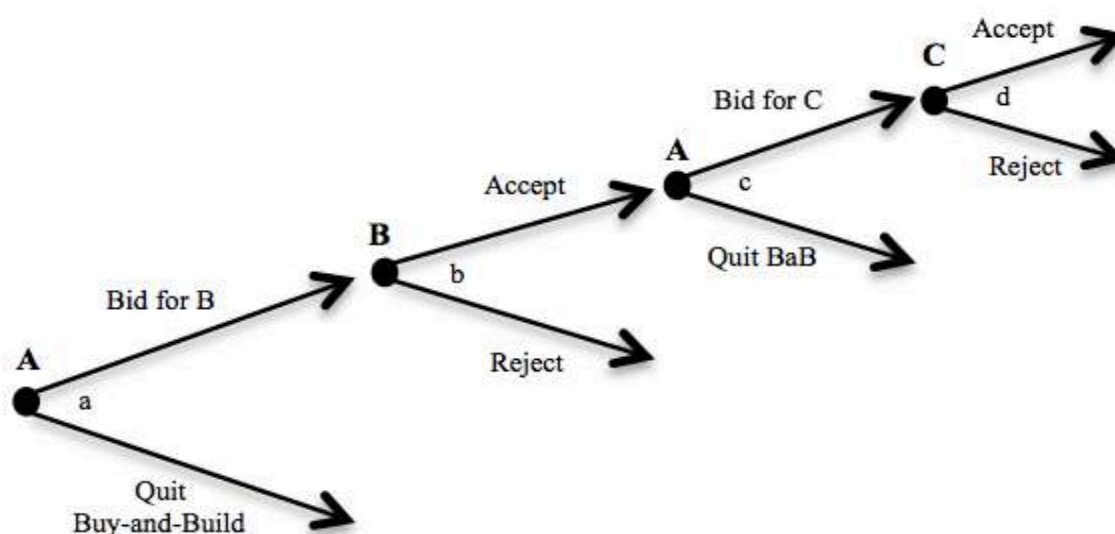
Despite the final and most visible objective of a buy-and-build strategy is typically consolidation, either from an industrial or geographical perspective (or both), what is actually sought is flexibility: in situations of uncertainty, firms highly value the opportunity to proceed step by step and to rearrange their strategy in line with contextual and competitive requirements. Essentially, this is what the idea of “real option” implies and it means that, at every stage following the first investment, the decision-makers enjoy the possibility of “opting in”, hence proceeding with follow-on operations, or “opting out”, hence abandoning the previous plan and go for different alternatives. In the light of this specification, it might be appropriate to say that “flexibility” is the keyword in buy-and-build strategies. The ability to reason and to act flexibly proves extremely advantageous in situations of shared interest towards a specific investment, meaning that there will be a competitive bidding for adjudication. The problem with shared interest lies in the effects it might have on the entire acquisition plan: the buy-and-build strategy works around the possibility of obtaining results (synergies, market position consolidation, market share increase, etc.) on a long-term horizon and through a variety of investments, hence requiring careful bargaining for avoiding the loss of financial benefits. It is in this exact aspect that game theory finds its most powerful application concerning follow-on acquisitions. In the words of Smit: “Game theory can provide a useful roadmap, helping buyers to evaluate the likely competitive responses and their impact on the acquisition strategy”. To summarize, two major applications of game theory in a buy-and-build strategy can be identified: first, the modelling of the acquisition plan and real options; second, the description of the competitive situation and consequences.

The modelling of the acquisition plan might be conducted through a simple extensive form that includes the acquirer and the various target firms it might be interested in buying, maintaining logical and chronological coherence with the planned steps – if the acquisition of company X implies the prior investment in company Y, the extensive form must respect this order -. As it was specified above, each investment and its consequences for the acquiring company depend on the contextual and competitive conditions in which the operation takes place, hence making the concept of flexibility critically important. The result of this might be the absence of specific payoffs at the terminal nodes of the tree, since these would be constantly changing according to the evolution of a series of factors influencing the acquisition sequence. To maintain the validity of each real option and to make the extensive form a helpful decision-making tool, it might be

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<sup>40</sup> Acquisition Strategies As Option Games – Journal of Applied Corporate Finance (vol. 14.2) – H. T. J. Smit, 2001

appropriate to build it in all its elements and to leave blank space for payoffs to be added and updated in line with the environmental evolution. An example of this tree is shown in the next page and its logic is the following: company A is the acquirer and starts by either bidding on its target platform firm “B”, hence starting its BaB (Buy-and-Build) strategy, or quitting this plan immediately; in node “b”, the target firm “B” can either accept the bid or reject it, but it is important to say that the interval between the acquirer’s bid and the target’s decision might include a process of bargaining between the two that is not explicitly represented in this tree; if company A is successful in the acquisition of the platform, then in the future it will choose whether to opt or not for the acquisition of firm “C”, according with internal and external conditions. In this example, the acquisition plan of firm A is concluded after the option concerning firm “C”, but nothing impedes to the acquirer the inclusion of additional stages in its BaB strategy.



Once completed with the updated payoffs at each stage, this representation might prove useful in intuitively summarizing the buy-and-build strategy for an acquirer and in helping keeping track of the different stages. Furthermore, for every decision, specific subgames could be extrapolated from the main tree and analysed separately, in order to obtain a more detailed strategic examination of each and every move. This form of game theoretic representation is not present in Smit’s work as it was represented above, though the author seems to offer a similar idea and relative graphic model in reference to the “value of synergistic opportunities”<sup>41</sup>. This first application of game theory in the context of buy-and-build situations does not have to be intended as separate from the second one, concerning the competition and its consequences on the acquisition plan, but rather as a complementary tool for a deep and exhaustive analysis of the context in which the acquiring company is making its decisions.

<sup>41</sup> H.T.J. Smit, in his “Acquisition Strategies as Option Games” (Journal of Applied Corporate Finance, vol. 14.2, 2001) presents a scheme under the name of “Staged Decisions for a Buy-and-Build Strategy” (Fig. 2, p. 85), where he represents the stages of a geographical expansion as real options available to the acquirer.

As it was discussed above, buy-and-build strategies are implemented with the main objective of consolidating a firm's position in a market, intended in either a geographical or industrial sense. Consolidation can take place in mature industries, perhaps characterized by an unusual degree of fragmentation, but also in younger markets, where competition is typically harsher. It might be intuitive to realise that every profitable market attracts a wide variety of companies, which aim to exploit its above-average margins as soon as they are available and as long as possible before the dust settles. In contexts of this kind, the possibility to effectively conduct a BaB strategy without being disturbed and potentially damaged by competitors is scarce: as a result of the crossing of two consolidation strategies or for the sake of imposing higher acquisition costs on a rival agent, competition will often create obstacles for BaB firms and will force them to either accept higher prices or be prepared to change targets. The problem with higher prices (or premiums) lies in the fact that they determine the erosion of the synergistic value, which represents the core of a buy-and-build strategy, hence reducing the effectiveness of the whole acquisition plan. Clearly, one of the most significant factors in determining the outcomes of competitive bidding is market power. In the words of Smit: "In the classic bidding contest between two equally dominant players, the competitive pressure to acquire the target induces the two firms to bid and pay a premium, "killing" the synergistic option value". This can be intended as a mostly theoretical case, while real-life situations typically see firms value acquisition alternatives differently, according to a series of internal aspects that directly influence the suitability of a target. The most basic application of game theory in these competition contexts consists in nothing more than competitive bidding games of the same kind as those analysed for the pricing models. Here two competitors bid over a desired target and the adjudication is reflected in the value of payoffs. Alternatively, the bidding can be described as a negotiation between the acquirer and target (as it was for the pricing models), with the first advancing offers that the latter chooses to accept or reject. This idea of competition as a rival bidding for a single target is as much realistic as it is simplistic, missing some interesting and more advanced features of the competitive setting. In his paper, Smit introduces the powerful idea of "reaction" and states: "In a build-up, the company must decide if it should expand through organic growth or acquisitions, which could invite a different market response and reaction value". What takes place here is an expansion of the relationship among market players, which become more than just rivals and are able instead to develop a sounder competition that might prove beneficial, instead of harmful as most people think. In the specific case of a buy-and-build strategy, the factors to be considered in this revisited competitive analysis are two: first, the approach of the acquiring firm; second, the reaction of the industry players. To maintain coherence with the work conducted above, it can be interesting to start from Smit's framework and to later discuss how adaptable this design is to the specific conditions of the context under analysis. Smit simply considers two alternatives for the acquiring company's approach and two potential reactions for the industry players: the acquiring company can either be tough, hence it wants to increase its market share with no regard for its competitors, or accommodating, hence creating value to be shared with or to benefit its rivals; the competitors' reaction can either be reciprocating, hence replicating the attitude of

the acquirer, or contrarian, hence going in another direction relative to buyer's intentions<sup>42</sup>. These alternatives are then grouped into a classic normal form matrix, as follows:

<i>P1/P2</i>	<b>Reciprocating</b>	<b>Contrarian</b>
<b>Accomodating</b>	(win , win)	(lose , win)
<b>Tough</b>	(lose , lose)	(win , lose)

Player 1 is the acquiring company, while Player 2 includes the set of direct competitors. To simplify the matrix representation and the description of rival behaviour, the idea is to group all competitors in the figure of a single player, though this approach might – and presumably does – lead to a superficial and purely theoretical description of the reactive attitude, which will in reality be peculiar for each and every rival firm. As it is possible to see, the matrix above presents extremely simple “win” or “lose” payoffs, which only have the objective of identifying what could be the outcomes of those specific strategic combinations and which lack a specific numeric value because, in this case, they are not linked to any real event. Interestingly, the matrix above could be rearranged to describe every strategic approach and respective rival reaction, with approaches and attitudes completely different from the ones in use. This makes the matrix a useful tool in the analysis of the obstacles deriving from the competitive environment during the implementation of a buy-and-build strategy and, if used together with the extensive form describing all the acquisition plan, can provide the acquiring company with a critical help in the preventive assessment of fundamental issues that might be faced in the future, hence allowing a prudential establishment of countermoves and exit strategies to avoid excessive value destruction.

To conclude this paragraph concerning the use of game theory in buy-and-build strategies, it might be interesting to highlight how different is the application with respect to the M&A pricing models analysed in the previous pages. Here, game theory offers to decision-makers some useful tools to strategically frame the issues that will be potentially met throughout the different stages of the acquisition plan, hence giving them the possibility of organising their actions in a variety of scenarios. To employ game theoretic concepts in this particular way does not imply an excessive trust in the mathematical and numerical component, but has rather to do with the exploitation of their logical component: both the extensive and normal forms presented above are built around logical and behavioural elements related to theoretical examples in the context of a buy-and-build strategy, providing useful insights even in the absence of payoffs. This wants to underline how this specific use of game theory is more qualitative than quantitative and could undoubtedly represent a helpful instrument to foster decision-makers' strategic reasoning. Nevertheless, a speech on the usefulness of these framing techniques does not cancel the presence of psychological and behavioural factors that might have a profound impact on the accuracy of the game theoretic models implemented as a support for the buy-

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<sup>42</sup> Acquisition Strategies As Option Games – Journal of Applied Corporate Finance (vol. 14.2) – H. T. J. Smit, 2001

and-build strategy. As for the pricing models, many aspects of these strategic plans involve a form of negotiation and competitive interaction among agents, hence creating a broad space for variations in the outcomes of each and every stage. From empathy to obsession, the array of human emotional traits that might have an influential role in negotiation contexts could not be wider and thus complicates the predictive ability of game theoretic frameworks. However, the use of these tools as a qualitative decisional support that provides hints in situations of high uncertainty can be properly managed to offset the disadvantages of such unpredictability and might on the contrary represent a critical element for a deeper comprehension of complex long-term contexts.

This journey across some of the applications game theory has found in the world of mergers and acquisitions has come to an end and, before moving to the third and last part of this work, it might be useful to draw some conclusions that may prove helpful in contextualizing the issues that will be faced later on. Without any doubts, the management of M&A operations presents heavy obstacles for those involved, both on the side of the acquirer and the target, imposing a constant search for tools and techniques that might effectively help to set up a clearer identification of the issues and to individuate strategically effective solutions. As it was discussed throughout this chapter and the previous one, the objectives of a merger or an acquisition can be quite different from one deal to another and this clearly determines the necessity to take into account and analyse factors belonging to different areas: earnings, market penetration, synergistic opportunities, etc. Interestingly, game theory has reached such a level of development throughout the decades that it has allowed the application of its elements and concepts into a wide variety of models, aiming to analyse a wide array of issues and to provide agents with supporting decision-making tools. As the considered game theoretic models were able to show in the previous pages, the degree of analytic depth reached is quite impressive and gives the opportunity to intuitively frame complex issues into simpler structures. Among the numerous business-related objectives cited, reality is that the most ambitious goal for these models might actually be to offer decision-makers a tool that helps in the identification of “convenience boundaries”, intended as a series of guidelines that, if followed, could lead to the conclusion of a value-creating deal. It might be intuitively stated that such a goal is more than ambitious and no model can be today enough accurate to provide such information. One can argue that the number one reason stands in the impossibility to take into account all the determining factors involved in such transactions, but perhaps it is not exactly the quantity to impose strong constraints – to be honest, with the due instruments, an infinite variety of factors could be considered – and the real obstacle can be rather identified in the quality of these factors: technical aspects present a higher degree of simplicity in terms of computation and prediction, whereas the human component of each negotiation presents such a level of complexity that some people might define presumptuous even the idea of calculating them. In more than one occasion, through this paper, it was highlighted how human psychological and behavioural aspects are a critically influential factor in the outcome of a negotiation, either in a M&A context or any other, hence deserving appropriate consideration

also from a strategic standpoint. Game theory, as other scientific disciplines, has tried to overcome the issue by applying assumptions about human behaviour derived from careful analysis and observation of reality, though forced to accept strong limitations imposed by the impossible description of the latter. All of this is everything but a critic to these refinement attempts, implemented with the objective of improving the analytical capacity of the available tools, but wants instead to underline the natural limits of an analytical process whose accuracy is too much dependent on elements that are even out of the control of whoever gets to experience them. With this in mind, the following chapter will try to go deeper into this idea and to provide examples that might help the reader to understand its founding principles. Wondering through the complexity of the human mind and behavioural attitudes, the last chapter of this work will attempt to highlight the limits of game theoretical models in the context of M&A negotiations.

## **CHAPTER 3 – IMPACT OF HUMAN PSYCHOLOGY ON M&A NEGOTIATIONS AND CONSEQUENT LIMITS OF GAME THEORETIC REPRESENTATIONS**

### **PART 1 – NEGOTIATION AS A PERSONAL AND INTERPERSONAL PROCESS**

As the title might suggest, the final objective of this work aims to be a discussion over the reliability of game theoretic representation as a descriptive tool of M&A negotiations. The discussion conducted throughout the previous chapters was organised to provide the reader with what can be considered as the key elements to conclude this analysis, i.e. to effectively establish whether and to what extent game theoretic concepts and deriving models can be used to represent strategic settings involving M&A transactions. More than once, through the text, a clarification was offered concerning the attitude of this paper towards game theory, which absolutely has no intention to be hostile and rather of respectful acknowledgement of some plausible conceptual limits. Up to this point, it might be accurate to define M&A transactions as strategic operations involving a multitude of parties which find themselves involved in a negotiation process over a certain entity, being it a group of assets, a division or an entire company. This strategic negotiation can be analysed from a two-fold perspective: on the one hand, an acquirer negotiates with the target to reach an agreement over the price; on the other hand, an acquirer negotiates with other interested parties over aspects different from the price (e.g. collateral effects, employment, antitrust agencies). The first negotiation, the one between the acquirer and its target, also implies an additional strategic element: competition. As it was analysed while examining the application of game theory in buy-and-build strategies, competitors often play a determining role in negotiations over price and hence must be taken into account in the modelling of a M&A transaction. Using its ideas and elements, game theory builds models that attempt to provide a faithful portrayal of the whole set of strategic interactions described above, with the underlying and ultimate intention of identifying optimal decision-making paths for the parties involved, i.e. those that deliver the best possible outcome according to the given assumptions. Nevertheless, as superficially mentioned in several previous occasions, these models seem to lack a proper inclusion of some dynamics that actually exercise a profound influence on the negotiation: cognitive biases and interpersonal skills are a simple example of elements that game theory struggles to include. Furthermore, game theory founds its models on unrealistically strict assumptions concerning agents' behaviour, of which perfect rationality is a clear example. The combination of a psychological absence and a restrictive assumption body determines the existence of pitfalls in the descriptive capacity of these models, which fail to account for a human component that represents a critically important aspect in negotiation contexts. Interestingly, it was a mathematics and game theory expert to first raise doubts concerning the validity of the discipline as a descriptive tool for negotiation settings: Howard Raiffa.

Born in 1924 in the Bronx, Raiffa graduated in mathematics (Bachelor's and Ph.d) and statistics (Master's) from the University of Michigan. He spent 37 years teaching at Harvard, where he was recognized as a pioneer in an innovative discipline, namely "decision science", which transversally covered topics

concerning negotiation techniques, conflict resolution, risk analysis and game theory<sup>43</sup>. As reported in Sam Roberts' article about Raiffa's passing in 2016, Harvard's Political Economy professor Richard J. Zeckhauser stated that the research conducted by his colleague in the field of negotiation "was not simply "how to win". Rather, it was strongly directed toward the question of how to create joint value"<sup>44</sup>. The beauty of Professor Raiffa's studies stood in the harmony between theoretical complexity and real-life application, something that is witnessed by his theoretical work, on the one hand, and his involvement in advisory tasks for strategic decisions<sup>45</sup>, on the other hand. In the context of this paper, it is interesting to observe Raiffa's view concerning the application of game theory in real-life negotiation contexts. As he writes in his book *"The Art and Science of Negotiation"* (1982): "The theory of games focuses its attention on problems where the protagonists in a dispute are super-rational, where the "rules of the game" are so well understood by the "players" that each can think about what the others are thinking about what he is thinking, ad infinitum. The real business cases I was introduced to were of another variety [...]". What Raiffa desired to highlight was the presence of a high degree of uncertainty in realistic competitive interactions, intended as the absence of a clear and stable set of alternative choices, of a shared perspective among the involved agents and of a pre-established payoff structure. Thus, the main difference between theoretical and practical settings could be identified in the extent to which rationality entered the decisions of the agents, unrealistically large in the former case and according to the ideal of "rational economic man". These pitfalls in the game theoretic description of negotiation processes led Raiffa to provide a two-fold definition of these interactive dynamics: first, negotiation as a science, intended as the analytical approach to problem-solving; second, negotiation as an art, hence implying the presence of interpersonal aspects and psychological factors influencing its execution. This is, essentially, the ultimate approach to negotiation, where the quantitative and qualitative factors provide complementary analysis that combine in a proper assessment of the interactive context, offering strong groundings for making appropriate decisions and, most of all, for evaluating the appropriateness from the perspective of the specific setting in which it is made. Hence, game theory cannot be defined as an inaccurate analytic tool in negotiation settings, since it allows to strategically represent the situation around which the bargaining takes place and to intuitively comprehend it, but it lacks flexibility for what concerns the identification of solutions and employs an excessively narrow perspective in the formalization of decision paths. In this sense, Raiffa introduces a more accurate and representative dimension to the domain of negotiation, entirely concerned with its human aspects and the doubts these raise in the mind of negotiators: "What are the interests, motives, concerns of the other negotiating parties? What are their alternatives to a negotiated agreement? What are the opportunities for exploiting differences in values, beliefs, constraints? How should you share information for joint problem-solving without making

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<sup>43</sup> Howard Raiffa, Mathematician Who Studied Decision Making, Dies at 92 – The New York Times – S. Roberts, 2016

<sup>44</sup> Howard Raiffa, Mathematician Who Studied Decision Making, Dies at 92 – The New York Times – S. Roberts, 2016

<sup>45</sup> Howard Raiffa worked as an adviser in McGeorge Bundy's team when U.S. President Lyndon Johnson demanded to develop international cooperation strategies with the Soviets by using science as a common ground; he helped the Mexican government to find an appropriate location for the construction of a new airport; he provided tools that helped the U.S. Navy to individuate a lost hydrogen bomb.

yourself too vulnerable [...]?”). As underlined above, the human nature of negotiators is the essence of uncertainty in bargaining situations and is thus of critical importance to define some of the forms in which it manifests. In the following pages, the objective will be the exploration of some psychological dynamics that strongly influence the development of a negotiation and which determine its departure from strict game theoretic constraints.

An exhaustive description of the psychological and behavioural dynamics taking place in a negotiation context is provided by the work of De Dreu, Beersma, Steinel and Van Kleef: *The Psychology of Negotiation – Principles and Basic Processes* (2007). As Raiffa anticipated in his forementioned book, the agents involved in a negotiation do not enjoy a state of full information and this premise is adopted by the authors of the article to justify how the singular characteristics of each individual’s information processing mechanism present differences, which themselves lead to a series of distinct psychological attitudes towards the bargaining procedure and their counterparts. Hence, the article pivots around the different approaches to information processing and their consequences on the agents’ attitude to interpersonal relationships and negotiation outcomes. Before entering the strictly psychological domain, the authors wisely spend some words to describe some structural aspects of the negotiation process that prove wonderfully helpful to comprehend the groundings of its interpersonal dimension. The key concept appears to be that of “interdependence”, intended as the presence of cooperative incentives determined by either the potential advantages deriving from the reaching of an agreement or the potential disadvantages deriving from the failure in cooperation. The degree of interdependence between two parties can be assessed, according to negotiation research, by analysing two main factors: first, the extent to which one party can reward or punish the other; second, the availability of good alternatives. Clearly, different measures of these factors are reflected in one party’s power of influence over the other, an element that might be easily compared to the concept of “bargaining power” discussed in Chapter 2, with perceivable effects on the negotiation process and its outcomes.

According to De Dreu and his colleagues, there is a second structural aspect of negotiations that deserves mention: the number of issues concerned. Whether the negotiation takes place around a single one or a multitude of issues, differences rise up in terms of value-creation capacity of a deal. In a single-issue negotiation, agents bargain over a unique aspect to which they attach a certain value and hence work to conclude a deal that presents an advantageous distribution of the latter. The scenario is more complex in negotiations concerning a multitude of issues and the reason does not only stand in the larger breadth of the alternatives scheme, but also in the introduction of an additional value-determining concept, namely the importance scale of issues. Along with this factor comes an interesting aspect of the relationship between agents, which is a natural difference in their importance scales and a consequent opportunity for integration: by valuing each issue on the table differently, in terms of importance, the parties create a wider space for reaching an agreement, according to their openness to make concessions on complementary demands.

Negotiation contexts presenting this feature are said to have “integrative potential” and seem to deliver agreements with higher joint value<sup>46</sup>. In the words of De Dreu and his colleagues: “Many analysts have argued that integrative agreements are superior because they exploit resources available to the negotiators, and because they provide high levels of relationship stability [...]”. What is important to understand, nevertheless, is that integrative agreements are an attractive as well as hardly-exploited opportunity, since agents tend to fail in the identification of the integrative potential. As it might be inferred, this difficulty in the individuation of integration occasions can be seen as a consequence of the partial information assumption that was discussed while introducing Raiffa’s vision about real-life negotiation situations and which is strongly supported by De Dreu and his colleagues. Furthermore, despite the presence of effective communication techniques nowadays, the diffusion of information in a negotiation context appears far more complex than it might actually be because of a force that often works in the opposite direction of the integrative potential: the competitive incentive. Even in presence of integrative opportunities, agents tend to engage in a high-effort thinking process, and eventually step back, when there is some information to share with their counterpart, due to the fear of exposing themselves to vulnerability. On the opposite hand, in cases of information sharing, the receiver is not free from concern and, on the contrary, experiences parallel fear of vulnerability exposure derived from the acceptance of information that might actually be voluntarily deceptive. These represent ordinary examples of the effect produced by human conscious and subconscious reasoning on a random competitive interrelation, hence providing valid groundings for proceeding with the analysis of psychological and behavioural attitudes as influential factors in the departure of negotiation descriptions from the clear-cut representations offered by game theoretic models. As perfectly summarized in De Dreu et al.’s article: “It is this and similar questions about strategic decision making in fuzzy situations that drives the social psychological study of negotiation, setting it apart from analyses in game theory and behavioural economics that often are mathematically sophisticated and logically comprehensive but weak in a truly accounting for human judgement and strategic choice”<sup>47</sup>.

In order to maintain consistency with the logical framework established in the previous lines, it might be appropriate to begin with an introduction to some cognitive obstacles in the domain of individual information processing. These barriers to an accurate comprehension and contextualization of the information gathered in a negotiation setting represent a strategically detrimental impediment to the exploitation of integrative potential, hence they deserve to be treated as a valid example of psychological influence in the achievement of optimal bargaining outcomes. More precisely, three specific cognitive mechanisms will be considered and analysed: cognitive heuristics, naïve realism, self-threat<sup>48</sup>.

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<sup>46</sup> The Psychology of Negotiation: Principles and Basic Processes – Social Psychology: Handbook of Basic Principles - C.K.W. De Dreu, B. Beersma, W. Steinel, G.A. Van Kleef, 2007

<sup>47</sup> The Psychology of Negotiation: Principles and Basic Processes – Social Psychology: Handbook of Basic Principles - C.K.W. De Dreu, B. Beersma, W. Steinel, G.A. Van Kleef, 2007 (p.612)

<sup>48</sup> The Psychology of Negotiation: Principles and Basic Processes – Social Psychology: Handbook of Basic Principles - C.K.W. De Dreu, B. Beersma, W. Steinel, G.A. Van Kleef, 2007 (p.614)

## Cognitive Heuristics

Proceeding with order, a more detailed analysis will start from the concept of cognitive heuristics. Before approaching the idea in the perspective of negotiation, it is interesting to define what is actually intended with the term “heuristic”. From a strictly psychological point of view, a heuristic is defined as a shortcut that offers the individual the opportunity to make a quick decision using a minimal mental effort. Depending on the specific situation in which these shortcuts are used, consciously or not, their effects can be two-fold: on the one hand, the decision-maker frees mental resources from the heavy burden of a complex decision; on the other hand, the decisional effectiveness might be compromised by the avoidance of critical information. Scholars and researchers all over the world have examined heuristics for decades, for the purpose of understanding their scope and practical effect on decision-making processes. Among popular works in the field, a special mention is deserved by the research of Daniel Kahneman and Amos Tversky, pioneers in the revolutionary behavioural economics. Two papers from 1973 discuss about the role of two heuristics, representativeness and availability, in the context of decision-making under conditions of uncertainty. The first one, titled “*On the Psychology of Prediction*”, reflects on the effects of representativeness, a judgmental heuristic according to which decision-makers “select or order outcomes by the degree to which the outcomes represent the essential features of evidence”. This means that decision-makers tend to predict the outcomes of a certain event according to their intuitive assessment of the available elements, instead of focusing on a probabilistic evaluation of likelihood. In the context of negotiation, according to De Dreu and his colleagues, the role of representativeness can be identified in the way the counterpart’s behaviors are predicted and interpreted by an agent through the use of stereotypes. More specifically, agents here seem to have a tendency towards the judgement of one’s bargaining attitude based on information about his personality and/or reputation, whereas a third element, namely fairness, works as a representativeness manifestation for the valuation of negotiation outcomes. What often lacks in judgements of this kind, nevertheless, is the consideration of situational aspects, which actually play a more determinant role in the modelling of bargaining behaviors.

The second heuristic analysed by Kahneman and Tversky, namely availability, is itself related to the evaluation of the likelihood of an event (or outcome) and takes into account the possibility that the judgmental process might rely on the information readily available to the judging individual’s mind, instead of examining the appropriate data. In their paper “*Availability: A Heuristic for Judging Frequency and Probability*” (1973), the two authors talk about this specific cognitive shortcut by stating that: “A person is said to employ the availability heuristic whenever he estimates frequency or probability by the ease with which instances or associations could be brought to mind”. This psychological mechanism is grounded on one individual’s ability to recall specific information concerning the frequency of certain events and then, through the use of “associative bonds”, use it for establishing the likelihood of another phenomenon. In this perspective, one might actually simplify the description of the bias by citing a statement by the authors, namely that “frequent events are easier to recall or imagine than infrequent ones”, and reading it in the

context of a scenario analysis: when evaluating the probability of different scenarios, an individual will see the most likeable opportunity in an event that proves easier to picture, according to the available associations. One of the major drawbacks imposed by the availability heuristic is not linked to the erroneous judgement, rather to the limitation it creates in the assessing capacity of the interested individual. More specifically, once the evidence used for evaluating the probability of an event creates a narrative that actually makes sense, there is a tendency to overlook at the missing information. From the perspective of a negotiation, the availability heuristic can be both a useful tool and a terrible trap: for the party taking advantage of it, the bias opens opportunity for exercising influence on the opponent “by carefully choosing comparisons to the current situation”<sup>49</sup>; for the party suffering its effect, the psychological mechanism determines high vulnerability to deceptive information. The most practical consequence of this cognitive bias for the managerial purposes analysed in this paper can be identified in a tendency towards “overconfidence”, typically displayed by managers in the form of excessive reliance on own beliefs and practices, which become both cause and effect of a widespread incapacity to consider the “big picture”. Overconfidence can manifest in a wide array of managerial attitudes and behaviours and a more specific analysis will be conducted in the second part of this chapter.

De Dreu and colleagues then refer to a third and last cognitive heuristic, which in this case is not exactly related with judgements over probability but rather considers the establishment of reference points for the bargaining process. This heuristic is called “anchoring” and, in the words of the authors, it has to do with individuals’ “tendency to overly rely on an arbitrarily chosen reference point”<sup>50</sup>. Consequently, agents manifest an erroneous inclination to form inappropriate aspirations concerning the outcomes of the negotiation. In turn, this propensity might end up influencing the psychological perception of the counterpart’s negotiation behaviour, potentially increasing the hostility and hence reducing the possibility of an agreement. Once again Kahneman and Tversky provide an interesting perspective concerning the anchoring heuristic: in their paper “*Prospect Theory: An Analysis of Decision Under Risk*”, the authors criticize the simple assumptions of expected utility theory by introducing an alternative model called “Prospect Theory”; the innovative aspect of this framework consisted in assessing utility in the perspective of gains and losses, rather than absolute value, starting from an arbitrary reference point; to complete the model, a further assumption implies that losses are valued as more impactful than gains. When applied to a negotiation context, the prospect theory determines a two-fold consequence: assuming the presence of a double anchor, including a high (desired) and a low (last resort) reference points, two alternative judgement paths are possible; first, everything is valued according to the high reference point, hence outcomes superior to it are gains and those below it are losses; second, everything is valued according to the low reference point, hence outcomes superior to it are gains and those below are losses; in the first case, most of the

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<sup>49</sup> The Advantages of Bias at the Negotiation Table: Use your knowledge of biases as an influencing tool in negotiation – Harvard Law School – P. Staff, 2020

<sup>50</sup> The Psychology of Negotiation: Principles and Basic Processes – Social Psychology: Handbook of Basic Principles - C.K.W. De Dreu, B. Beersma, W. Steinel, G.A. Van Kleef, 2007 (p.615)

outcomes will be judged as losses and, since each concession will represent an increase in loss and thus will be more painful, the possibility of reaching an agreement will surely decrease; in the second case, which can be labelled as “gain-framing”, most of the outcomes will be judged as gains and, since concessions will represent a decrease in gain and thus will be less painful relative to the case above, the possibility of reaching an agreement will surely increase. From a practical standpoint, it appears evident that anchoring can transversally influence the development of a negotiation process and its outcomes and, as it was written for the availability heuristics, it can be an advantageous tool for one party and a fatal trap for another one. In a real-life negotiation, what could happen is that a skilled agent persuades a more naïve negotiator to anchor his reference points to values that actually benefit the former, hence driving the negotiation towards a higher personal gain without even making it noticeable.

These above are three simple examples of cognitive heuristics experienced by an agent during a negotiation and represent a minuscule portion of the vast array of existing mental shortcuts. In general, the employment of biases of the kind described above is a consequence of the necessity for the agent to reduce the degree of uncertainty implied in a negotiation. Cognitive heuristics, indeed, provide a simplistic view of the situation and allow the parties to proceed with their bargaining in a faster though potentially inefficient way. Cognitive heuristics, however, do not represent an isolated alternative in the context of biased information processing. In their paper, De Dreu and colleagues provide two additional principles in the domain of psychologically influenced information processing: naïve realism and self-threat.

### **Naïve Realism**

Starting from the concept of naïve realism, before entering its deepest realms, it might be accurate to state that it does not move far away from the idea of heuristic and still represents a form of mental shortcut for the agent to make quicker decisions in uncertain conditions. Nevertheless, an appropriate reason for giving it separate treatment, with respect to the cognitive heuristics analysed above, stands in the fact that it actually includes a series of specific manifestations. In its most general definition, naïve realism represents the assumption of similar views and thoughts between the parties or, more specifically, one agent’s assumption of accuracy in his perception of the world and consequent alignment of other agents’ perceptions. To make things even clearer, it helps to report the words of Pronin, Ross & Gilovich.: “Naïve realism, we suggest, thus gives rise to the conviction that others in general, and others who disagree with us in particular, are more susceptible to biasing influences than we are ourselves”<sup>51</sup>. As a straight consequence of this initial description, one might say that the concept of naïve realism is directly linked with an expression of overconfidence. It is undeniable, indeed, that overconfidence is one of the most practical representations of this principle and is concretely manifested in a tendency by “naïve realists” to overvalue their probabilities of success in a negotiation, due to a more precise comprehension of reality, and hence to reject a superior number of settlement alternatives according to the belief of being directed towards more rewarding ones.

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<sup>51</sup> Objectivity in the Eye of the Beholder: Divergent Perceptions of Bias in Self versus Others – Psychological Review (2004, vol. 11) – E. Pronin, L. Ross, T. Gilovich, 2004

Besides a natural level of overconfidence, agents characterised by the adherence to this principle tend to engage in an ulterior practice: confirmatory information search. Clearly, in the presence of erroneous starting information, this practice can lead to nothing but an inefficient negotiation process. An example offered by De Dreu et al., based on some findings in the paper “*From self-prediction to self-defeat: Behavioral forecasting, self-fulfilling prophecies, and the effect of competitive expectations*”<sup>52</sup>, provides an interesting insight on the effects of this confirmatory information search in the context of a negotiation: once an agent has a strong belief concerning the competitive attitude of a potential counterpart, his confirmation bias will lead him to misjudge additional information and hence to set the goals of his bargaining in accordance with that belief; interestingly enough, it is the same attitude derived from one’s belief to transform a potentially theoretic situation into reality, due to the behavioural responses of both parties to each other’s actions and to the interpretation of each behaviour as the consequence of some reliable motive. For this reasoning to be more straightforward, one might simply imagine that an agent believes his counterpart to be a strong and hostile negotiator and thus sets reasonable goals for the negotiation; once the counterpart receives these modest requests, he will actually increase the level of competition in response to the apparent inexperience of his opponent and with the intention of exploiting it; on the other hand, the agent will see its initial belief confirmed by this attitude and hence will act accordingly. What comes to light according to the previous concepts is the possibility for an agent to remain stuck in blinding beliefs, up to the point that his own actions might turn them into reality. Naïve realism then appears as a seriously influent concept in the context of negotiations, being it the cause of a distortion in the perception of reality and, in turn, the determinant of unfounded strategies. As for cognitive heuristics, naïve realism manifests as a consequence of the agent’s need to reduce uncertainty and works to provide him with apparently reliable foundations for decisions to be made. Unfortunately, the belief of an alignment between agents’ views of the world creates the illusion of diametrically opposed preferences and hence sets the ground for win-lose agreements, hiding on the other hand the opportunities for integration.

### **Self-Threat**

Both cognitive heuristics and naïve realism are related to the perception an agent has of the external reality, though it is important to take into account the role of self-consideration in the context of a negotiation. It is undeniable that each and every individual perceives himself as characterized by specific traits and manifests a tendency to judge them positively, thus building a strong and protective self-concept that can influence the dynamics of his social relationships. This idea of protection of the self is then manifested through an interesting form of bias, namely “Self-Serving Bias” (or SSB)<sup>53</sup>, defined by Campbell and Sedikides as “the explanatory pattern that involves external attributions for outcomes that disfavour the self but internal

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<sup>52</sup> From self-prediction to self-defeat: Behavioral forecasting, self-fulfilling prophecies, and the effect of competitive expectations – Journal of Personality and Social Psychology – K.A. Diekmann, A.E. Tenbrunsel, A.D. Gailnsky, 2003

<sup>53</sup> The Psychology of Interpersonal Relations – F. Heider, 1958

attributions for outcomes that favour the self”<sup>54</sup>. Without an excessive effort it is possible to relate this concept to the idea of overconfidence analysed in the domain of naïve realism, despite the existence of differences concerning the scope of this “auto-credibility”. Indeed, in the context of naïve realism, the individual strongly relies on his individual perception of reality, hence confining overconfidence to a specific domain while, in the context of self-protection, the concept extends to the consideration of the whole self and of the whole set of manifestations. Nevertheless, the idea of overconfidence might be misleading when applied to the domain of self-conception, where the individual does not manifest a blind conviction of superior abilities and instead employs a subconscious defence mechanism to safeguard his own perception of the self. The use of the term “defence” might end up proving extraordinarily appropriate to introduce another important principle in the field of information processing: self-threat. Indeed, the words “threat” and “defence” seem to create the right juxtaposition to proceed with the description of this psychological process which, in the context of negotiation settings, imposes further limits to the efficiency of the bargaining procedure. As described above, individuals feel the necessity to carefully defend the perception of the self and hence employ a protective attitude in situations of apparent threat to this mental image. Intuitively, this is what self-threat is about: “when favourable views about oneself are questioned contradicted, impugned, mocked, challenged, or otherwise put in jeopardy”<sup>55</sup>. For the individual at the receiving end of the threat consequences can be of the most varied sorts, depending on the characteristics of the specific threat: origin, threatening subject, context, public impact, etc. According to the intensity of the threat and the personal traits of the threatened individual, the extent to which SSBs are activated changes and influences the relationship with the source of the menace. For a concrete comprehension of the mechanism, it might be useful to analyse a practical (but simple) case: consider a student who believes in himself as an extremely smart individual, but fails a mathematics test; his self-consideration is endangered and a defence mechanism is necessary, hence he might end up avoiding quantitative subjects in the future to reduce the probability of experiencing that trauma once again. In this super simple example, the self-threat derives from a concept, namely mathematics, towards which the student reacts accordingly. However, a self-threat might come from another individual and the reaction in this case will be directed towards the individual himself. The latter eventuality is closer to the typical dynamic of a negotiation setting, where an agent might feel attacked personally and thus increase his hostility towards the threatening counterpart. The consequence of an increased competitive attitude stands in a greater complexity for the achievement of a deal and an enhanced possibility of deterioration in the view of a long-term relationship. In the light of this, it is reasonable to say that the appropriate assessment of the personal dimensions involved in a negotiation and the ability to include their treatment in the strategic approach to the talks might represent a critical advantage in a bargaining setting.

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<sup>54</sup> Self Threat Magnifies the Self-Serving Bias: A Meta Analytic Integration – Review of General Psychology (1999, vol.3) – W.K. Campbell, C. Sedikides, 1999

<sup>55</sup> Relation of Threatened Egotism to Violence and Aggression: The Dark Side of High Self-Esteem – Psychological Review – R.F. Baumeister, L. Smart, J.M. Boden, 1996

The exploration of the world of cognitive heuristics could go on for a while, though it would represent a departure from the final objective of this work. For this reason, it might be appropriate to conclude the reflection over this particular aspect of human psychology and proceed instead with the additional effects of the latter on a negotiation. Before doing so, however, one further element might deserve appropriate mention in this specific field and could be useful to gain a deeper comprehension of the functioning of cognitive heuristics. For decades, researchers believed in a limited human cognitive capacity that represented a catalyst factor for the employment of cognitive heuristics, intended as mechanisms that could help individuals gain a refined perception of the world. This limited cognitive capacity has been labelled with the expression “cognitive miser” and its definition can be summarized in the words of Corcoran and Mussweiler: “cognitive miser means that people strive to process information efficiently and to make decisions without consuming too many cognitive resources”<sup>56</sup>. The authors are also extremely clear in linking this definition with its natural consequence, pointing exactly at what has been written above: “Because the human mind is rather limited [...], people often engage in the more economical instead of the more elaborate and arduous information-processing mechanism [...]. In other words, people often rely on heuristics to reduce cognitive tasks to more simple operations.”<sup>57</sup>. Despite this being a widespread view in the field of social psychology, some refinements to the basic theory have been advanced over the years and have highlighted how cognitive limits might not always be connected to natural characteristics of the individual and might instead derive from a series of external factors that can be summarized in the word “motivation”. Relying again on the work of De Dreu and colleagues<sup>58</sup>, it is interesting to observe how they explore this theory by pointing out how the individual itself seems to have a choice between two perceptual approaches, one more detailed and effortful and another one more heuristic and effortless. Clearly, this choice takes place according to the individual’s level of motivation and this can be easily assumed to change in relation to the situation and to the necessity for the agent to develop a perfectly detailed view of the world. Hence, a multitude of internal and external factors can actually influence the motivation of an agent and push him towards a more or less effortful information processing: need for cognitive closure, accountability, time pressure, etc. Negotiations are not excluded from these dynamics and manifest a series of aspects that exert influence on the negotiators’ levels of motivation. De Dreu and colleagues highlight the importance of some specific aspects in the context of a negotiation: fatigue in the bargaining procedure, unexpected acceptance of an offer, temporary impasses, etc. Basically, the general idea is that as the level of motivation grows, the extent to which cognitive heuristics are used decreases. However, a further specification could be made for what concerns motivation: in their description of the scheme, De Dreu and colleagues complement the term “motivation” with the adjective “epistemic”, whose meaning stands in the desire to deepen one’s

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<sup>56</sup> The Cognitive Miser’s Perspective: Social Comparison as a Heuristic in Self-Judgements – European Review of Social Psychology – K. Corcoran, T. Mussweiler, 2010

<sup>57</sup> The Cognitive Miser’s Perspective: Social Comparison as a Heuristic in Self-Judgements – European Review of Social Psychology – K. Corcoran, T. Mussweiler, 2010

<sup>58</sup> The Psychology of Negotiation: Principles and Basic Processes – Social Psychology: Handbook of Basic Principles - C.K.W. De Dreu, B. Beersma, W. Steinel, G.A. Van Kleef, 2007 (p.615)

knowledge; the resulting expression, “epistemic motivation”, clarifies how the determinant level of motivation in this specific context is the one related to the desire of the individual to perfect his knowledge of the surrounding world, instead of a general level of motivation. The feeling is that of supporting the use of this expression, which accurately specifies the kind of motivation required by the mechanism under analysis. This digression represents the conclusive step of the discussion over cognitive heuristics and their influence on the negotiation process. The field of cognitive heuristics experiences a constant update due to the work of academics and researchers who strive for the identification of psychological mechanisms that might prove helpful to explain the departure of human reasoning from the idea of perfect rationality. Nowadays, it is possible to recognize the existence of tens of these mental shortcuts and this imposes limits to their accurate treatment in this specific work. As a matter of fact, cognitive schemes represent a single element of a broader set that encompasses a wide variety of aspects of human psychology worthy of attention in the domain of negotiation. Cognitive heuristics, indeed, are mainly responsible for peculiarities in the agents’ information-processing capacity and hence take into account a unique aspect of the human influence on the decision-making process. Nevertheless, it is undeniable that the amount and typology of information available to every decision-maker have a determining effect on his strategic choices, thus making cognitive heuristics a single though fundamental aspect in the assessment of the effects of human mind on the ability of agents to bargain efficiently and effectively.

## **Emotional Influence**

The cognitive aspect of a negotiation is not the only psychological element to be influent in such a situation, since these settings are often highly demanding also from an emotional perspective. Despite the apparent distinction of these two concepts, cognition and emotion actually represent the core of a serious discussion concerning their relationship and combined effects. A wide array of theories has been developed over this theme, with the final goal of shedding light on the dynamics that govern human interaction in general and negotiation consequently. To understand the range of this discussion, it might be interesting to simply observe the volume of theories concerning the development of emotions. A quite popular one is labelled as “appraisal theory” and it promotes a strong connection between the concepts of cognition and emotion. In the paper “*Emotion in Negotiation*”, Bilyana Martinovski summarizes the theory as follows: “emotion is seen as something automatic, non-reflective and immediate and at the same time cognition leads emotion, i.e. the way we cognize events influences our emotions related to them”<sup>59</sup>. However, it is sufficient to type “appraisal theory pdf” on Google Search to bump into another paper titled “*Appraisal Theory: Overview, Assumptions, Varieties, Controversies*” and to read: “Appraisal theories may be contrasted with other theories of the causes of emotions”<sup>60</sup>. Here, four alternative emotion-formation theory categories are offered in less than ten lines, offering distinguished perspectives about the relationship between cognition and

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<sup>59</sup> Emotion in Negotiation – Handbook of Group Decision and Negotiation - B. Martinovski, 2010

<sup>60</sup> Appraisal Theory: Overview, Assumptions, Varieties, Controversies – Series in Affective Science. Appraisal Processes in Emotion: Theory, Methods, Research - I.J. Roseman, C.A. Smith, 2001

emotion and mostly assuming the possibility of emotions arising regardless of a cognitive evaluation process. As it can be inferred autonomously, the number of theories concerning this aspect is far higher than five and the objective of this brief incipit was to provide the reader with a concrete proof of the ambiguity surrounding the role of emotions – intended in a stricter sense - in a negotiation context. One of the first aspects to notice when discussing about emotions is their transversal presence: individuals experience an infinite variety of emotions throughout their lives and a wide variety throughout a single day, as a consequence of several events they take part in; emotions pertaining to one of these events are not limited in their effect to that specific situation and influence most of the experiences occurring within a certain time frame; the duration of this effect varies according to a series of factors, among which the magnitude of the relative event plays a role of critical importance together with the personal characteristics of the interested individual. In this context, negotiations represent one of numerous events taking place in the lives of the negotiators and for this reason are subjected to a two-fold emotional effect: first, emotions deriving from other events might affect the bargaining attitude of the individual; second, events taking place in the middle of the negotiation might produce – and do it in most of the cases – emotional reactions by the agents, which will influence the continuation of the talks. These two propositions can be further specified and supported by additional notions. For what concerns the first one, hence the effect of emotions deriving from events outside the negotiation, De Dreu and colleagues provide a simplistic and illustrative principle called the “moody negotiator principle”, according to which emotions of anger experienced by one negotiator push him towards tougher bargaining attitudes and smaller concessions, emotions of happiness drive the opposite effects and emotions of sadness are linked with evasiveness<sup>61</sup>. The second proposition, which has to do with the emotions derived from the negotiation process itself, can be supported with findings from different researchers: O’Connor and Arnold identified an interesting relationship between impasses during the negotiation and perceptions of scarce success, negative emotions and resentment towards the counterpart<sup>62</sup>; Kwon and Weingart verified that the timing of and the justification for concessions have a direct impact on the receiver’s level of satisfaction<sup>63</sup>. These are just two examples of a direct relationship between the events taking place during a negotiation and the display of specific emotions throughout the process. Clearly, these emotions have strong behavioural consequences and hence end up exercising a powerful influence on the negotiation process and its outcomes. Furthermore, it is important to understand the interpersonal dimension of emotional reactions, which surely drive behavioural responses on the side of the interested individual (intrapersonal effect), but which also determine behavioural consequences on the side of the counterpart (interpersonal effect). This interpersonal effect of emotions is produced through a double intervention on the counterpart’s negotiation behaviour, which takes place on both a subconscious and conscious level:

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<sup>61</sup> The Psychology of Negotiation: Principles and Basic Processes – Social Psychology: Handbook of Basic Principles - C.K.W. De Dreu, B. Beersma, W. Steinel, G.A. Van Kleef, 2007 (p.621)

<sup>62</sup> Distributive Spirals: Negotiation Impasses and the Moderating role of Disputant Self-Efficacy – Organizational Behavior and Human Decision Processes (vol. 84, is. 1) - K.M. O’Connor, J.A. Arnold, 2001

<sup>63</sup> Unilateral Concessions from the Other Party: Concession Behavior, Attributions and Negotiation Judgements – Journal of Applied Psychology – S. Kwon, L.R. Weingart, 2004

subconsciously, one negotiator's emotions seem to have the effect of evoking reciprocal and/or complementary emotions in the counterpart; consciously, one negotiator's emotions may serve the purpose of conveying information to the counterpart concerning feelings, social intentions, orientation towards other people<sup>64</sup>. In the paper "*I laughed, I cried, I settled: The role of emotion in negotiation*", the authors provide a significant passage summarizing the behavioural and informational role of emotions in a negotiation contexts: "Thus, in a negotiation negative emotions may be used to communicate dissatisfaction with a particular state of affairs, which may be interpreted by the opponent as endangering agreement and may thereby produce more conciliatory behaviour. Conversely, positive emotions may be taken to suggest that no further concessions are needed." In order to translate these principles into reality and to verify their validity, one of the authors – G.A. Van Kleef – and some colleagues decided to build a practical experiment: people were asked to engage in a remote negotiation with a counterpart, which was actually a computer-simulated negotiator; this computer could display emotions of anger or happiness, but also be non-emotional, and the objective was to analyse human negotiators' reactions to these emotional states. As stated by the above principles, results showed that negotiators facing an angry opponent were prone to accept larger concessions, while the opposite was true for those with happier counterparts. Clearly, the non-emotional opponent registered reactions that placed in the middle. Though representing an extremely simplified form of assessment of behavioural reactions to the display of emotions in the context of a negotiation, this uncomplicated – not in the construction, but rather in the analysis of its results – experiment offers interesting insights concerning the real-life effects of emotion expression on the outcomes of a bargaining event. It must be recognized, however, that the distinction of emotions in the two broad categories of anger and happiness is quite insignificant, considering the actual width of the emotional spectrum, and hence faces the risk of reducing the extent to which the analysed behavioural reactions might be concretely linked to specific emotional displays. For this reason, the field of study concerning the psychological influences on negotiation has evolved in the last fifteen years and has led to a more specific analysis of emotions and related reactions. As Alison Wood Brooks wrote in her 2015 article on the Harvard Business Review: "Even when experts started looking at psychological influences on negotiations, they focused on diffuse and nonspecific moods [...] Over the past decade, however, researchers have begun examining how specific emotions – anger, sadness, disappointment, anxiety, envy, excitement, and regret – can affect the behaviour of negotiators."<sup>65</sup>. Despite this evolution in the study of the effects of emotion on the conduction of negotiations, it might be appropriate to recognize how a simple distinction as the one presented in Van Kleef et al.'s experiment is useful to prove basic relationships that can be further examined with additional researches. To conclude, it is undeniable that emotions have a critical role in negotiation contexts, influencing behavioural attitudes and responses on multiple sides of the bargaining structure. From a practical and utilitarian perspective, it appears of fundamental importance to recognize the value of dealing

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<sup>64</sup> *I laughed, I cried, I settled: The role of emotion in negotiation* – Handbook of Social Psychology – B. Barry, I.S. Fulmer, G.A. Van Kleef, 2004

<sup>65</sup> *Emotion and the Art of Negotiation* – Harvard Business Review (December, 2015) – A. Wood Brooks, 2015

with one's own emotional states and of understanding how to effectively manage their effects on social interactions. Also, it appears useful to learn how to read counterpart's emotional states as clearly as possible, in order to gather the most useful information and to exploit it for strategic purposes in a competitive bargaining setting.

### **Interpersonal Dimension**

The influence of emotional states on the outcomes of a negotiation and the effects they produce on the bargaining attitude and behaviour of all the parties involved have witnessed a strong interpersonal component in contexts of this kind. Nevertheless, the social component of a negotiation is in any way limited to these direct interactions and typically involves relationships characterized by a higher degree of remoteness. Perhaps the use of the term "remoteness" might drive misleading conclusions, since the intention is not that of referring to subjects presenting a minor interest concerning the negotiation, but rather to identify parties that can be directly addressed by the outcomes despite having a marginal role in the design of the actual agreement. To clarify, it might happen to see a negotiator bargaining beyond his mere self-interest and instead reasoning over social advantages or disadvantages implied by his decisions and those of his counterparts(s). As an example, one could think about a discussion over the utilization of some public space: company XYZ proposes to the city council a project for the construction of a luxury shopping mall, accompanied by the promise of a socially responsible requalification of the site; however, this site is one of the last green areas of the city and is beloved by the citizens, especially in warmer days when they can enjoy it with family and friends; the population did not express any necessity for an upgrade of existing shopping facilities and, on the contrary, rumours about the shopping mall project have generated unfavourable reactions; public administrators have been promised political favour and economic advantages in exchange for support to the project, hence some of them are tempted; in the context of a negotiation over the acceptance or rejection of the proposed solution, the one public officer who takes into account the desires of his fellow citizens is actually extending the scope of the social dimension of these talks and demonstrating how his personal utility function would be in this case dependent on the levels of utility of those whose interests he has at heart. This simplistic example has no intention whatsoever to enter the domain of political representation and the clash between its moral rules and behavioural habits, manifesting instead the desire of portraying a classic example of a personal vs. social interest. To formalize this social bargaining orientation one could quote Beersma and De Dreu who, in their "*Social Motives in Integrative Negotiation: The Mediating Influence of Procedural Fairness*", state: "Negotiation not only involves attempts at integrating own and other's interests as much as possible. Equally important [...] is the distribution of outcomes between oneself and the other negotiator.". Stretching this statement enough to augment its reach, what could be obtained is the higher interest of guaranteeing an appropriate distribution of the outcomes not only between the parties actually involved in the bargaining, but also between them and other interested parties. The necessity to extend the above concept derives from the fact that a fair attitude in the distribution of the

outcomes between a negotiator and his counterpart appears far from a reasonable definition of social motivation, despite the potential altruistic dimension of such a kind of fairness. As a matter of fact, distributive fairness in its narrowest interpretation - hence between two counterparts - might actually imply real social orientation, in the eventuality of it taking place as a direct consequence of one's decision to avoid an abusive exploitation of his bargaining power. What is intended here is that a fair distributive attitude might be considered as such only when put in place as a voluntary sacrifice on the side of an agent who would have no other incentive than a personal pressure towards justice and a desire to feel the sense of wellbeing it delivers. As a consequence, one might argue that a defining element of social orientation in a negotiation context is bargaining power, being it the determinant of arbitrariness in the negotiator's choice of undertaking specific strategic initiatives that will result in altruistic outcomes. Clearly, what arouses interest in the perspective of this work is the effect of social and non-social orientation on the bargaining procedure and, more specifically, on the bargaining attitude of the negotiators. De Dreu and his colleagues make a simple distinction between "proself" and "prosocial" motivation, providing synthetic though exhaustive definitions of both attitudes. In the words of the researchers, individuals characterized by proself motivation "tend to see the negotiation as a competitive game in which power and personal success is important", while individuals who display a prosocial attitude "tend to see negotiation as a cooperative game in which fairness, morality, and harmonious social relations are key"<sup>66</sup>. These broad descriptions are obviously translated in practical behaviors and attitudes: on the one hand, proself negotiators tend to display hostility and to employ deceptive negotiation techniques; on the other hand, prosocial negotiators show a higher degree of trust and openness, driven by the intention of enhancing the constructive side of the interaction. Interestingly, the idea of beneficial vs. detrimental attitude applied to adversarial interactions is a theme exhaustively discussed in Morton Deutsch's book *"The Resolution of Conflict: Constructive and Destructive Processes"* (1973). The author not only discusses over the advantages of a constructive approach with respect to a destructive one – an idea that might be interpreted in the light of the previously observed concept of "integration" – but also presents a fascinating perspective concerning the complex dynamics of a destructive interaction and the remote possibility of evolving it into a constructive setting. First of all, it is useful to mention that Deutsch relates the concepts of "constructive" and "destructive" respectively to cooperation and competition, assuming each interpersonal conflict to be characterized by either one or the other. Then, the words of Michael Billig, author of a detailed review of Deutsch's book, provide a brief and clear description of what the two categories imply: "A conflict is destructive if they [the negotiators] feel dissatisfied with their outcomes and conversely it is constructive if they feel that they have gained as a result of the conflict."<sup>67</sup>. To think about these two approaches to negotiation in the above terms creates an undeniable connection between the concepts of "constructive" and "integrative", being the result of both behaviours that of creating

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<sup>66</sup> The Psychology of Negotiation: Principles and Basic Processes – Social Psychology: Handbook of Basic Principles - C.K.W. De Dreu, B. Beersma, W. Steinel, G.A. Van Kleef, 2007 (p.619)

<sup>67</sup> The Resolution of Conflict: Constructive and Destructive Processes, by Morton Deutsch (Book Review) – European Journal of Social Psychology – M. Billig, 1975

a higher value relative to the one available before the start of the cooperation. In the light of this, one might say that prosocial agents are most likely to display a constructive attitude throughout the negotiation and hence present a higher probability of reaching integrative agreements. What is intriguing, though, is Deutsch's perspective concerning the possibility for a constructive relationship to evolve into a destructive one with a relative degree of ease, whereas the opposite transformation appears extremely more complex and less likely to take place. It seems like hostile and counterproductive attitudes by an agent produce more durable consequences on the counterpart, who experiences emotional and conscientious effects that drive a strong behavioural reaction and determine a hard-to-change attitude. Hence, if the presence of an initial constructive behaviour does not prevent a subsequent destructive attitude from turning the dynamics of the negotiation, whereas the employment of a destructive position is not scratched by a following constructive attitude, then the logical consequence appears to be the consideration of destructive behaviours as attitudes with an undoubtedly higher degree of incisiveness relative to constructive ones. Nevertheless, an additional element might be added to the discussion over the social dimension of a negotiation and it might determine an increase in the complexity of these settings. It can be synthesized in the word "impression". Among people manifesting forms of interest in the outcomes of a specific negotiation, some might present a concrete influence on the agent's attitude and behaviour as a consequence of the latter's desire to impress them. The term impression here is actually intended in a wider sense, where it does not only imply the intention to amaze someone for the sake of personal satisfaction but also has to do with the obligations deriving from contractual relationships or other forms of coercion. The consequence of this additional element, and of some further manifestations, is the potential presence of a double-layer personality in the single person of the negotiator: a more evident one, often related with the need for impressing, and a more hidden one, often related with the actual personality traits of the individual. As it is often the case with increases in complexity, this actually determines the presence of both opportunities and threats: opportunities are identified in the possibility of leveraging on emotions characterized by a higher degree of intimacy and, hence, of influence; threats derive instead from the ability of a negotiator to hide his most personal self and, consequently, to deceive his counterpart. The idea of impression cannot be described as a novelty and is instead a renown component of human social contexts, with individuals finding themselves in the position to play the double role of the person who judges and of the one who is judged. Judgements are passed frequently on a wide array of topics and in the most diverse situations, hence imposing different degrees of attention to one's behaviour. Professors Aistė Mažeikienė and Kęstutis Peleckis provide an interesting and clarifying view on the concept of impression in their *"Negotiation and Business Meetings: Strategies of Self-Presentation"*, by stating that "a person realising himself as a social object, tries to perceive and see himself as such who can be seen by others, and, representing himself correspondingly, tries to show himself to be accepted and evaluated"<sup>68</sup> (a suggestion is to read the quote as if the first comma was not present). As it was specified above, it is impossible to deny the presence of a social component in the context of a negotiation

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<sup>68</sup> Negotiation and Business Meetings: Strategies of Self-Presentation – A. Mažeikienė, K. Peleckis, 2010

and, in addition, it can be recognized how this component itself presents distinct facets. When discussing the matter of impression, the most typical interpretation concerns the relationship between an agent (or group) and an audience observing his behaviour. The problem with this perspective is the lack of accuracy in the definition of this audience which, during a negotiation, can be composed by different nuclei. Each nucleus observes the agent's behaviour in the light of own objectives and expectations, hence submitting satisfaction to specific constraints that vary according to the one interest group being considered. For a clear comprehension of how these dynamics develop in the context of a negotiation, a valid example is provided by those settings in which one of the negotiators acts as a representative. The individual in this role will surely act with the intention to make a good impression on those who hired him for the job and, simultaneously, will try to make a good impression on his counterpart too. A conscious approach to the establishment of a positive impression and the ability of complimenting more than a single audience fall under the name of "impression management", formally defined as "behaviors that [...] actors use to shape how they are seen by others"<sup>69</sup> Regardless of the individual or group towards which the impression effort is directed, it is of critical importance to recognize that it is often characterized by a final objective: in the case of employers, objectives might be identified in the form of promotions or rewards; on the side of the counterpart, objectives can be synonym of concessions. An interesting extension concerning the concept of impression is the idea of "reputation": impressions can be intended as short-lived, immediate perceptions of one's attitude and behaviour, often driven by ignorance and necessity of schematizing reality; reputation is instead a more durable concept and can be interpreted as the sum of the impressions driven by one agent's past behaviours. The Merriam-Webster dictionary provides a three-fold definition of the word reputation, described as: (1) overall quality or character as seen or judged by people in general; (2) recognition by other people of some characteristic or ability; (3) a place in public esteem or regard. These three sides of the definition prove helpful in representing the durability trait of reputation and show how it differs from the momentary aspect of impressions. In the context of a negotiation, reputation receives the more univocal definition of "socially constructed labels that extend the consequences of a party's actions across time, situations and other actions"<sup>70</sup>. Again, and with an even higher degree of clarity, this last definition highlights the temporal dimension of reputation and helps in the recognition of its importance for the approach to and development of the talks. The problem with reputation stands in the impossibility of assuming it as an absolute and objective judgement, being often the result of "communications from other people, social media, and/or traditional media and not based on any actual face-to-face contact [...]"<sup>71</sup>. What should be always born in mind and taken into consideration is that negotiation behaviours and bargaining attitudes might be a direct consequence of the counterpart's conduct, which could determine actions that are

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<sup>69</sup> Impression Management in Organizations: Critical Questions, Answers, and Areas for Future Research – Annual Review of Organizational Psychology and Organizational Behavior (vol. 3) - M. Bolino, D. Long, W. Turnley, 2016

<sup>70</sup> Tough guys finish last: the perils of a distributive reputation – Organizational Behavior and Human Decision Process (vol. 88, is. 2, p. 621-642) – C. Tinsley, K. O'Connor, B. Sullivan, 2002

<sup>71</sup> Image, Professional Reputation, and Impression Management for Managers – International Journal of Business and Social Science (vol. 8, no. 5) – D.E. Bartz, M. Brink, 2017

actually far from the nature of the individual and which are exclusively directed to respond to insults and lack of respect. Though in some occasions this might not imply reputational consequences, there are situations in which a single reaction could determine the labelling of an individual and hence charge on him the burden of a reputation that is not supported by behavioural evidence. This does not mean that a reputation is always built on bad traits and characteristics, since there is a concrete possibility of being addressed with positive rumours and narratives, but in all cases the term “burden” accurately describes the difficulties of dealing with untruthful labels. From a practical perspective, reputations have direct consequences on one party’s approach to the preparation of the talks: a high degree of reliance on potentially erroneous reputational information might negatively influence the elaboration of a strategy for conducting the negotiation. To be clear, what has been written up to this point is not elaborated with the intention to stigmatize the role of reputation as a useful warning element, but instead with the purpose of shedding light on the limits of the concept and of its reliability. In the context of a negotiation, it is essential to comprehend how the information about one’s behaviour and attitude, no matter how solid the groundings, cannot substitute the interpersonal dynamics taking place on the field and the resulting judgements. To conclude and sum up, it appears logic to state that impressions, in the first place, and the resulting reputation affect the negotiation process deeply by imposing changes to the parties’ approach and by triggering mechanisms that end up compromising the outcome or determining results that are far from reflecting agents’ primary intentions. In the light of this, it might be appropriate to say that an influence of this kind traces back to the domain of cognitive heuristics, since a high degree of reliance on the counterpart’s reputation and the conditioning resulting from short-lived impressions could concretely compromise the ability to elaborate an objective judgement, based on reasonable facts and determined by elements arising from the negotiation itself, instead of past stories.

Up to this point, it was possible to analyse and comprehend how the negotiation process is strongly affected by cognitive, emotional and social dynamics, all responsible for both single and combined effects. Indeed, elements belonging to each sphere act individually by triggering specific reactions in the attitude and behaviour of an agent, though being responsible for more complex effects determined by the interaction with factors pertaining to other domains. Furthermore, the single or combined effects of each cognitive, emotional and social feature are not only the cause of reactions on the side of the interested agent, but imply the activation of dynamics that unavoidably affect the counterpart(s), hence modifying the whole setting and opening the bargaining process to an endless set of potential outcomes. Before moving to a more detailed analysis concerning the actual consequences of the above-mentioned psychological and behavioural dynamics from an M&A and game theoretic perspective, there will be a last concept to discuss as part of this path: culture.

## **Cultural Influence**

The idea of culture has to do with values, beliefs and norms shared by a certain group and assumed by its participants as “guidelines” for regulating their daily behaviour and interactions. Nevertheless, a clear comprehension of what culture actually implies has to start from a proper definition of the concept of “group”. A valid starting point is to define the word which, according to the Merriam-Webster dictionary, identifies “a number of individuals assembled together or having some unifying relationship”. To be assembled together is a representative characteristic of groups intended in the most logistical sense, that is individuals who share a limited spatial dimension. On the contrary, to have a unifying relationship represents a deeper level of connection among individuals and is at the core of the culture concept. A relationship of this kind might actually be interpreted in the light of those elements that have been previously identified as the main components of culture – values, beliefs and norms -, proving of critical importance to determine the presence of different groups. Most of the research on culture has focused on the geographical aspect, distinguishing groups based upon nationality and finding strong application in business environments to help agents deal with foreign partners or to expand in foreign markets. It is widely recognized, however, that culture and groups are an extremely deeper concept and are not limited to the distinction of geographical groups. Since the late decades of 20<sup>th</sup> century, several disciplines started to approach the idea of culture and, consequently, the concept of group in the light of social relationship connecting individuals. As a consequence, cultural groups began to be defined according to aspects related to age, wealth, hobbies, habits, politics and much more, with an undeniable extension of their scope outside national, or even continental, boundaries. Throughout the years, the specificity with which cultural groups have been defined has become narrower and narrower, hence allowing to elaborate precise theories and assumptions concerning the behaviour of individuals identifying with a certain culture. It appears obvious to say that, alongside the emergence of new and different cultural groups, the concept of cultural difference has grown and has acquired critical importance as an influential factor for what concerns the interaction between individuals belonging to different aggregations. In business terms, however, the distinction among geography-based cultural groups has always represented a critical aspect and is still considered one of the most relevant aspects in the design of strategic projects and in the conclusion of deals. Among the numerous frameworks developed to classify global countries, the one created by Geert Hofstede – considered the founder of comparative intercultural research - is considered one of the most comprehensive and clearest. Professor Hofstede believed that “national culture cannot be changed, but you should understand and respect it” and for this exact purpose he conducted an extensive study concerning the effect of culture on the values displayed in the workplace and obtained six dimensions that he considered widely descriptive of national approaches to business: Power Distance Index, Individualism vs. Collectivism, Masculinity vs. Femininity, Uncertainty Avoidance Index, Long Term Orientation vs. Short Term Normative Orientation, Indulgence vs.

Restraint<sup>72</sup>. These dimensions prove extremely helpful for the rationalization of cultural differences and are used as a starting point for researches that attempt to relate these national peculiarities to behaviours in specific fields. Negotiation is one of these fields and several works decided to analyse the extent to and modality with which cultural differences have an impact on the execution and outcomes of a bargaining process. Interestingly, the analysis has been conducted from a two-fold perspective: first, an observation of negotiation behaviour and outcomes for people of the same nationality; second, an observation of negotiation behaviour and outcomes in the context of intercultural negotiations. Apparently, negotiations present traits and practices that are commonly shared across cultures and that mostly concern the basic elements and objectives of the process, e.g. the fact that negotiations work around the distribution of a certain value and that the process implies a bargaining procedure between two or more parties. Nevertheless, approaches and strategies seem to present differences related to the cultural context in which the negotiation takes place and hence are strong determinants of its development and results. In the paper “*Culture and Joint Gains in Negotiation*” (1998), the authors provide a brief list of examples: “the involvement of third parties; the reliance on interests, rights, or power in the resolution of disputes; the treatment of in-group versus out-group members; the appropriateness of types of persuasive appeals, directness of communication, and concession patterns.”<sup>73</sup>. As written above, these cultural differences in the context of a negotiation are believed to have a direct effect on the conduction of the bargaining process between agents of the same nationality. In 1994, three scientists carried out an experiment concerning this eventuality and analysed the possibility of effectively applying a typical U.S. negotiation approach – the Problem-Solving Approach (also PSA) – to negotiations between couples of agents belonging to ten other cultural groups. According to differences in some specific measures, chosen as representative characteristics of the cultural contexts in which the negotiation took place, the experiment demonstrated that a single approach could not lead to universally aligned results and that instead cultural differences had specific effects on the outcomes of the bargaining procedure<sup>74</sup>. One might argue that 1994 is a long time ago and that evidence from such an “ancient time” is poorly representative of the dynamics currently taking place among negotiators. Primary argument in support of this conclusion might be the recognition of an undeniably lower degree of globalization in 1994, thus a stronger influence of national traditions and cultural aspects in general on the interactions between individuals of the same nationality. Nevertheless, a valid counterargument here might take into account the fact that a growth in globalization is actually more influent in the context of intercultural/international negotiations, where the increase in cultural openness might positively influence the interaction between individuals with different backgrounds and enhance the possibility of sharing

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<sup>72</sup> Respectively, each dimension represents: the degree to which the less powerful members of a society accept and expect that power is distributed unequally; the tendency of a population to have looser or tighter social relationships; the tendency of a population to be more competitive (masculine) or cooperative (feminine); the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity; the tendency of a population to stick to traditions or to foster productive change; the degree to which a population accepts the enjoyment of life or imposes strict social norms – Src: <https://hi.hofstede-insights.com/national-culture>

<sup>73</sup> Culture and Joint Gains in Negotiation – Negotiation Journal (January, 1998) – J.M. Brett, W. Aldair, A. Lempeur, T. Okumura, P. Shikhirev, C. Tinsley, A. Lytle, 1998

<sup>74</sup> Exploration of Negotiation Behaviors in Ten Foreign Cultures Using a Model Developed in the United States – Management Science (January, 1994) – J.L. Graham, A. Mintu-Wimsatt, W. Rodgers, 1994

perspectives on matters that have represented hostile topics in the past. On the contrary, interactions between individuals grown in a similar cultural context might still be influenced by aspects rooted in the social fabric and hence unconsciously accepted. To understand whether globalization can be interpreted as an openness-enhancing factor in intercultural negotiations, it might be appropriate to rely on researches conducted over this topic. For this purpose, it is interesting to propose the work of Brian Gunia and Michele Gelfand who, in their article “*The Science of Culture and Negotiation*”, offer a comprehensive revision of some of the literature elaborated on the topic of intra- and intercultural negotiation. It appears evident that intercultural negotiations present a higher degree of complexity with respect to intracultural ones, especially when assuming a value-creation perspective, due to the fact that negotiators “have to overcome the underlying differences in their culturally-normative strategies.”<sup>75</sup> Some specific factors are believed to produce a friction effect on the bargaining process, such as: cultural distance, hierarchical concerns, communication medium, cultural perspective-taking. Though these factors clearly represent an obstacle to the development of common negotiation behaviours and goals, the last one – cultural perspective-taking – paves the way to an intriguing interpretation of the reasons why intercultural negotiations often encounter failure. What Tinsey et al. discuss in a work from 2012 is that the biggest problem in the agent’s approach to an intercultural negotiation might actually stand in the incapacity to recognize the counterpart’s ability to adopt an intercultural attitude and to abandon the norms and stereotypes belonging to the native culture<sup>76</sup>. The direct consequence of this incapacity is that “in an effort to match the other cultures’ negotiation schema, negotiators exaggerate their partner’s cultural goals and behaviors, resulting in an overadjustment to the other culture’s negotiation goals and behaviours.”. According to this perspective, it might be natural to identify the key to constructive intercultural negotiations in the agent’s habit and experience in facing multicultural settings. A concept that perfectly suits this discussion is that of “cultural intelligence”, defined as a person’s ability to adapt effectively to new cultural contexts bound to the values and beliefs of a given society or culture<sup>77</sup>. This form of intelligence is manifested through a series of attitudes and behaviours that help an individual to decode a culturally different setting and interact with it in the most effective way. As the degree of globalization increases, today cultural intelligence is among the most valued characteristics in corporate culture and hence represents a source of competitive advantage also in the context of negotiation. The existence of such a form of intelligence and its high value for corporations successfully demonstrate how the presence of cultural differences has direct effects on the effectiveness with which international operations are conducted and global success is achieved, hence supporting the argument according to which culture is an additional element of influence in the field of negotiation and for this reason must be appropriately taken into account when elaborating a bargaining strategy. Nevertheless, it might be appropriate to say that globalization is proving helpful in the development of a higher and more widespread

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<sup>75</sup> The Science of Culture and Negotiation – Current Opinion in Psychology (November, 2015) – B. Gunia, M. Gelfand, 2015

<sup>76</sup> Culture and International Negotiation Failure – Unfinished Business: Why International Negotiations Fail - C.H. Tinsley, W.L. Aldair, M.S. Taylor, 2012

<sup>77</sup> Cultural Intelligence: Bridging the Cultural Differences in the Emerging Markets – Indian Journal of Research (Vol. 5, Iss. 9) – J. Dangmei, 2016

degree of multicultural experience, thus demonstrating itself a potential success factor in the demolition of those cognitive barriers that separate negotiators with culturally different backgrounds. In turn, the globalization process might reduce the impact of cultural differences on the outcomes of intercultural negotiations.

Culture represented the last element of this discussion over psychological and behavioural factors that have a direct influence on the negotiation process and its outcomes. Throughout these pages, it was possible to analyse how cognitive, emotional, social and cultural determinants have a critical role in the creation of obstacles to an efficient and effective conduction of the talks, hence determining a departure of real-life bargaining settings from the rational game theoretic representations presented in the previous chapter. It is undeniable that human negotiators cannot avoid to be influenced by their life experiences, personality traits, societal belonging and whatever element impacting their existence, hence adopting bargaining attitudes and aiming to outcomes that are impossible to confine under specific behavioural constraints. The consequence of this extreme variety directly stands in the necessity to adopt a more qualitative approach to the development of a negotiation strategy, taking into account a series of factors that might not pertain to a financial cost/benefit analysis and might instead belong to the domain of social interaction and human psychology. What the previous pages should teach the reader is that negotiations must be intended as interpersonal encounters and hence be accepted as situations in which the human component has to be considered to its deepest intimacy, thus calling into question the role of economic rationality as a cognitive tool for the comprehension of negotiation settings and as a technical tool for the elaboration of negotiation strategies. The last part of this work will focus its attention on the influence of these concepts on game theoretic models representing M&A operations. The approach will not be technical and instead will offer qualitative perspectives on the limits presented by these forms of representation and on the obstacles they create for a valid analysis of the strategic settings faced by an organization. Furthermore, the following pages will be written with the additional objective of identifying the pitfalls in the approaches chosen by organizations to undertake a M&A negotiation, attempting then to highlight potential integrations and purposeful solutions for the development of a more comprehensive negotiation strategy.

## **PART 2 – PSYCHOLOGICAL AND BEHAVIORAL LIMITS OF GAME THEORETIC REPRESENTATIONS: HOW M&A NEGOTIATIONS DEPART FROM GAME THEORETIC PREDICTIONS**

The first part of this chapter provided exhaustive information concerning the impact of psychological, and consequentially behavioural, factors in the process of a negotiation, shedding light over the component of uncertainty governing human actions. What might instinctively come to mind, as a consequence of the previous insights, is that the possibility of summarizing an entire human decision-making process inside a model built on completely rational assumptions is quite remote. The reasons for this are multiple and mostly

stand in the complexity of accurately representing the wide array of scenarios available to each agent. Obviously, it would be pretentious to expect a model to include all the options available to a decision-maker and for this reason the assumption of rationality is often accepted as a valid alternative for the purpose of simplifying the portrayal of otherwise tremendously complex settings. Nevertheless, a problem arises as a consequence of this acceptance and it mainly has to do with the resulting meaning attached to the concept of irrationality. Regardless of the academic definition of the adjective “irrational”, the most typical meaning given by a random human being is usually related to the idea of something external to the traditional behavioural schemes. In a context of this kind, it appears logical to believe that the idea of scheme functions as a barrier that separates what is rational from what is not. The problem with a reasoning of this kind, however, is that the variety of alternatives available to each human being in situations characterised by a higher degree of complexity is uncountable and, therefore, impossible to schematize. One of the most direct implications of such an argument is that no behavioural scheme is actually trustworthy, since it is probably based on some strict assumptions and does not take into account – because it would be impossible to do so – the totality of contextual variables that might influence the agent’s action. In this work, the decisional model under investigation is the one offered by game theory and the discussion concerns whether or not its predictions can be assumed as a valid proxy of the agents’ behaviour. As the title suggests, a conclusion has already been drawn and it is inclined towards a negative interpretation of the model’s ability to make applicable behavioural predictions. Clearly, as it is for each valid conclusion, some support evidence is necessary and to provide it will be the objective of the following pages. With the help of previous works and researches by experts in the field of game theory, decision-making theory and social sciences, the reader will be accompanied throughout a series of concepts and ideas that should help proving the predictive flaws of the game theoretic models. However, before moving to the actual core of this analysis, it feels appropriate to precise once again the absence of any critical intentions towards the game theoretic discipline and to show instead appreciation for its schematizing capacities, which can be considered nothing but helpful in the simplification of complex realities and hence in the provision of valid insights concerning their dynamics. Researches over the mistaken predictions of game theoretic models date back to the 1950s, when a series of works were conducted in order to analyse the errors and to attempt the identification of a valid explanation. Among the authors involved, one has been already mentioned in the second chapter and his name is Herbert Simon: his work is a clear example of the immediate responses received by Von Neumann and Morgenstern for their work on game theory and expected utility; to be precise, Simon was one of the first scientists to propose the idea of limits in the cognitive capacities of the agents and to develop models that tried to include more psychological and behavioural components in the description of decision-making strategies. Moving forward to the 1970s, some of the most comprehensive and revolutionary works on utility and cognitive heuristics were elaborated by Kahneman and Tversky, as it was partially described before. Up to the present times, researches and experiments have been conducted over the most varied topics concerning limits of decision and game theory, due to the fact that the old-fashioned assumptions concerning human cognitive

limits were refined and scrutinized in order to derive more detailed hypothesis and simplify their demonstration. Together with heuristics and biases, which were themselves broadened in scope over the years, there was an increasing attention towards the social and contextual dimensions of the decision-making process, which were understood to play a critical role in the making of a decision and in the rational valuation of available alternatives. Interestingly, after the translation of many researches into practical experiments and the registration of their outcomes, many attempts were conducted with the objective to integrate the findings in the existing game theoretic models. The idea was to improve the models up to the point that they would have included all the psychological and behavioural aspects considered necessary for the provision of a comprehensive description of the agent's decision-making progress. This attempt is wonderfully discussed in a paper titled "*Can We Build Behavioral Game Theory?*"<sup>78</sup>, where an interesting journey through the evolutionary steps of behavioural theories is proposed in order to analyse the forementioned effort to build a more inclusive and exhaustive decision-making model. In the first page, Lucas and his colleagues appear severe in stating that attempts to build a model of this kind "are inconsistent in ways that prevent us from drawing general characterizations of an individual's choices or beliefs or of the general populations' choices and beliefs. A general behavioural game theory seems a distant and, at present, unfulfilled hope." It does not seem like the authors' desire is that of leaving much space to debate, clearly displaying a strong belief in the impossibility of building a comprehensive model that includes behavioural and psychological components in the description of an agent's decision-making strategy. This conviction is further developed through the use of two main observations, concerning the ideas of payoffs and common knowledge. About payoffs, Lucas et al. argue that the introduction of behavioural factors in a game theoretic model increases the degree of complexity for the valuation of players' payoffs. Presumably, what the authors intend is that the degree of subjectivity to which the evaluation of alternative scenarios are subjected imposes strong – if not insurmountable – constraints to the mathematical calculation of the outcomes, which are now the result of a sophisticated interaction among a wide array of qualitative and quantitative factors that are far from easy to be added up. Giving this opinion some thought, it appears difficult to develop strong counterarguments, since the psychological mechanisms involved in the actual making of a decision affect the orderly organization of preferences and create space for a subjective dimension that can hardly find an appropriate quantitative representation. On the other hand, for what concerns the idea of common knowledge, the authors argue that this assumption – all the players know they act rationally and understand the game being played; they all know each one knows that and so on and so forth – cannot be accepted since there is no actual possibility of knowing exactly what the agents' beliefs are. Here, discussion might appear unnecessary due to the evident truthfulness of this argument: a scenario that implies complete awareness about players' convictions and beliefs is difficult to imagine. Regardless of the acceptance or not of these two arguments, the underlying logic is pretty much undeniable and will be further analysed. What is interesting to consider here is the logic behind the hypothesis of impossibility concerning the development

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<sup>78</sup> Can We Build Behavioral Game Theory? – Duke Law School - G.M. Lucas, M.D. McCubbins, M. Turner, 2013

of a general behavioural decision-making model: on the one hand, a series of narrower arguments could be taken into consideration for an appropriate analysis of the obstacles in the construction of such a model, hence exhaustively examining the distinct dynamics taking place in the process of making a decision; on the other hand, however, these narrower arguments can be intended as branches of a unique central concept and thus the analysis can adopt a broader perspective. This central concept, as interestingly pointed out by Lucas and colleagues, has to do with the concept of “consistency”. The idea is that without a certain degree of coherence in the behaviours of the agents under specific circumstances, there is no concrete possibility of creating a general model. More specifically, a consistent behaviour would be necessary in circumstances of deviation from the rational actions imposed by game theoretic models, since this would create the opportunity for generalizing on an eventual irrational behaviour and hence for reducing it to a computable dimension. However, there is no demonstrated form of consistency in the behaviours and beliefs of agents acting under the same exact conditions and for this reason there is no actual possibility of building a generalizable behavioural game theoretic model. One can agree with this view, which simply states that no predictive behavioural model can be built in a context where predictions over human behaviour are impossible. And without even taking into account the forementioned concepts of heuristics, biases, emotions, social interactions or cultural differences, it appears natural to believe in the impossibility of categorizing human behaviour and in the presence of an insurmountable degree of subjectivity in whatever decision is being made. The conclusions drawn by Lucas and his colleagues have been presented under a mainly theoretical perspective, though being actually accompanied by a serious experimental framework. It might be interesting, indeed, to move the discussion towards a more practical dimension and to concretely analyse how the concepts presented above influence the validity of game theoretic settings. In this specific case, the game under investigation is the Trust Game and it is built as a slightly varied version of the “investment game” presented in Berg et al.’s *“Trust, Reciprocity, and Social History”* (1995). The original game is explained as follows: “Subjects in room A decide how much of their \$10 show-up fee to send to an anonymous counterpart in room B. Subjects were informed that each dollar sent would triple by the time it reached room B. Subjects in room B then decide how much of the tripled money to keep and how much to send back to their respective counterparts.”<sup>79</sup>. The variations introduced by Lucas and his colleagues concern: (i) the initial endowment, which is \$5 and not \$10; (ii) the fact that the receiver does not send money to the initial donor, but to a new subject; (iii) the possibility for the players to place bets on the decisions made by the other parties. For both versions of the game, however, the Subgame Perfect Nash Equilibrium consists in offering \$0. Is this strategy profile consistent with the agents’ actual behaviour? Unfortunately, it is not and just a modest percentage of the subjects involved in the experiment behaved accordingly to the game theoretic predictions. This result can be observed from the perspective of “consistency” which, in the words of Lucas et al., can be intended as “either consistently following SPNE or

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<sup>79</sup> Trust, Reciprocity, and Social History – Games and Economic Behavior – J. Berg, J. Dickhaut, K. McCabe, 1995

consistently deviate from SPNE”<sup>80</sup>. Hence, as it was discussed above, the idea of consistency does not simply refer to the absence of coherence between actual behaviour and the game theoretic predictions, but instead to the absence of behavioural alignment in general. In his paper, Berg provides a simple though valid explanation for agents’ departure from the SPNE strategy, by stating that “from a rational choice perspective, subjects who sent money must have believed their expected return would be positive; but given the noncooperative prediction, why would they believe this?”<sup>81</sup>. As the title of his work suggests, he is trying to introduce the concept of “trust” in the field of decision theory and not only as the result of repeated interaction between two agents but also as a subjective and contextual trait potentially present in one-shot situations. Trust itself can be easily interpreted as a psychological construct influencing the agent’s valuations and consequent decisions. Moving back to Lucas et al.’s experimental results, an interesting observation can be conducted for what concerns the betting process described above: the majority of individuals, both considering donors and receivers, placed a bet according to which the opponent would have sent them a positive amount of money. What this implies is that not only behaviours depart from the SPNE strategy profile but also players’ beliefs present a remarkable degree of inconsistency with it. As a final consequence, this experimental evidence provides a valid demonstration of the distance between theoretical predictions and practical observations and hence represents a concrete grounding for accepting the impossibility of creating a truly predictive behavioural model in the field of decision-making. Clearly, the work of Lucas and his colleagues on trust games represents a simple example of how the presence of psychological and behavioural factors affect the ability of game theoretic models to provide an accurate representation of agents’ behaviour in interactive contexts. What would be interesting to analyse at this point is whether or not an increase in the degree of contextual complexity imposes an increase in the influential power of psychological and behavioural factors. On the one hand, it might seem appropriate to say that it does and that the result of an increase in contextual complexity is a consequent increment in the degree of uncertainty implied, hence imposing a stronger cognitive effort and paving the way to a larger number of processing errors. On the other hand, nevertheless, one might argue that an increase in contextual complexity is accompanied by a growth in the degree of attention paid in the process of making decisions and of accuracy with which grounding elements are analysed. This second scenario appears perfectly suitable to the description of the decision-making process taking place in the context of M&A operations, where interests of high relevance are typically at stake and, as a consequence, agents tend to employ elaborate valuation techniques for analysing the advantages and disadvantages entailed in each and every option available. Among the several stages in which a M&A operation can be divided, post-merger integration has often received the deepest consideration for what concerns the success or failure of the entire transaction. As valid as this view might be, it might not represent the most accurate perspective for the identification of critical success factors in a merger or acquisition deal. Indeed, many experts have recently pointed out the

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<sup>80</sup> Can We Build Behavioral Game Theory? – Duke Law School - G.M. Lucas, M.D. McCubbins, M. Turner, 2013

<sup>81</sup> Can We Build Behavioral Game Theory? – Duke Law School - G.M. Lucas, M.D. McCubbins, M. Turner, 2013

importance of pre-merger negotiation as a point of departure for the development of a value-creating deal and for the organization of a well-established integration plan. In the words of Javier Enrile, a two-decade expert in the fields of M&A and Venture Capital, “most companies approach M&A deals incorrectly, thinking that is merely an exercise of agreeing on a price between both parties. What they fail to understand is that there is a science to doing M&A deals that often makes the difference between a deal being successful or not.”<sup>82</sup>. Actually, indeed, the price element only represents a single component of the entire deal and must be accompanied by reasonable agreements concerning a series of additional dimensions: allocation of top jobs, location of the headquarters, percentage of the new formed company allocated to each partner’s shares, etc.<sup>83</sup>. Failure in the reaching of a reasonable agreement on a single element of this set might be the cause of a value-destroying deal or, in the worst case, of the impossibility to even conclude one. Presumably, the majority of the aspects included in a merger or acquisition deal could be framed and analysed under an objective perspective, hence valued in terms of benefits and disadvantages they deliver in alternative scenarios. Considering value-creation as the ultimate goal of a M&A operation and assuming that it could take place in the form of share price increase or revenue growth or cost structure implementation, one might centre the focus of the negotiation on quantitative aspects and employ advanced predictive tools and techniques to analyse the outcomes produced by each available alternative and their combination. The high degree of objectivity implied in an analysis of this kind would allow decision-makers to translate the results in a clear-cut game theoretic model, which would then be helpful in the identification of an optimal solution that allows the maximization of the parties’ utility. Assuming this type of circumstance as acceptable, the discussion conducted up to this point could be easily deprived of whatever form of underlying logic and the work would conclude right here. Maintaining instead the exact same perspective that supported the writing of the previous pages, it might be interesting to analyse how the presence of an undeniable human component in negotiations, M&A ones included, prevents the application of absolute economic rationality in the bargaining procedure and determines an increase in complexity for the conclusion of a successful deal. More specifically, it is necessary to acknowledge the presence of not only a subjective psychological influence in general but also of specific attitudes and consequent behaviours that are typical of the figures of the acquirer and the seller. To be clear, managers involved in the conclusion of a M&A agreement on the acquiring side tend to manifest peculiar approaches to the negotiation, especially when covering a high-rank managerial position or if employed by a big international corporation; the same happens on the side of the selling party, where a series of psychological and behavioural factors result in a determining influence on the outcome of the deal. There will be the occasion to observe how the element of subjectivity inside a negotiation is concretely identifiable and how its practical manifestations justify a departure from the predictions of rational decision-making models, especially game theoretic ones.

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<sup>82</sup> M&A Negotiation Tactics and Strategies: Tips from a Pro – Toptal – J. Enrile, 2018

<sup>83</sup> Successful Factors for Business Negotiations in International Mergers and Acquisitions – H. Rogers, B. Challacombe, 2006

An appropriate literature body concerning the influence of human psychology in the specific context of M&A negotiations is still missing, with most researches in the field being built around the extension of generic works about the cognitive limits affecting the negotiation and/or the decision-making process in general. The problem with this approach stands in the absence of an appropriate distinction between the figures of the acquirer and the seller, who undoubtedly share some mental dynamics though presenting deep differences under several other perspectives. Interestingly, despite quotes like the one by Javier Enrile cited above tend to specify how the nature of M&A negotiations includes, but does not exclusively focus on, the matter of the price, the major psychological factor examined by scholars and researchers is related to this topic. It is referred to as “hubris” and is generically defined as the “exaggerated pride or self-confidence”. To understand how the concept of hubris manifests its psychological influence in the context of M&A negotiations, one can refer to the work of Richard Roll, who in 1986 wrote a paper titled “*The Hubris Hypothesis of Corporate Takeovers*” and provided valid insights into the role played by this cognitive element in shaping the bargaining procedure. As a starting point, it might be appropriate to briefly recall the functioning of a merger or acquisition from the perspective of the bidding process: the first step is to identify a target in line with the strategic vision of the acquiring company; once the prey has been individuated, a valuation is necessary to understand its conditions, predict – under circumstances of clear uncertainty – its future performance, evaluate the presence of synergistic opportunities and several other aspects concerning the validity of the operation in terms of value-creation perspectives; after having completed the valuation and having obtained a figure, a comparison is made with the market price and, if the valuation is lower than the market price, the operation is withdrawn, while if it is higher then the first bid is presented; the first bid paves the way to a multi-stage negotiation process between the parties in which everyone tries to get away with the highest value. According to this analysis there should not be much space for mistaken bids, being the execution/withdrawal threshold quite clear and objective. Nevertheless, the presence of managerial hubris imposes an additional layer of complexity in the conduction of these transactions and creates the space for errors in the bidding decision, with consequent destruction of value and shareholders dissatisfaction. But how does hubris actually work? As the forementioned definition suggests, the hubris factor is closely related to the concept of overconfidence and it impacts the objectivity with which information is processed. In the specific situation of a bidding procedure, such a psychological influence determines the extent to which a manager is inclined to overpay for a certain target and hence the possibility of creating value out of the investment. Roll gives an accurate description of how the hubris factors concretely manifests and, considering the scenario in which a manager is reflecting over the target valuation, writes: “He may convince himself that the valuation is right and that the market does not reflect the full economic value of the combined firm.”<sup>84</sup>. What Roll wants to precise then is not only the presence of an evident form of personal overconfidence – which can be intended as referred to the single manager in charge or to the entire team involved in the operation – but also a more subtle form of mistrust towards the

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<sup>84</sup> The Hubris Hypothesis of Corporate Takeovers – Journal of Business (April, 1986) – R. Roll, 1986

predictive power of the market and its valuations. To dig a bit deeper into what hubris actually implies on the side of those manifesting it, it might be interesting to integrate the words taken from Roll with those from another work on hubris applied to M&A. In his paper “*Economists’ hubris – the case of mergers and acquisitions*”, Shahin Shojai broadens a little bit Roll’s perspective and specifies that “since the bidding firm’s management believe that they are more capable of extracting value from the assets of the target that the incumbent management they might be willing to pay over and above what is really worth. It is their arrogance that makes them pay such high premiums and the markets recognize this fact, hence pushing the price of the target’s shares higher in anticipation for this overpayment.”. In a context that presents objective elements such as the target valuation and the market price, the hubris factor is a clear and practical example of how real-life decisions may depart from the traditional idea of rationality assumed in game-theoretic models. The application of the concept of hubris to a situation in which a manager or team is excessively reliant on the available target valuation might reduce the influential scope of this psychological factor. Indeed, hubris in general is a vast idea and its managerial effects can extend beyond the domain of personal confidence. Considering the generic definition of the word “hubris” provided in the previous page, it might be interesting to focus the attention on the relationship with the term “pride”. The definition of pride in the Oxford Dictionary is the following: “A feeling of deep pleasure or satisfaction derived from one’s own achievements, the achievements of those with whom one is closely associated, or from qualities or possessions that are widely admired”. Giving this definition some thought, one might accept to interpret it as composed of two major dimensions: a strictly personal dimension, related to what is individually achieved and the emotional gratification it delivers; an interpersonal dimension, related instead to a feeling of fulfilment experienced towards not only the achievements of others but also the external perception of one’s own success. In the light of this deconstruction, it appears reasonable to believe in a connection between the simple concept of pride and several of the psychological and behavioural factors discussed in the first part of this chapter. As a consequence, being pride a solid component of the hubris concept, one might actually believe that also the latter can be interpreted in the light of those personal and interpersonal influential aspects analysed in the previous pages. Without departing from the M&A context under analysis, it does not appear difficult to find a concrete manifestation of these ideas in the decision-making processes surrounding operations of this kind. On the one hand, the more personal dimension cited before can be observed in the decision of a manager to trust his valuation more than the market price and to proceed with the operation, encouraged by the aspiration of being right and by the desire of experiencing a sensation of self-respect and fulfilment. It might be interesting to observe how decisions of this kind could be themselves a direct consequence of prior emotional states and perhaps be driven by a personal need for redemption or self-awareness. What should be reminded is the influential power exerted by each and every dimension of an agent’s life on his emotional response to a specific situation, which must always be taken into account when charging him with responsibilities. On the other hand, the interpersonal aspect finds its strongest connection with the forementioned concepts of reputation and impression. In this case, a quote from Roll’s paper is

appropriate: “Although some firms engage in many acquisitions, the average individual bidder/manager has the opportunity to make only a few takeover during his career.”<sup>85</sup>. If interpreted in a reputation/impression perspective, this means that the opportunities for a manager to be noticed by his superiors and to potentially turn around his career are strongly limited, hence eventually inducing a more pronounced risk-taking attitude: for example, a manager might decide to proceed with a risky operation in order to build or maintain a specific reputation or to impress higher-rank officers and eventually aim to a promotion. In the end, starting from the definition of pride, the discussion has been able to highlight the breadth of the hubris concept and to clarify how a single psychological feature can be actually the umbrella under which a wide array of more specific cognitive and emotional dynamics take place, influencing the degree of rationality with which a real-life situation develops, relative to merely theoretic frameworks. It must be specified that, regardless of the limited body of literature and research focusing on the psychological factors influencing the acquirer’s behaviour in a M&A negotiation, there is a quite remote possibility of accounting for the totality of mental dynamics directly and indirectly affecting these settings. For this reason, the example of the hubris hypothesis and its extension towards the inclusion of a wider set of psychological elements can be assumed as a valid proxy of the actual effect produced by dynamics of this kind on the development of a perfectly rational bargaining process, at least on the side of the acquirer. However, the acquirer is not the only one to suffer the effects of psychosocial mechanisms in the context of a M&A negotiation and might instead be the most rational party, especially when the transactions concern the incorporation of a smaller and inexperienced organization into a larger one. Indeed, the position of the acquirer and, more specifically, of the team in charge for the operation is often protected by a higher level of experience and by the availability of powerful analytic tools, which might shield the impact of irrational behaviours and the achievement of sub-optimal outcomes. On the other hand, instead, the figure of the seller is often weaker and subjected to the burden of inexperience, which creates a suitable space for the manifestation of inhibiting emotional and psychological reactions. An interesting insight into the potential mistakes committed by the seller during a M&A transaction is provided by Richard Harroch in his article on Forbes Magazine, titled “*22 Mistakes Made By Sellers In Mergers And Acquisitions*”. Reading the article, it appears quite automatic to put oneself in the seller’s shoes and to feel the pressure of the numerous factors that must be taken into account to drive the negotiation towards the desired outcome. Among the presented errors, most have to do with the inability of the selling party to face the negotiation process appropriately from two major perspectives: (i) the hiring of valid advisory personnel; (ii) the understanding of the negotiation dynamics. Failure in the correct consideration of these two aspects typically translates in a bargaining process that mostly takes into account the price factor and leaves more qualitative features almost unconsidered, such as: protection of corporate secrets and proprietary information, employees’ rights, advisors’ fees, terms of the letter of intent, terms of the acquisition agreement, etc.. Regardless of the concrete consequences of a superficial approach to these issues, which might represent a crucially determining aspect in the outcomes of a merger or acquisition

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<sup>85</sup> The Hubris Hypothesis of Corporate Takeovers – Journal of Business (April, 1986) – R. Roll, 1986

negotiation, the interesting aspect of an incomplete comprehension of the bargaining dynamics is the emotional and behavioural consequences it imposes. As it was discussed in the first part of this chapter, the objective of an agent involved in a negotiation is that of reducing the degree of uncertainty that surrounds him and, for this purpose, he resorts to using mental shortcuts and biased information-processing techniques. Once the seller finds himself overwhelmed by an increasing amount of doubts and insecurities, his desire for lucidity will grow and will lead him to stress his information-processing through an excessive reliance on cognitive heuristics like those previously mentioned. Unfortunately, the illusion of a deeper comprehension might determine irrational and sub-optimal decisions, especially in contexts where the counterpart is characterized by a strong experience and bargaining power. Inexperience is then a critical determinant for emotional and psychological influences to emerge in the context of a merger or acquisition and should be appropriately taken into account by both the acquirer and the seller, in order to avoid negative consequences in terms of outcomes. Indeed, though it might seem like an inexperienced seller is the one finding himself in the most vulnerable position, the position of the acquirer should be carefully considered and understood. A M&A negotiation could have its groundings in the buyer's decision to acquire a strategically valuable target as well as in the seller's desire to cash out, hence determining the existence of a spectrum onto which it is possible to classify the operation in terms of "acquisition interest". Coined by Graebner and Eisendhart<sup>86</sup>, this expression was presented in a pioneering work on the topic of acquisitions from the perspective of the selling party, a point of view that had been long shelved and which can provide instead valuable insights on the motives pushing a firm to sell and on its attitudes in the bargaining context. After a detailed analysis of empirical evidence concerning several M&A transactions, the authors proposed a distinction among three classes of selling firms, based on the degree of acquisition interest displayed: proactive, neutral, discouraging. Since the labels appear sufficiently explicit, there seem to be no actual necessity for specifying the characteristics of each category and hence the focus will be on the consequences they imply for the advancement of a negotiation. Intuitively, a proactive firm will put itself in the condition of smoothening the dialogue with the interested parties and hence its representatives will be positively influenced by the ultimate goal of reaching an agreement. This attitude might traduce in a wider openness to concessions and a stronger cooperative behaviour. For acquirers, this represents a valid occasion for negotiating extremely valuable terms in a peaceful condition and, for this reason, they must avoid to push their luck asking for too much. In general, proactivity is the proper base for the exploitation of integration opportunities and hence for the creation of value through the conclusion of a M&A deal. Neutral firms do not present a clear intention to sell and hence are open to consider upcoming offers and to value their potential. This condition of neutrality offers the seller a higher bargaining power and toughens the negotiation, potentially increasing the degree of competition in the talks and consequently reducing the possibilities of integration. However, if this neutral attitude on the side of the seller is matched by a non-urgent interest in the purchase on the side of the acquirer, then this condition might create the space for a transparent and productive dialogue between the

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<sup>86</sup> The Seller's Side of the Story: Acquisition as Courtship and Governance as Syndicate in Entrepreneurial Firms – Administrative Science Quarterly – M.E. Graebner, K.M. Eisendhart, 2004

parties, allowing them to spend a necessary amount of time figuring out solutions that meet each other's requests. Despite the potential prosperity deriving from the encounter between a neutral firm and a non-hurried bidder, it is important to notice how the conditions of the negotiation change in a context of this kind: the absence of an impellent necessity to sell forces the acquirer to employ a strategic approach for concluding the deal and hence requires a higher level of experience in the field of M&A negotiation, which implies the capacity not only to leverage on price but also to exploit every other weakness presented by the counterpart. The last category is that of discouraging firms, which repel whatever attempt of purchase and clearly represent the toughest target for an acquisition, strongly reducing the possibility for integrative deals. These companies are usually subjected to hostile takeovers conducted by financially strong corporations, which require an extremely scrupulous post-merger integration plan in order to make the liaison work productively and not end up in heavy losses for the buyer. The description of these generic approaches to the sale of a firm and their consequences on the trend of a negotiation highlight the profound impact that a simple factor, such as the degree of openness to the transaction, can have on the entire dynamic of the bargaining process, especially in terms of smoothness with which the talks are conducted and emergence of value-creation opportunities. According to the seller's perspective concerning the disposal of the assets, the psychology of the negotiation suffers deep changes on both sides and opens itself to the achievement of specific outcomes.

In general, each and every factor of influence analysed in this second part of the chapter emphasizes a critically important concept for the logic of this work: contextual complexity cancels the assumption of perfect rationality from a negotiation process. More precisely, one could assume the presence of an inverse relationship between these two factors, implying that an increase in the degree of contextual complexity is accompanied by a reduction in the degree of reliability of the rationality assumption. The reason behind this inverse relationship can be identified in the forementioned human necessity to reduce the degree of uncertainty implied in most decision-making processes, which leads to the employment of those mental shortcuts described in the previous pages. Cognitive heuristics and biases are themselves directly affected by the emotional states of the agent, hence by his subjective response to contextual stimuli. Clearly, the number and typology of stimuli experienced by the agent can suffer profound variations and hence determine different levels of contextual complexity. As complexity increases, the variety of stimuli changes accordingly and creates an intricate network of cognitive, emotional and behavioural reactions, responsible of obscuring the individual's capacity of objective valuation. This reduction in the degree of objectivity is concretely manifested in a modification of the agent's priority scale, where the economic rationality of an available option becomes a single element in a wider set of criteria to be considered and weighed in the choice of a certain alternative. As the importance of the financial aspect in the making of a decision is scaled down, the whole idea of utility maximization loses significance due to a reduction of its representative capacity. Utility becomes itself a more complex construct, enriched with a stronger subjective component

that complicates the computational procedure and thus creates obstacles for its inclusion in strict theoretic models. Indeed, game theoretic and generic decision-making modelling clearly lack the structure and features for the inclusion of such complexity, which is characterized by an enormous quantity of overlaying layers that produce interrelated responses among agents belonging to a same context. These responses are apparently far from being defined through clear-cut behavioural rules and this cancels the predictive capacity of decision-making models which, even if supported by the most sophisticated computational capacity, will be unable to objectively describe the individual reaction to different contexts, characterized by a strong subjective component whose simplification would coincide with its total annulment. Despite the evident distance between real-life and game theoretic settings, attempts to improve the modelling of decision-making contexts should not be abandoned. The revision of the utility concept might represent an interesting turning point for the correction of game theoretic models and the work of some researchers is moving in this direction. A valid example of this revision trend in the field of utility theory is provided by the work of J.R. Parada Daza, who published in 2004 an article titled "*The utility function and the emotional well-being function*", in which he discusses the limits of the economic rationality implied in the classic utility function and advances the possibility of expanding its scope with the introduction of additional elements that would allow the analysis of agents' behaviour from a wider and more "human" perspective, relative to the strict hypothesis of utility maximization. Parada Daza's work is founded on Schumpeter's idea that the view of utilitarianism misses an excessive number of factors that are influential in the explanation of economic agents' behaviour and the justification he provides is the following: "[...] it lacks a vision of a complete being and, therefore, does not fully explain an individual making economic decisions. [...] a complete individual will be defined as a biological being (with economic, instinctive and erotic values), a social being (with vital and social values), a cultural being (with religious, ethical, logical and esthetic values), and obviously as a "homo oeconomicus"."<sup>87</sup>. These words contain the core of the discussion conducted throughout the previous pages, that is how the construct of economic rationality and the deriving concept of utility impose strong limits in the understanding of the logic inducing human behaviour. What is interesting to observe is the extent to which said limits have been accepted and applied to economic theories for decades, despite a visible limitation of their descriptive power. In this context, the explanation of Von Mises is helpful in the clarification of the logic underlying the employment of such ideas in economic research: he points out that the behaviour of an individual in the economic landscape is often examined in the unique context of economic theory and that other disciplines are not taken into account as potential factors of influence. According to Parada Daza, this view has progressively led to the formation of a presumptuous attitude on the side of the economists, who defined rationality within restrictive boundaries with the objective of supporting their view of agents as utility maximizers. The author's expansive view on utility is concretely supported thorough the reference to specific economic decisions that raise intuitive doubts on the hypothesis of utility maximization. The common aspect of these economic decisions is individuated in the

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<sup>87</sup> The utility function and the emotional well-being function – Electronic Journal of Business Ethics and Organization Studies – J.R. Parada Daza, 2004

agent's determination to sacrifice the opportunity to maximize his return in order to respect other values he believes in, hence acting in total opposition with regards to the idea of economic rationality and paving the way to the research and development of more comprehensive behavioural functions. Among the examples provided, the most representative have to do with investment decisions and provide clear examples of how the human cognitive and emotional dimension intensely shakes down the founding principles of the original utility function. Parada Daza talks about ethical and environmental investment funds, characterized by the inclusion of financial assets emitted by companies respecting specific managerial criteria. The return rates offered by investments of this kind are typically lower than those provided by a series of alternative investment opportunities available on the market, but represent a perfect example of the agent's economic sacrifice in the name of a satisfaction that is different in nature and realization. In front of such a decision, the evaluation of the agent's level of utility becomes higher in complexity and leaves the right space for asking: has the agent maximized his utility? The answer to a question of this kind implies the solution to the forementioned juxtaposition between the firm concept of economic rationality and the increasingly recognized idea of behavioural response and, for this reason, cannot be provided with accuracy. The work of Parada Daza tries to introduce not only a perspective to analyse this context but also a tool: the emotional well-being function. In broad terms, the objective of this function is to evolve the descriptive capacity of the original utility function, in order to include additional factors of influence in the composition of the agent's motivation to act in a specific way. The idea of utility as the driver for a certain action is substituted by a more comprehensive concept of satisfaction, which does not exclude the presence of economic rationality and simply extends its scope to a more human assessment of the consequences implied by a decision. In its formal representation, the emotional well-being function distinguishes between "rational economic ethic" and "global ethic", with the first one including decisional criteria in the domain of economic rationality and the second one concerned with a series of human virtues. The distinction is concretely manifested in the function itself, where these two ethics are represented in the form of weights. For a deeper understanding, it appears useful to present the actual function:

$$BE(x) = a_1 \text{sen}(\pi x) + a_2 \ln x + c$$

The three elements that deserve a definition are:  $x$ ,  $a_1$  and  $a_2$ .

The variable " $x$ " represents wealth, while the factors  $a_1$  and  $a_2$  can be considered as the weights established by the agent for, respectively, global ethic and rational economic ethic. As typical in the presence of weights, also in this case their sum must equal 1 ( $a_1 + a_2 = 1$ ) and values of  $a_1 = 1$  or  $a_2 = 1$  represent extreme cases of absolute global influence or absolute economic influence, where the agent's behaviour is completely guided by either one or the other form of rationality. Interestingly, the extreme case of absolute economic rationality ( $a_2 = 1$ ) implies the employment of the original utility function. The logic underlying this function is grounded on the assumption that agents can experience an emotional compensation that

justifies the economic sacrifice implied by a certain decision. As the weight of the global ethic factor increases, the strength of the emotional compensation grows to a point in which no economic interest is strong enough to offset the emotional/ethical delusion ( $a_1 = 1$ ). Without entering the strictly mathematical domain supporting this revisited utility function, it is interesting to observe how the emotional aspect of human decision-making processes is not substituted to the classic assumption of economic rationality, but rather welcomed as an integrative factor for the analysis of agent's behaviour. This integration takes place as a consequence of the acceptance of the ethical extremes or, more specifically, of the economic rationality extreme ( $a_2 = 1$ ), which implies the presence of agents whose behaviour is guided by a mere economic interest. As Parada Daza specifies in relation to the existence of these extreme cases: "It is interesting to note that, although the economic maximizing individual is presented as being borderline or extreme [...], evidently such individuals do exist."<sup>88</sup> Economic rationality and global ethic, which includes both cardinal and theological human virtues<sup>89</sup>, are just two of the several cognitive perspectives from which the agent's behaviour can be observed and examined. Together with the pure economic interest and the forementioned virtues, numerous other elements compose the set of influential factors in the process of making a decision and hence leave a wide unexplored territory for the identification of additional integrative elements in the attempt to build a more complete utility function. Nevertheless, the undeniable presence of further aspects worth of inclusion does not reduce the importance of Parada Daza's effort to expand the sphere of competence of the original utility function and to provide a revisited analytical tool with an enhanced qualitative perspective. Regardless of its practical employment and reliability, this effort is a valid indicator of the widespread intention to integrate quantitative and qualitative analysis into comprehensive tools and approaches that not only provide a more detailed ex-post description of the agents' behaviour but also become helpful in the ex-ante valuation of alternative available options. As it was discussed above, however, the possibility of creating such inclusive analytical frameworks is remote and must take into account the computational complexity that would derive from the integration of an increasingly wider set of influential factors. Presumably, the point of view provided by Lucas et al. in their paper "*Can We Build Behavioral Game Theory?*" represents a correct synthesis of the numerous doubts surrounding the potential inclusion of psychological and behavioural factors in a single model and does not leave much space to debate, at least according to the tools and theories accessible in present times. Arguments of the kind of those offered by Lucas and his colleagues seem more than valid and hence raise questions on the actual possibility of increasing the level of representativeness provided by existing models. A general answer to such questions should imply the possibility of improving the theories and models that are currently employed for behavioural analysis, though recognizing the existence of potentially insurmountable obstacles to the development of a fully descriptive model. As a consequence, the most realistic solution appears to be an enhanced and strengthened multidisciplinary integration, grounded on the common acceptance of basic

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<sup>88</sup> The utility function and the emotional well-being function – Electronic Journal of Business Ethics and Organization Studies – J.R. Parada Daza, 2004

<sup>89</sup> Cardinal virtues: prudence, justice, temperance, bravery; Theological virtues: faith, charity, hope

theoretical fundamentals and on the mutual respect of each discipline for the others – and their exponents -. According to the specific situation under analysis, the disciplines involved will vary and will provide their contribution in different proportion, offering insights that not only will help in the achievement of a more profound understanding of single features but also will pave the way for the discovery and examination of the interactions taking place on a more transversal level. These exact interactions among elements belonging to different domains and disciplines represent one of the toughest obstacles for an appropriate ex-ante valuation and ex-post examination, since it is often extremely complex to understand the extent to which each single aspect influences the combined outcome. In the context of this work, it is undeniable that the implementation of a multidisciplinary analysis might represent an interesting solution in the attempt to reduce the percentage of failed M&A transactions. The amount and variety of factors influencing mergers and/or acquisitions is far from being bounded in financial and economic domains, involving instead aspects that belong to the most diverse fields. Beside elements pertaining to the strictly financial side of the operation, mergers and acquisitions are typically concerned with features related to corporate culture, human resources, logistics, politics, etc. A vast literature has been developed over the decades on the topic of success and failure factors in M&A operations, helping the parties involved to acquire an increasingly wider knowledge related to those aspects that deserve a deeper or more superficial consideration throughout the different stages of the operation. This has proved undoubtedly helpful for improving the skills of those in charge of such projects, allowing the elaboration of more comprehensive and transversal strategies that take into account distinct elements and treat them as facets of a unique reality. From this perspective, the idea of integration can be identified as the core of an innovative approach to mergers and acquisitions, where an increase in the degree of complexity with which a transaction is analysed is perceived as an opportunity to refine the strategic approach and to address emerging issues with greater precision. Nevertheless, the first part of this work highlighted the presence of several flaws in this innovative approach that are not due to errors in the underlying logic, but rather are the consequence of errors in its materialization. From a broad perspective, a series of negative implications derive from the managers' decision to consider the post-merger stage as more important than the pre-merger one. The post-merger activities concern the concrete integration between the businesses of the parties involved, the definition of an organizational structure, the allocation of human and other resources, the establishment of a cultural fit, the re-organization of productive activities, the assignment of managerial responsibilities and several additional tasks that aim to “reconfigure merging firms by redeploying, adding, or divesting resources, lines of products or entire businesses, in order to achieve the expected combination benefits.”<sup>90</sup>. The critical importance of these activities is unquestionable, since they allow the merger or acquisition to concretely manifest its potential. However, it might be a huge mistake to excessively focus on these tasks and give instead little importance to the pre-merger phase, which includes activities in the fields of macroeconomic analysis, target(s) identification and valuation, negotiation and legal formalities. Errors in the undertaking of such activities might determine unrecoverable situations

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<sup>90</sup> Post-merger Integration – Journal of Organization Design – J. Bodner, L. Capron, 2018

and hence compromise the deal, resulting in negative post-merger performance and consequent value-destruction. On the other hand, a careful execution of such tasks might pave the way to a smoother conduction of post-merger activities and thus increase the possibility of success for the entire operation. Among the multiple pre-merger activities, this work emphasized the importance of the negotiation process and discussed the significance of understanding and leveraging its fundamental components. The multitude of factors implied in a M&A negotiation process provide a perfect example for the application of the multidisciplinary analysis presented above, combining features of financial relevance with aspects belonging to psychology, sociology, anthropology and much more. The combination of such a wide array of disciplines in a single process imposes the examination of its dynamics under the most diverse perspectives and also forces an integration of these varied viewpoints, in order to accurately ponder the feasible strategies and to adapt their features to the specific negotiation context to be faced. This idea of integration seems also suitable to support the major conclusion of this work, according to which no single decision-making model can be inclusive enough to account for all the factors and variables implied in a negotiation. The game theoretic frameworks presented in the second chapter displayed a descriptive capacity that is too narrow to be considered sufficient in the analysis of the M&A negotiation dynamics, not only as a direct consequence of the strict assumptions they imply but also as a result of their quantitative groundings and hence of the impossibility to include a stronger qualitative perspective. It is of critical importance, though, to understand how these descriptive and predictive limits impose several constraints only to the use of these models as exclusive tools for the analysis of an M&A negotiation process, without compromising their role as valid support instruments. Indeed, the discussion over the role of game theoretic models in the context of buy-and-build strategies highlighted the relevance of these frameworks for the schematization of the strategic setting under analysis, especially for what concerns the parties involved and the alternatives available. In the context of an M&A decision, the opportunity of relying on such intuitive representations determines a valuable advantage for a party, since it allows a rationalization of the process and hence a focus on the critical aspects of its execution. In multiple occasions, the failure of a merger or an acquisition has coincided with critical errors in the planning of the necessary activities and in the organization of their implementation. Such oversights might be rectified through the employment of clear-cut decision-making models, included game theoretic ones, which can pave the way for a more straightforward comprehension of the stages, the feasible alternatives for each stage, the agents and hence the interests involved in each decision. However, it should be clear at this point that the complete awareness of the setting in which a decision is made does not guarantee a concrete advantage unless it is accompanied by a deeper comprehension of the factors and variables that directly and indirectly affect it. This necessity for a broader assessment of the conditions in which a decision-making process takes place creates the space for the combination of those planning tools analysed above with a more qualitative investigation. As it was possible to infer from the considerations of this third and last chapter, the rationality on which game theoretic models are grounded is extremely far from the dynamics taking place in real-life decision-making settings, hence reducing the degree of reliability for

predictive purposes. Among the numerous factors that contribute to this departure of the theory from the practice, this work mostly focused on the effects produced by psychological and behavioural elements influencing the agents' information-processing capacity and clarified their role in the induction of decision-making behaviours that might be defined "irrational", according to the definition of rationality employed by the game theoretic discipline. The presence of such influential factors in real-life M&A negotiations impose a more comprehensive approach to the definition of a bargaining strategy, which shall take into account the human component in its entirety. Countless are the practical manifestations of this element of subjectivity, from the inhibition of objective judgements to the modification of priority scales, endowment effects, emotional reactions, cultural and societal influences. The sources of these mental processes can be individuated in every single event taking place in the life of an agent, from birth to death, hence widening the scope of the analysis necessary for a complete understanding of the playing field where the negotiation will take place. The ability to gather enough information for a sufficient understanding of the available levers is an inestimable source of competitive advantage and, in the context of an M&A negotiation, can determine a distinction between success and failure. Such an inclusive analysis can only be the result of that multidisciplinary interaction mentioned above, where the schematizing ability of the decision-making models is combined with the qualitative perspective offered by social disciplines. When such a degree of inclusivity and width in scope is reached, value-creating agreements become a closer reality and the opportunity of exploiting the integrative potential hidden within a negotiation incredibly increases. As the scenarios of integration and value-creation grow in number, a sense of hope and trust might pervade the business environments and hence pave the way for a change in the conduction of business negotiations, where the figure of the agent and its inner condition receive the same consideration guaranteed to figures.

## CONCLUSIONS

Apparently, the historically accepted rationality assumption can be excessively simplistic for the prediction of agents' behaviours in specific settings, particularly those characterized by the presence of a more incisive human component. To make it clearer, the idea of a perfect utility-maximizing attitude actually portrays a fundamental tendency existing in numerous living beings and, for this reason, it can hardly be interpreted as a descriptive tool for human action. Professor Geoffrey Hodgson, from the University of Hertfordshire, shed light on this perspective in his article "*Utility Maximization Is an Unfalsifiable and Inadequate Explanation of Human Behavior*", where he refers to the utility and preference functions by writing that: "It cannot explain any particular behaviour because it is consistent with any observable behaviour. [...] The claim that utility maximization can explain the behaviour of anything from bacteria to bees demonstrates crucially that there is nothing specifically human about such functions of utility or preference.". Despite the harsh critics, it is undeniable that the simplification opportunities offered by such functions allowed the investigation of an extremely complex reality and the elaboration of theories that contributed to the progress of countless disciplines and, as a consequence, of our society as a whole. Nevertheless, it must be recognized that the degree of acceptability of the rationality assumption and related utility-maximizing attitude are subjected to the level of human factor implied by a certain context: as the human presence increases, the reliability of these theoretic concepts does the opposite (and conversely). This means that the description of settings entailing a limited human element – which can be intended as the presence of human free will and of psychological, emotional and contextual influence – does still maintain an acceptable degree of representativeness when grounded on assumptions of rationality and utility maximization. As the human presence grows, however, these assumptions cause a visible departure of theoretic frameworks from the observable reality. Among the innumerable disciplines, theories and models relying on those assumptions, game theory undoubtedly plays a crucial role in the attempt to schematize and rationalize strategic settings. In game theoretic frameworks, the idea of a rational utility-maximizing agent is firmly accepted and strongly influences the outcomes obtained through the resolution of each model. Indeed, game theory has the ultimate goal of identifying the optimal interaction strategy for the agents involved, according to a series of assumptions onto which its models are built. Throughout the previous pages, however, it was possible to analyse and understand the reasons that weaken the position of game theory as a descriptive tool for human behaviour in cooperative/competitive contexts, with most of them sending back to a unique basic idea: agents' behaviour is influenced by several psychological, emotional and contextual factors that reduce the degree of reliability of the rationality assumption. In particular, the work focused on the effects of such factors in the context of M&A negotiations, with the intention to highlight the impact of subjective dimensions in situations characterized by a high degree of interaction and the extent to which these can be considered accountable for a departure of real-life bargaining outcomes from the predictions of game theoretic models. More precisely, the game theoretic representation of M&A negotiations appeared to

display an excessive grade of simplification and decontextualization, with each decisional stage represented as an attempt to maximize the agent's economic return in circumstances of independence from the surrounding environment. As a consequence, the solutions individuated according to the game theoretic instructions provided an evidently misleading illustration of the actual dynamics taking place in M&A negotiation contexts. To investigate the reasons underlying the rejection of such solutions, it appeared necessary to examine the negotiation process from a different perspective, taking into account the cognitive limitations of the agent and his subjective response to psychological, emotional and contextual influences. This investigation underlined the presence of a wide variety of elements and circumstances directly and indirectly affecting the information-processing capacity of the agent and hence his ability to act according to a perfect rationality pattern. From cognitive heuristics to cultural differences, the amount and variety of identified influential factors highlighted the impossibility to schematize and generalize over the agents' behavioural attitudes, both in individual and interactive decision-making contexts. The strongly interactive dimension of a negotiation process was shown to foster this process of influence, with the interpersonal dimension working as a catalyst factor for the emergence of additional and more complex subjective dynamics. According to this analysis, the acceptability of a game theoretic description of M&A negotiations could hardly be accepted as a valid proxy of the actual bargaining process occurring in real-life settings and, for this reason, displays the necessity of integrative analysis in order to provide relevant insights. This integration must take place on a multidisciplinary level, with game theoretic models functioning as basic structures for the representation of specific M&A negotiation frameworks and providing intuitive insights into their most characterizing aspects (parties, stages, available alternatives). However, additional disciplines must be considered for the realization of an increasingly comprehensive analysis and for the achievement of value-creating agreements. As the ideas treated throughout this work show, one of the most critical aspects to deserve appropriate consideration and examination is the subjective dimension of the agents in contexts of negotiation, due to its undeniably strong influential power on the outcomes of a bargaining process and hence on its capacity to destroy or create value for the parties involved. The decision to ground the analysis of a merger or acquisition negotiation on exclusively quantitative aspects creates the right space for omitting elements of crucial importance in the elaboration of a valid strategic approach and compromises the possibility of concretely exploiting the integration potential implied in a cooperative interaction. To consider the inner dimension of an opponent offers the opportunity to employ negotiation tactics that leverage on aspects such as empathy, respect, reciprocity and fairness, all of which disregard the merely quantitative component and focus instead on the construction of an intimate and respectful relationship with the counterpart. Though the employment of an integrative, multidisciplinary approach to the elaboration of a strategy for an M&A negotiation, the possibility of creating value through a single transaction or to set the ground for a long-term fruitful relationship might increase exponentially and might determine the passage to an innovative, more sustainable negotiation system, where people and figures are recognized the same importance.

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*Limits in Game Theoretic Representations of M&A  
Negotiations: The Influence of Psychological and  
Behavioural Factors*

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## CHAPTER 1 - MERGERS AND ACQUISITIONS: WHAT, WHY, HOW AND WHEN

Mergers and Acquisitions (M&As) represent one of the most widespread investment alternatives and growth strategies in today's business environments, primarily due to the speed they confer to a company's expansion plan and the value-creation opportunities they offer. Over the decades, the number and value of M&A agreements has grown significantly and has led to the creation of huge conglomerates, which made of M&A transactions the core of their development strategy and, for this reason, made efforts in the attempt to improve their deal-making skills. Despite these efforts, the failure rate of M&A deals is still extremely high and this typically results in the destruction of shareholder value, hence damaging the financial stability of a corporation and jeopardizing the career of its managers. The reasons for failure can be identified in a multitude of factors affecting the conduction of M&A transactions, belonging to both quantitative and qualitative domains, which have been the subject of deep analysis and are still examined with the objective of individuating the optimal approach to their treatment. The extensive variety of factors directly and indirectly influencing the dynamics of the transaction is also due to the numerous forms assumed by a merger or an acquisition, e.g. asset purchase, stock purchase, take over, reverse take over, horizontal/vertical merger, subsidiary merger, statutory merger, etc.. Each of these forms presents some specific characteristics and is driven by peculiar motives, hence weighing all factors of influence from a particular perspective. The reasons underlying M&A operations play a role of critical importance in the definition of the process and, for this reason, deserve appropriate consideration. As it was mentioned above, the fundamental motive for M&A transactions to happen is growth, intended as the creation of shareholder value. Indeed, M&A operations are part of a wider set of strategies described as "external growth strategies" – i.e. M&A, franchising, licensing, joint ventures, strategic alliances, overseas distributors - and opposed to the "internal growth strategies", specifically referred to those development alternatives that take place inside the company itself and without third-party interaction. However, growth is a general goal and it is often pursued through the chase of more specific objectives. Among these goals, two play a role of critical importance in the opening of value-creation opportunities, namely synergies and access to intangible assets. Synergies refer to the achievement of higher profitability through the combination of resources belonging to the involved entities and can take place both on an operating or financial level. On the other hand, the access to intangible assets refers to the availability of knowledge-based capital and hence to strategies, processes and skills employed by a certain corporation inside its operations. Clearly, goals of this kind are widely comprehensive and typically manifest in the pursuit of more specific outcomes – e.g. cost structure improvement, tax benefits, customer base expansion, access to capital, entrance in high-profit business segments, etc. -, which are also differentiated according to the party manifesting stronger interest (i.e. buyer-side and seller-side motives). It must be repeated, however, that the success probability of a M&A agreement, and thus the concrete achievement of the forementioned goals, is actually low and influenced by numerous variables. Technically, M&A transactions tend to be broken up in two minor stages, pre-deal and post-deal phases,

each presenting specific activities and hence being subject to definite factors of influence. For instance, the success of the pre-deal phase is typically affected by the buyer's level of acquisition experience, financial power, selection criteria and several other aspects related to the strategic intentions of the operation, the degree of compatibility between the entities and the financial aspects involved. Different are the elements to be considered in the post-deal phase and these mostly belong to the domains of synergy creation, culture and change management, allocation of responsibilities. Together with a technical overview of M&A operations, it is interesting to observe some historical determinants of such activities and to understand their occurrence under a broader contextual perspective. M&A waves, as the periods of stronger activity have been labelled, seem to take place as a consequence of some large-scale shocks taking place on the economic, technological or regulatory levels: economic shocks are related to a growth in demand, pushing companies towards expansion; technological shocks modify existing industries and create new ones, changing the necessary skill set; regulatory shocks might result in processes of deregulation, offering new combination opportunities. For a proper growth in the volume and value of M&A activity, a fourth factor results necessary: capital liquidity. The presence of liquid funds in the companies' accounts paves the way for the undertaking of larger strategic investments. Despite events taking place in a single one of the forementioned areas might foster the conclusion of merger or acquisition agreements, there could be the need for a combination of situations occurring across multiple domains in order for a proper wave to make its appearance. Up to present times, seven waves have been identified and something quite interesting to notice is the presence of peculiar traits in each one. These differences in the conduction of M&A transactions concern the form of a deal, the underlying motives, the objectives and the scale, hence offering valuable insights on the interaction between the social/historical context and the relative business environments.

## **CHAPTER 2 - GAME THEORY AND APPLICATIONS IN M&A: EXAMPLES OF GAME THEORETIC REPRESENTATIONS OF M&A NEGOTIATIONS**

### **PART 1 – GAME THEORY**

#### **Fundamental Concepts**

The architecture of a merger or acquisition agreement is typically decided through a process of negotiation taking place between the acquiring firm and the target. This interaction can be either competitive or cooperative and, for this reason, it is often described and examined using decision-making models that help in the schematization of such a relationship. Distinct disciplines offer useful tools for constructing and interpreting models of this kind, with a series of benefits and disadvantages identifiable in each alternative and hence making the choice dependent on the specific situation under analysis. Among these alternatives, one field of study has become broadly widespread over the decades and its models have been employed for the description and analysis of numerous strategic scenarios: game theory. In broad terms, the core of game theory can be synthesized in the study of conflict and cooperation, with its frameworks finding proper

application in situations implying interdependency among agents – intended as the subordination of one agent's outcome on both his behaviour and other parties' behaviours -. The forementioned frameworks are labelled as “games” and require the formal description of involved agents (players), preferences, available information, influence of actions on the outcomes. Game-theoretic-like approaches to the analysis of strategic scenarios date back to Ancient Greece, specifically to Plato's Symposium, but the first mathematical formulation is relatively recent and refers to a work by John von Neumann and Oskar Morgenstern, titled “*Theory of Games and Economic Behavior*” and published in 1944. The authors' objective was the identification of rules describing individuals' attempts to maximize utility and of general principles outlining the rational behaviour of participants in a social economy. Clearly, the work presented strong limitations and hence could be applied to a bounded set of circumstances, but an intense process of evolution and refinement has occurred year after year and has led to the development of more generalized structures. This generalization has widened the array of fields in which game theoretic frameworks can be applied, ranging from economics to biology.

Game theory is built around a series of fundamental concepts, helpful in the determination of precise boundaries inside which players can make their decisions and attempt to rationally maximize their utility. The most important elements underlying game theoretic frameworks are: preferences, utility, rationality and information. In order to rationally maximize his utility, an agent has to rank its preferences according to the available information. Preferences can be simply intended as the alternatives among which an agent can choose and which will be ranked according to the personal benefit they deliver. Since the objective of game theory stands in the description of rational behaviour, these preferences must fulfil an economic rationality criterion and hence must present four characteristics: completeness, transitivity, continuity and reflexivity. As a consequence of the mathematical foundation of the game theoretic discipline, the qualitative ranking of preferences made them useless in the construction of a model. The necessity for a more quantitative representation led to the employment of the more abstract concept of “utility”, defined as a measure of subjective welfare or change in subjective welfare that an agent derives from an object or event. The attribute “subjective” helped in the identification of utility as a personal factor, based on a series of individual characteristics manifested by the agent. Utility, as numerous other concepts, has evolved over the years and has refined its initial definition, elaborated by the English philosopher and economist Jeremy Bentham in an excessively subjective perspective, which compromised the quantification of the measure. It was the work of Paul Samuelson, who developed a theory called “Revealed Preference Theory”, to reduce the degree of subjectivity implied by the idea of utility and to transform it in a purely technical measure, paving the way for a vast application even in the description of non-human decision-making. As it was stated above, however, the objective of game theory was the identification of utility-maximizing behaviours and this imposed the definition of a function to maximize: the utility function. Once utility was made numerically representable through the use of mathematical functions, the possibility of maximizing it

employing analytical tools became concrete and made it possible to build models describing situations characterized by a higher degree of complexity.

The maximization of utility in game theory, and more generally in economic analysis, is grounded on the assumption that agents act rationally. In the context of decision-making processes, rationality can be defined as “the process of determining what options are available and then choosing the most preferred one according to some consistent criterion”, as Levin and Milgrom wrote in their 2004 work *“Introduction to Choice Theory”*. This criterion happens to be the forementioned utility function. Game theory employs a technical concept of rationality, defined as “economic rationality”, which implies the agents’ ranking of outcomes based on their contribution to personal welfare and the consequent selection of actions to take in order for the most preferred outcome to be achieved, taking into account the actions of other agents. This rational choice theory has proved fundamental for the simplification of economic behavioural analysis and has helped in the generalization of decision-making models. Nevertheless, the rationality assumption strongly limits the subjective dimension of agents’ decisions and this has resulted in a constant departure of theoretical models from empirical evidence. Generally speaking, the missing factor in rational choice theory is the consideration of situational and contextual factors as influential elements in the agent’s decision-making process, hence creating the space for a decontextualization that decisively reduces the descriptive capacity of a theoretical framework. Being a probabilistic evaluation of available alternatives practically unfeasible, the idea of utility maximization seem hard to apply in real-life situations and this had led to the elaboration of substitute theories. One interesting view is proposed by Schwartz in his paper *“What is Rationality?”*, where he introduces the idea of “good enough utility” as an alternative to maximization and describes it as the opportunity for agents to choose the most suitable option according to the widest set of circumstances, with the ultimate objective of reducing the possibility of regretting the choice. Without entering a discussion over the degree of acceptability of such a theory, this short example is only necessary to recognize the presence of critical attitudes towards the rationality assumption and related utility-maximization approach to decision-making, in order to highlight the need to carefully examine the conclusions drawn from theoretical models that strongly rely on these concepts. Another valid contribution to the revision of the rationality assumption was provided by Herbert Simon, who introduced the idea of “bounded rationality” as an explanation for the agents’ impossibility to act in accordance to perfect rationality. Simon identified two main reasons for this impossibility: limits in human computational capacity and limits in information access.

The players’ access to information is an element explicitly taken into account by game theoretic models, which make a general distinction between two situations: perfect information and imperfect information. Perfect information allows players to make decisions with complete awareness about events that happened until that specific point of the game. Imperfect information, on the other hand, verifies when players have to make their decisions simultaneously and hence are forced to consider all possible interdependencies between

their move and the other players'. Imperfect information can assume a variety of forms and typically manifests as asymmetric information, when a player knows something unknown to others, or as incomplete information, when nature is responsible for certain events that are privately observed by a single player.

### **Elements, Structure and Representation**

The representation of games can take place through the employment of several approaches, but five fundamental elements must always be included: players; players' possible actions; players' knowledge; relationship between actions and outcomes; players' preferences about outcomes. These elements are included in the graphical representation of a game, which is typically realized using a "tree" (strategic form) or a matrix (normal form). Approximately every game can be represented using both forms and, normally, both are employed with the objective of obtaining more inclusive insights on the strategic setting. Indeed, the two forms offer different perspectives to examine the game and should be used according to the information being searched. An important difference between the strategic and normal forms stands in the representation of a player's action plan: strategic forms portray the game as a sequence of decisional stages, where each player has alternative single options available; normal forms describe the game without giving it a chronological dimension and hence provide each player with "strategies" among which to choose. The term "strategy", in game theoretic contexts, is intended as the specification of a player's actions throughout each existing decision point in the game. While the strategic form offers a stronger descriptive capacity, the normal form represents a more compact and synthetic layout. The passage from one form to the other one is tricky: while a strategic form has a unique normal form correspondent, the opposite is not true and hence a normal form game might correspond to multiple strategic forms. The absence of a direct relationship between normal and strategic form has led theorists to doubt the informative content of the former.

### **Solutions and Equilibrium**

The construction of a game is followed by the identification of its solutions, which describe the strategies selected by the players and hence the outcome of the entire game. More precisely, solutions are searched in order to identify each player's best strategy when other players choose their best response, defined as the strategies that produce the most favourable outcome given other players' actions. Game theoretic solutions can be individuated through the employment of several techniques, also known as "solution concepts", which are applied singularly or in combination according to the specific model under observation. These concepts can be interpreted as rules that determine how a game will be played and some of them are: dominance, best response, rationalizability, iterated dominance, Nash equilibrium, sequential rationality and subgame perfection.

## **PART 2 – APPLICATION OF GAME THEORY TO M&A SETTINGS**

The concepts presented above can be employed for the construction of models that help in the analysis of M&A transactions. Game theoretic frameworks can prove helpful for the provision of an intuitive representation of the interaction between the acquiring firm and the target, in the first place, but can also prove useful in the schematization of a merger or acquisition strategy, composed of multiple operations. To be more specific, game theoretic models can help in the schematization and examination of a multi-stage bargaining process and hence in the assessment of the value-creation potential of a single M&A event. The typical focus of such an investigation is the pricing procedure of the merger or acquisition, which undoubtedly represents one of the most influential factors on the possibility of creating value through the investment. Game theoretic models are built around the pricing procedure and have the final goal of identifying a solution that can be intended as the optimal strategy for both parties. Also, this schematization capacity offered by game theory and its frameworks can be exploited for the representation and analysis of entire merger or acquisition strategies, which include multiple transactions that create value on a longer-term horizon. These strategies are technically referred to as “buy-and-build” strategies and, as the name suggests, are developed around the idea of undertaking platform-like transactions, with the objective of creating a valid base for further operations and hence to the creation of value. The difference with single M&A operations stands in the assessment of value-creation potential: in the case of single events, the assessment mostly concerns the integration potential of the two entities involved; in the case of buy-and-build strategies, the assessment is conducted on a wider scale and concerns the opportunities offered by each operation in terms of future operations. The application of game theoretic models to buy-and-build strategies presents some differences relative to the construction of models portraying the pricing procedure and this is reflected in the resulting analysis. Nevertheless, game theoretic pricing models can be included in the analysis of buy-and-build strategies, in order for the single operations to be accurately valued and managed.

### **Game Theoretic Models in M&A Pricing**

The matter of pricing in a merger or acquisition is considered by researchers and scholars to be one of the crucial success factors in the conduction of such operations, with overpayment being placed in the top ranks for what concerns the major causes of failure in M&A operations. Theoretical works on the subject have identified the perfect price for a corporate entity in the “Fair Market Value”, intended as the reasonable price that a buyer would be expected to pay and the seller to ask in conditions of open market, shared information and absence of compulsion. Nevertheless, the possibility of concluding a transaction at such a price is remote, due to the presence of multiple obstacles to the identification of this figure. The existence of obstacles in the identification of the FMV creates the right space for M&A negotiations to happen, hence allowing the buyer and the seller to undertake a bargaining process with the ultimate goal of obtaining the highest payoff. In a game theoretic context, this bargaining process is portrayed in what are commonly called “bargaining games”: strategic settings that describe a competitive negotiation between players who

claim value through the exploitation of advantageous positions and seek the most favourable agreement. Two typical scenarios can take place in the context of a negotiation: a distributive scenario, where players negotiate over the distribution of a fixed amount and hence the gains of one party are offset by the losses of the other one; a constructive scenario, where players seek an optimal combination of requests and concessions, in order to increase the available value and make both parties better off thanks to the agreement. Game theoretic models describe situations of this kind using a series of additional elements and refinements to the basic bargaining problem structure, allowing theoretical frameworks to close the distance with real-life circumstances and to increase their descriptive capacity. Among the numerous alternatives, the closest one to realistic M&A negotiation settings are the multi-period alternating-offer games, where agents are involved in multiple rounds of offers and counteroffers, until one is accepted or the possibility to conclude an agreement is lost. Nevertheless, despite the attempt of including several realistic factors of influence, the solutions identified by game theoretic models in their application to M&A negotiations appear far from the structure of real-life agreements. This happens as a consequence of the firm mathematical groundings of the game theoretic discipline, which surely can be stretched to account for more qualitative features, but fail in the combination of such elements with strictly quantitative ones and in the elaboration of more comprehensive analysis. Among the numerous factors influencing the outcome of a M&A negotiation, the psychology and personality of the agents involved undoubtedly play a role of critical importance in the determination of their bargaining attitude. The subjective dimension of a negotiation, in the context of a merger or acquisition, manifests in the definition of an “optimal price” and thus in the progression of the talks. The variety of alternative scenarios, under a behavioural and aspirational perspective, is almost infinite and hence impossible to wholly consider, imposing strong simplifications for the construction of a representative game theoretic model and, consequently, reducing the degree of acceptability of its solutions if observed from a real-life standpoint. However, the employment of game theoretic models for a simplified and more intuitive representation of the structural dynamics taking place in the context of a M&A negotiation actually represents a valid alternative for an investigation of the underlying logic.

### **Application of Game Theory in “Buy-and-Build” Acquisition Strategies**

As it was already mentioned, M&A operations can be valued in the perspective of both a single transaction and a multistage strategy. The first point of view tends to be adopted more frequently, due to a greater simplicity of the analysis and a widespread tendency towards short-term orientation. Unfortunately, this approach to the assessment of a M&A investment opportunity might miss important value-related aspects, especially those having to do with the role of an operation as a “platform” for future profitable transactions. This wider perspective for the valuation of a merger or acquisition opportunity can be viewed as the result of two global trends transversally affecting most business environments: the fast emergence of new and highly profitable industries; the economic growth of underdeveloped countries. Both trends have created the necessity for companies to enter new markets, either on an industrial or geographical level, and hence have

determined an increase in the number of mergers and acquisitions. However, the awareness concerning the complexity of managing such deals, combined with the desire to avoid excessive investments in new and unknown markets, determined a shift in the way of approaching M&A operations and paved the way for multistage acquisition strategies. These strategic plans are called “buy-and-build” strategies and are built around the idea of “platform effect”: the entering firm values a target entity not only in the light of its synergistic prospects and profitability forecasts but also as a valid starting point for future mergers or acquisitions in the same industry and/or market, hence fostering a process of consolidation directed towards the establishment of a leadership position. Game theory is employed in the context of buy-and-build strategies with the objective of portraying long-term strategic settings that the acquiring firm is set to encounter throughout the implementation of its multistage acquisition plan, hence functioning as a complementary tool in the decision-making process and supporting corporate finance techniques employed in the valuation of the various investments. Relative to the game theoretic models employed in pricing settings, this approach presents its major differences in the integration of proper financial valuation with game theoretic modelling, with the latter playing a more strategic role as a means for highlighting the available alternatives and for investigating the competition component present in every negotiation. This particular use of game theoretic frameworks as descriptive tools in the context of strategic decisions sheds light on the possibility of using this discipline as a support tool in decision-making processes, primarily relying on the logic underlying the discipline and leaving behind the strictly mathematical component that imposes constraints on its degree of representativeness. However, buy-and-build strategies must be also intended as a sum of single M&A transactions, hence implying multiple bargaining processes and, consequently, being subjected to hardly predictable negotiation dynamics taking place in contexts of competitive interaction. Again, the influential role of the human component appears evident and undeniable, emphasizing the complexity of building theoretical models with an acceptable degree of representativeness, relative to real-life situations. Nevertheless, the role of game theory as a supporting tool in the qualitative analysis of long-term strategic plans might represent a valid solution to manage the uncertainty surrounding such complex circumstances and, if well implemented, might represent a source of competitive advantage.

## **CHAPTER 3 – IMPACT OF HUMAN PSYCHOLOGY ON M&A NEGOTIATIONS AND CONSEQUENT LIMITS OF GAME THEORETIC REPRESENTATIONS**

### **PART 1 – NEGOTIATION AS A PERSONAL AND INTERPERSONAL PROCESS**

The analysis of game theoretic models applied to M&A settings highlighted the descriptive complexity of the competitive interaction occurring between parties involved in the transaction, especially in the context of a negotiation. Despite the attempt to provide a faithful portrayal of the competitive interactions implied in a merger or acquisition negotiation – e.g. price, employment, allocation of responsibilities, headquarters –, game theory seem to lack a proper inclusion of multiple dynamics that exercise a profound influence on the

negotiation: human psychological and behavioural traits cannot find a proper representation in game theoretic models, for example. Furthermore, the game theoretic discipline is grounded on some excessively strict assumptions regarding agents' behaviour, with perfect rationality being presumably the most valid example. Howard Raiffa, a mathematics and game theory expert, can be considered among the first individuals to raise doubts concerning the validity of the game theoretic discipline as a descriptive tool for negotiation settings. In his book from 1982, *"The Art and Science of Negotiation"*, he clearly writes that the focus of game theory are problems in which the agents act in an excessively rational manner and that real-life cases have nothing to do with this complete awareness. More specifically, Raiffa highlighted the absence of a clear set of alternative choices, of a common perspective and of an established payoff structure, hence doubting about the presence of perfect rationality in the decision-making process of the parties. His view over the actual dynamics of a negotiation, which provides the basis for this entire work, is synthesized in the title of the forementioned book: negotiation can be intended as both a science and an art; it is a science, because it provides an analytical approach to problem-solving; it is an art, because it implies a personal and interpersonal dimensions that transversally influence its execution and hence its outcomes. Interpreting the negotiation process in this light, Raiffa is the first to understand the necessity of intersecting quantitative and qualitative investigations in order to obtain a comprehensive description of the bargaining interaction and hence to firmly criticize the descriptive capacity of the game theoretic discipline in its application to such strategic settings. Interestingly, Raiffa is among the first to cite the importance of interests (other than the economic ones), concerns, beliefs, values and vulnerability as influential factors in the minds of negotiators and thus to explicitly express the necessity of an appropriate consideration of the human component in order to comprehend the mechanisms underlying the initiation, execution and conclusion of this form of interaction. Over the decades, theories concerning the impact of human-related factors in the negotiation process have been developed and refined, offering insightful perspectives over the numerous aspects affecting the bargaining process and the extent to which they determined a departure from the rationality assumption and, as a consequence, from the game theoretic modelling. A comprehensive overview concerning the psychological and behavioural factors implied in a negotiation process is offered by De Dreu, Beersma, Steinel and Van Kleef in a 2007 paper titled *"The Psychology of Negotiation – Principles and Basic Processes"*, where the authors accurately investigate the features of the human mind that are most likely to impact on the rational conduction of the bargaining. Prior to a detailed analysis of each single aspect, De Dreu and his colleagues offer a valid explanation of the practical manifestation of the examined mental processes: the absence of a state of full-information on the side of the agent imposes the collection of additional information in order to reduce the degree of uncertainty implied in the setting; such information must be processed, but the information-processing capacity of each individual is affected by subjective dimensions and this subjectivity impacts on the attitudes of the agent towards interpersonal relationships in general, included those with eventual counterparts, and the negotiation process. The subjective dimensions affecting the objective information-processing capacity of an agent are expressed across multiple domains

and arise from cognitive attitudes, emotional states and social interactions. Researchers have identified peculiar dynamics for each one of these areas, carefully gathered and explained by De Dreu and his colleagues in the forementioned paper with respect to their direct and indirect effects on the negotiation process and outcomes. Impactful cognitive mechanisms have been identified in the employment of cognitive heuristics, self-threat principle and ego defensiveness, for example, which work as obstacles to an accurate comprehension and contextualization of the information collected in a bargaining context. With the help of such mental shortcuts, agents put themselves in the position to simplify their vision of external reality and hence to draw conclusions in a faster, though potentially inefficient, way. Furthermore, mechanisms like naïve realism and self-threat work on both internal and external dimensions, encouraging the examination of external reality in the light of internal self-perceptions and beliefs. The consequences of these dynamics on a negotiation can be individuated in the erroneous valuation of available data, misleading beliefs about the priority scale of a counterpart and inaccurate assessment of a counterpart's attitudes, all driving the bargaining process towards inefficient outcomes and reducing the possibility of exploiting value-creating opportunities. The effect of subjectivity on the agent's behaviour can also be observed in the influential action of his emotional states, whose transversal presence in an individual's daily life create the right condition for their single and combined effects to affect the events he will experience within a certain time frame – which varies according to the intensity of the emotion felt -. As a consequence, negotiations can be influenced by emotions on a two-fold level: first, significant emotions might be the result of events taking place outside of the bargaining context; second, the negotiation itself might present a strong emotional content. Researchers have gathered evidence concerning both situations: the effect of emotions arising from external events can be individuated in a tougher bargaining attitude and reduced level of concessions observed in negotiators approaching the talks displaying emotions of anger; the effect of events occurring during the negotiation, on the other hand, can be observed in situations of impasse and have to do with resentment towards the counterpart or weaker self-perceptions. It might be appropriate to conclude that, as for cognitive limitations, emotional influences tend to drive the negotiation away from efficiency and value-creation. Clearly, while the cognitive component of a negotiation seems more related to a personal dimension, the emotional aspect is also connected with a social element that is typical of such circumstances. This interpersonal dimension of a negotiation does not only refer to the direct interactions taking place around the bargaining table but also to third-party interests that might be at stake. Such an interest can be interpreted as a socially oriented bargaining attitude, characterized by the pressure of an agent towards the conclusion of an agreement that sacrifices selfish elements in favour of more altruistic ones. This selfish or altruistic negotiation attitude has been labelled as “proself” or “prosocial” and some practical consequences on the execution of the talks have been identified: proself negotiators tend to manifest hostility and to adopt deceptive techniques to obtain personal success; prosocial negotiators show a higher degree of trust and openness, with the objective of fostering a constructive negotiation.

Selfish and altruistic bargaining attitudes are an interesting manifestation of the interpersonal dynamics taking place in the context of a negotiation, but they are not alone. The relationship between negotiators can be influenced by another interesting feature of the individual: culture. Having a direct impact on values, beliefs and norms, the agent's cultural background can represent an element of serious influence in the conduction of a negotiation. Interestingly, a double perspective has been adopted to examine the effect of culture on the negotiation process: on the one hand, researches have been conducted concerning the bargaining process and its outcomes between agents from the same country; on the other hand, observations have been collected in the domain of intercultural negotiations. The evidence gathered over the years seems to witness the presence of differences in negotiation approaches and strategies from one cultural context to another, hence affecting the outcomes. For what concerns intercultural negotiation settings, a higher degree of ambiguity surrounds the conclusions drawn by different researchers: while multiple studies highlighted the presence of cultural factors whose specificity increased the degree of complexity of a negotiation, hence compromising the reaching of efficient outcomes and the creation of value, several other researches proposed a distinct view, according to which the problems of intercultural negotiations lay in the incapacity to recognize the counterpart's ability to adopt an intercultural attitude and to abandon the stereotypes of the native culture, which results in an overadjustment of bargaining behaviours and in a form of artificial misalignment. However, a clear-cut view does not exist yet and the cultural factor still receives profound attention in the domain of negotiation research, especially as a result of the reduction of cultural barriers and of the increasing globalization.

## **PART 2 – PSYCHOLOGICAL AND BEHAVIOURAL LIMITS OF GAME THEORETIC REPRESENTATIONS: HOW M&A NEGOTIATIONS DEPART FROM GAME THEORETIC PREDICTIONS**

Shedding light over the high degree of uncertainty governing human actions, the possibility of building a truly representative decision-making model based on rational assumptions appears quite remote. The complexity of the settings in which the agent is called to make a decision, the wide array of variables that directly and indirectly influence the decisional process and the potentially uncountable alternatives create a space in which the attempt to formulate schemes might result in a complete failure. The employment of strict assumptions in order to reduce the degree of complexity of real-life settings and their consequent oversimplification for theoretical purposes categorically reduce the extent to which conceptual predictions can be trusted, hence imposing strong limitations to the descriptive capacity of a model. In this work, the decisional model under investigation is the one offered by game theory and the discussion concerns whether or not its predictions can be assumed as a valid proxy of the agent's behaviour. As the title suggests, a conclusion has already been drawn and it is inclined towards a negative interpretation of the model's ability to make applicable behavioural predictions. Researches over the mistaken predictions of game theoretic models date back to the 1950s and were refined over the decades through the work of infamous researchers

and scholars - Herbert Simon, Daniel Kahneman, Amos Tversky, just to cite a few -, being still conducted in present times. The core of such studies and experiments was the demonstration of limits in human cognitive capacities and hence the impossibility for the rationality assumption, in decision-making contexts, to be accepted. While the work on heuristics and biases has the most ancient origins, research over the influential role of social and contextual factors – the role of emotions, interpersonal relationships, cultural distance, etc. - has grown recently and is constantly increasing in importance. Interestingly, after the translation of many studies and researches into practical experiments, with consequent registration of the outcomes, many attempts were conducted with the objective to integrate the findings in the existing game theoretic models. Clearly, the idea was to improve such models up to the point that they would have included all the psychological and behavioural aspects considered necessary for the provision of a comprehensive description of the agent's decision-making process. As Lucas and his colleagues highlight in the work "*Can We Build Behavioral Game Theory?*", there seems to be no concrete possibility of building a comprehensive model that includes strictly qualitative aspects in the description of an agent's decision-making strategy, hence emphasizing the remoteness of a general behavioural game theory. The authors ground their conclusions on the presence of multiple pitfalls in the construction of a decisional game theoretic model and provide two concrete examples: first, the subjective evaluation of alternative scenarios, subject to multiple qualitative and quantitative factors, inhibits the objective mathematical calculation of the payoffs; second, the presence of subjective beliefs concerning the progression of the events reduces the reliability in the idea of common knowledge typically implied in game theoretic settings. Nevertheless, the provision of such illustrations does not end in itself, but works instead as a foundation for the introduction of their main finding. Lucas and his colleagues believe, indeed, that the major reason underlying the impossibility of developing a reliable decisional game theoretic model can be identified in the concept of "consistency". The idea is that without a certain degree of coherence in the behaviours of the agents under specific circumstances, the creation of a general model represents an unfeasible option. More specifically, a consistent behaviour would be necessary in circumstances of deviation from the rational actions imposed by game theoretic models, since this would create the opportunity for generalizing on eventual "irrational behaviours" and hence for reducing it to a computable dimension. The problem here stands in the absence of a demonstrated form of consistency in the behaviours and beliefs of agents acting under the exact same conditions, which determines the impossibility of a general behavioural game theoretic decisional model. Such a conclusion can be accepted even assuming a purely logical approach to its interpretation, according to which the categorization of human behaviours in a decision-making context cannot be accepted as a concrete possibility and this is the consequence of an insurmountable degree of subjectivity that permeates most decisional processes. These mostly theoretical conclusions are empirically supported by some experimental work conducted by Lucas and his colleagues, who investigated the validity of game theoretic settings through a specific analysis of the Trust Game. The results of this experimental investigation showed that not only the agents' behaviours departed from equilibrium strategy profile but also their beliefs

manifested a remarkable degree of inconsistency with it, hence providing a valid demonstration of the distance between theoretical predictions and practical observations and offering a concrete reason for believing in the impossibility of creating a truly predictive behavioural model in the field of decision-making. It must be said, however, that trust games represent an example characterized by a high degree of simplicity and thus raise doubts on the validity of the forementioned conclusions in contexts characterized by a greater contextual complexity, of which mergers and acquisitions can be a reasonable example. This work specifically focus on the negotiation process taking place in the context of such operations, with the intention to investigate whether or not it might be possible to provide an accurate representation using game theoretic models. The examination of the positions of both buyer and seller in the context of a M&A negotiation highlighted the strong influence of human factors in the conduction of the bargaining and in the conclusion of an agreement. Multiple dynamics take place and most are related with the cognitive, emotional and social domains presented in the first part of this last chapter: prosocial attitudes, desire to impress an audience, employment of heuristics and biases to reduce uncertainty, etc.. As the degree of contextual complexity increases, the number of triggers potentially responsible for the activation of psychological and behavioural mechanisms follows the same path, hence paving the way to the intersection of numerous subjective dynamics whose effects combine and contribute to a departure from theoretical predictions. Clearly, this determines a huge distance between the predicted outcomes of a negotiation and the actual results of the bargaining process, strongly reducing the predictive effectiveness of the game theoretic models attempting to describe situations of this kind. Not surprisingly, the hope of game theorists to improve the descriptive capacity of their models through the inclusion of human factors, already recognized as worthy of an appropriate consideration, does not disappear. Interestingly, this refinement process of the game theoretic models might start from a re-interpretation of the utility function, which is classically built around factors of strict economic rationality and which might instead be expanded to include features with increasingly qualitative characteristics. Nowadays, the employment of game theoretic models in the analysis of M&A negotiations cannot deliver appropriate conclusions and hence cannot provide helpful insights for the creation of value-creating deals. However, if combined with integrative disciplines that present the tools for a concrete examination of psychological and behavioural factors, game theoretic models could be employed with an even higher degree of usefulness, due to their excellence in the creation of schematic representations that might prove helpful for an intuitive analysis of the strategic settings in which a company is involved.

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