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THE GAME THE 'EVOLUTION OF COOPERATION' AND THE NEW FRONTIER OF KNOWLEDGE MANAGEMENT

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ABSTRACT

This research is intended to investigate Cooperation and to understand how we can stop the self-interested behaviour of the individual from damaging the long-term interests of the group. Indeed, it is reasonable to think that following cooperation could lead to a mutual benefit for everyone. Nevertheless, reality is often controversial, as selfishness and individuality dominate. This create problems, because people and organizations fail to coordinate and to make optimal decisions. Because of the wide-ranging nature of the issue, we relied on a largely interdisciplinary theoretical base, grounding on a managerial, microeconomic, financial, epistemological and sociological literature and empirical cases. Our methodological approach grounds on the Thompson's Epistemic-Ontological Alignment Theory (2011), by combining an Entitative Dimension (models of reality) and a Process Dimension (flux of interactions) to create a consistent and justifiable Mid-Range Theory. By departing from the Prisoner's Dilemma and the Axelrod's solution, Coordination Games and models of cooperation between firms, we then analysed flux of cooperative interactions and knowledge creation. We eventually found out that the so-called Future Game® and the Scenario Game represent a practical embodiment of the Evolution of Cooperation envisaged by Axelrod, and an important contribution to the *Reformation of Cooperation* envisaged by Sennett, to avoid the spread of the uncooperative self. They also constitute an example of the emerging practice of gaming, acknowledged as the New Frontier of knowledge management and managerial consultancy. This work wants to be a new beginning for a new research stream around cooperation and knowledge creation through *gaming*, and around the Scenario Game and the related Future Game®, to create a base for further discussions by departing from the insights produced by our analysis.

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INTRODUCTION

This research is a study around Cooperation, originated from a curiosity about what happens around us.

Every one of us has been involved in cooperative experiences, interactions with others to fulfil a common goal, which can have been turned into successes or failures. That is what happens in our daily lives, and what even organizations look for. That is why I decided to focus my thesis on this wide and "everyday" issue, as I was eager to investigate the origin of cooperation and the hostility of the context, where it strives to establish. Indeed, I have always though that following cooperation could lead to a mutual benefit for everyone. Nevertheless, reality is often controversial, as selfishness and individuality dominate.

Thus, I asked myself the reason why it happens, if this trend could change or if it is just a utopia.

I decided to study and investigate, to find reasonable answers to those simple – but very complex – questions. That is the origin of my Master's Thesis on collaboration, which has an interdisciplinary nature, deriving directly from the chosen research methodology.

Firstly, it is important to identify the resulting underlying questions representing the drivers of my Master's thesis:

- What stops or could stop the self-interested behavior of the individual from damaging the interests of the group? What could deceive actors in making sub-optimal decisions?
- If they succeed, what are the potential benefits? And, how can they behave in order to internalize them?
- What can we do, in practice, to "trigger" as well as maintain cooperation alive?

What I also asked my self is how I could approach the issue, that is to say how I could create *consistent* and *justifiable* new theory within this so wide interdisciplinary field of study. I did not want to fall in the usual error to be already unconsciously inclined to pre-defined answers

or to analyze the problem just from one perspective, by arriving to a "weak" solution, which could have been easily criticized and took apart. I wanted to create something which could have been consistent and solid from a theoretical point of view. I wanted a methodological approach which could have made me closer to understand cooperation, by helping me in starting a path able to bring me to some interesting new insights based on reasonable argumentations.

That is the reason why, during my Erasmus mobility in Belgium, at the Université Libre de Bruxelles (ULB), I followed an unusual course, named "Epistemology and Critical issues in Management studies", and taught by Prof. Kevin Jackson. It was an open-minded course, whose aim was to make us aware on how is difficult to define "knowledge" and "science", and, as a consequence, even to help research in creating "new knowledge" and "scientific theory". Within the course, I studied and made a presentation around the methodological approach of my Master's Thesis. I relied on an interesting article representing the driver of my thesis' development: "Ontological Shift or Ontological Drift? Reality Claims, Epistemological Frameworks, and theory generation in organization studies", by M. Thompson (2011).

According to Thompson, to create new consistent and justifiable theory, we need our research to be Epistemic-Ontological Aligned. He distinguishes mainly two ways which have been used so far to create new theory in Organization Studies: (1) Structuralism approach; (2) Social constructivism approach. While, in the first one, scholars seek for an approximate correspondence between knowledge and observable reality, by emphasizing the value of enduring models of reality applicable across multiple situations, the second one emphasizes the opposite. Social constructivism's scholars highlight the socially constructed, dynamic and partial nature of knowledge, by emphasizing the limitations of such models and the crucial role played by intersubjective, emergent, and metaphysical factors in shaping organizational reality. The first approach is identified as the **Entitative Dimension**¹ of the phenomenon under consideration, and the second approach as the **Process Dimension**². Thompson argues

¹ The Entitative Dimension has Greek roots: indeed, Parmenides (c. 485 bce) spoke about and the unchangeability of reality, as he argued that what change are things (entities). Much later, Pugh, Hickson, Hinings (1986) introduced the principle of **classification** of similarities and differences between organizations (Thompson, 2011).

² The Process Dimension is, for instance, embraced by Bakken & Hernes (2006), who stated that "Organizing is both a verb and a noun", to make clear that "thing" and "the happening to thing" are collapsed into a single becoming (Thompson, 2011).

that the combination of the two dimensions, during the analysis of a specific phenomenon, gives life to the so-called **Mid-Range Theories**. Mid-Range Theories acknowledge the importance of abstraction, representation and general principles, while also recognizing their limitations in accurately representing the emergent and locally specific reality. Hence, it can be an effective method of "**Theory Creation**". Therefore, it is important to make a shift in the different ontological emphasis between these two dimensions. However, it is very likely to misinterpret them, by risking to attribute process-like qualities to entities (*Processification*) or entitative existence to processes (*Reification*), by ending with a non-desirable Epistemic-Ontological Misalignment. We have to shift from the Process Dimension to the Entitative Dimension (or vice versa), by taking care that we are describing the process with the epistemological and ontological features of a process, and the entity with the epistemological and ontological features of an entity (Conjunction or Abstraction). To better understand, see Figure 1.

Figure 1 - Epistemic-Ontological Alignment and Misalignment: shift between Entitative and Process Dimensions (Elaboration from Thompson, 2011)



If we take the approach to Mid-Range Theories from a cultural point of view, we recognize that the Entitative Dimension is closer to Western culture and philosophy³, while the Process Dimension is closer to the Japanese ones⁴. Nonaka and Takeuchi (1995) see them as mutually complementary cultural distinctions, by arguing that a combination and integration of elements coming from both these cultures can be an effective method of "Knowledge Creation". Thus, we conclude that the creation of a Mid-Range Theory, by maintaining research epistemic-ontological alignment during the combination of entitative and process dimension, is an effective way to create new consistent and justifiable theory and new knowledge. After all, this thesis has also the aim to understand how knowledge is created through cooperation, and a similar approach could be strongly useful. Moreover, it is important to stress that, according to Thompson, Nonaka and Takeuchi's knowledge-creating theory is an example of a Mid-Range Theory itself, based on a knowing ontological shift back and forth between Abstraction (from process to entitative dimension) and Conjunction (from entitative to process dimension). The whole literature has been chosen by trying to select epistemic-ontological aligned theories, to thereby give to our approach the same epistemic-ontological aligned nature.

Therefore, we have delighted our methodological approach. The Master's Thesis follows the "Conjunction" epistemic-ontological shift: we depart from the entitative dimension to then analyze the process dimension of cooperation, and integrate them into a unified new Mid-Range Theory.

Following these methodological choices, this research is structured as follows:

1. Entitative Dimension:

Chapter One – "Models of Cooperation": we take a Game Theory's approach to cooperation, by focusing our discussion on the Prisoner's Dilemma Game. Indeed, it represents the most elegant embodiment of the problem of achieving mutual cooperation. We also discussed the "Evolution"

³ In Western philosophy, we have a traditional separation between the subject who knows and the object that is known (Cartesian dualism). They distinguish between "subject" and "object", between "mind" and "body", between "self" and "others". Western culture is characterized by Stability, Controllability and Independency (Nonaka & Takeuchi, 1995).

⁴ In Japanese philosophy, the ultimate reality lies in the delicate, transitional process of "permanent flux" (Nishida's theory of acting intuition). They recognize the oneness of "humanity" and "nature", "mind" and "body", "self" and "other". Japanese culture is characterized by Duality, Unpredictability, Contingency (Nonaka & Takeuchi, 1995).

of Cooperation" envisaged by Axelrod, through the use of cooperation strategies based on reciprocity. We need also some forms of coordination, and we also analyzed Coordination Games, between individuals and organizations. Thus, we departed from considerations around individuals, to pass through coordination among teams, and to end up with interactions among multiple organizations;

Chapter Two – "Models of Cooperation Between Firms": we shift our attention more specifically to models of cooperation between organizations of individuals. It contains a screening on several existing inter-firm cooperative models developed in different but related disciplines, to involve different viewpoints. We will analyzed models developed within managerial, financial and industrial perspectives. The aim is to understand if they are in line with each other or there are some potential differences;

2. Process Dimension:

• Chapter Three – "Cooperation and Knowledge Management: 'The Game' ": it explores cooperation as a flux of interactions between human beings, as continuous exchanges in behaviors and knowledge, in a constant evolution that is possible if we are together. We will see the possible implications of this approach in terms of cooperation and knowledge creation, by departing from the single individual to relationships among organizations. We will conclude by proposing a new driver for knowledge creation and cooperation, which has recently started to be studied as a new strategic tool for firms: the "Game";

3. Mid-Range Theory:

• Chapter Four – "The Future Game®: Closing the Circle": it has the aim to understand how games can practically be used and integrated in business practices, and whether they can be combined with other recent organizational forms created to encourage cooperation and knowledge sharing. We will also try to interpret this trend by taking into account the whole theoretical framework discussed in the previous chapters, to end up with some insights on the "evolution of cooperation" with reference to the Prisoner's Dilemma Game. In particular, we will focus on the emerging "Future Game®".

As we can see, the Chapters follow a circular path, by starting from the most simple theoretical embodiment of the non-cooperative behavior – the Prisoner's Dilemma – to end up with a practical embodiment of the Axelrod's solution to this dilemma – The Future Game®. Indeed, it seems to have the right characteristics to allow:

- the 'evolution of cooperation' envisaged by Axelrod, and
- knowledge creation through the emerging practice of "gaming", which is becoming and we need to declare it – the 'new frontier' in Knowledge Management and in the Management Consulting field.

Now, we will just begin our path, inspired by the curiosity to learn more about Cooperation, and to understand how we can find a common compromise between Entitative and Process dimensions. We want to understand how to integrate each other to create a new overarching vision, based on a solid comprehensive theoretical base, grounding on a managerial, micro-economic, financial, epistemological and sociological literature and empirical cases. Thus, we will rely on a largely interdisciplinary approach.

Figure 2 - Research Methodology



1. CHAPTER ONE – MODELS OF COOPERATION

When we talk about Collaborative Action Models, we are referring to a broadly interdisciplinary field of study focusing on cooperation processes and collective action, also known as **Cooperation Theory**.

Cooperation Theory encompasses many disciplines, from biology to sociology, philosophy, economics, computer science, mathematics, psychology and political science. In biology, cooperation is defined as any adaptation that has evolved, at least in part, to increase the reproductive success of an actor's social partners (Gardner, et al., 2009). In Game Theory, it can be defined as the study of the dynamics through which cooperation between players can emerge and persist. The central issue is always the attempt to solve social dilemmas grounding on the following questions: What stops – or could stop – the self-interested behavior of the individual from damaging the interests of the group? What could deceive actors (social, economic, biological, etc.) in making sub-optimal decisions?

The most known literature about the solution of these social dilemmas is focused on three mythic narratives: (1) The Prisoner's Dilemma; (2) The Tragedy of the Commons; (3) Public Goods.

Public Goods problems are related to negative externalities resulting from an excessive use, or to the "free-rider" problem, in which people not paying for the good may continue to access it. This also leads to the second social dilemma that is the Tragedy of the Commons. Garrett Hardin introduced this issue in the '50s in a paper asserting that the depletion of a shared resource by individuals - acting independently and rationally according to each one's self-interest - acts contrary to the group's long-term best interests. Precisely, he argued that users of a commons are caught in an inevitable process that leads to the destruction of the resources on which they depend⁵ (Hardin, 1968). Elinor Ostrom and other economists revised his work in the increasing attempt to find and demonstrate a solution to the commons

⁵ The base for his statement was that the so-called *rational* user of a commons is supposed to demand a resource until the expected benefits of his or her actions will be equal to the expected costs. However, the single user ignores costs imposed on other users, and this leads to a tragic overuse and the potential destruction of an open-access commons (Hardin, 1968).

problem⁶ (Ostrom, et al., 1999). Also Robert Axelrod⁷, mainly dealing with the Prisoner's Dilemma theory, has criticized the impossibility to escape from the dominant self-interested solution. His main contribution was a well-known scientific article, "The Evolution of Cooperation", written together with William D. Hamilton⁸, in 1981, with the aim to contrast - or better to further develop - the Darwinian individualistic theory of evolution. The 1981-article of Axelrod and Hamilton represents an introduction to how game theory and computer modeling may illuminate certain aspects of moral and political philosophy, particularly the role of individuals in groups, the "biology of selfishness and altruism", and how cooperation can be evolutionarily advantageous.

Chapter One of this research will use a **Game Theory's approach** to cooperation. This is the reason why the simple game of **Prisoner's Dilemma** will represent our foundational theoretical narrative, together with the related **Axelrod's Model**.

1.1. The Prisoner's Dilemma Game (1950s)

The Prisoner's Dilemma game⁹ can be considered as an elegant embodiment of the problem of achieving mutual cooperation. It also embodies the common tensions between what is good for the individual in the short term, and what is good for the group in the long run, that is one of the basic problem of Cooperation Theory.

In the two-player version¹⁰ of the Prisoner's Dilemma game, two individuals can each either cooperate or defect. They choose strategies simultaneously and the game is played only once (*one-shot game*). No matter what the other does, the selfish choice of defection yields a higher pay-off than cooperation. However, if both defect, both do worse than if both had

⁶ Their article discusses how it could be most likely to foster sustainable uses of common-pool resources. Some of the most difficult challenges concern the management of large-scale resources, which depends on international cooperation; to wit, we are talking about fresh water supply in international basins or large marine ecosystems protection. In these case, it seems also true that both institutional diversity and biological diversity would be important for our long-term survival (Ostrom, et al., 1999).

⁷ R. Axelrod is a Professor of political science and public policy at the University of Michigan, from 1974.

⁸ W. D. Hamilton was an English evolutionary biologist, widely recognized as one of the greatest evolutionary theorist of the 20th century. He was a professor of evolutionary biology in the Museum of Zoology and the Division of Biological Sciences, University of Michigan.

⁹ The extreme simplicity of the Prisoner's Dilemma paradigm proved to have several important benefits over the years: (1) it allowed a set of theorems to be proved about the conditions under which cooperation can get started and be sustained; (2) it allowed both professional game theorists and amateur computer hobbyists to devise an impressive range of more or less sophisticated strategies with which to play the game; (3) the results have inspired a good deal of empirical work demonstrating that cooperation based upon reciprocity does indeed exist between individuals, nations and animals (Axelrod, 2000).

¹⁰ In the corresponding n-player PD game (NPD), players make a choice that they play with all other players. It is demonstrated that increasing the number of players makes cooperation more difficult: for cooperation to be part of an equilibrium in NPD, it is necessary that either the shadow of the future is long or the number of co-operators is large (if the number of Tit For Tat's players passes a certain threshold, then it dominates the population of ALL D; however, the threshold rises with n). (Axelrod & Dion, 1988)

cooperated. *Figure 3* shows the pay-off matrix¹¹ of the Prisoner's Dilemma (Axelrod & Hamilton, 1981).



Figure 3 - The Prisoner's Dilemma Game: the Payoff matrix (Source: Axelrod & Hamilton, 1981)

By assumption, T > R > P > S,

where T stands for the temptation to defect, R the reword for mutual cooperation, P for the punishment for mutual defection, and S for the sucker's pay-off (when Player A is cheated by Player B, who defects).

Thus, no matter what the other player does, it pays to defect. Consequently, the mutual defection appears to be the dominant solution, even though they both get P rather than the larger value of R. Thus, individual rationality leads to a worse outcome for both than it is actually possible. This is the real dilemma: the one-shot game eventually leads to a **sub-optimal equilibrium**, where the choice to defect is always an evolutionarily stable strategy.

Anyway, some assumptions are at the base of the Prisoner's Dilemma Game: (1) players cannot make enforceable threats or commitments; (2) no way to be sure what the other player will do on a given move; (3) no way to eliminate the other player or escape the interaction; (4) no way to change the other player payoffs.

So, players can communicate with each other only through the sequence of their own behaviors.

1.2. The Evolution of Cooperation

However, is this the way cooperation works? Is it impossible to cooperate with each other, at the end?

¹¹ Other possible games have been constructed on the base of the Prisoner's Dilemma models, but with different assumptions about the payoff matrix: (1) the Chicken Game, where the each player do the opposite of what he/she think the other player will do: mutual defection yields a worse outcome than unilateral cooperation, T > R > S > P. (2) the Assurance Game, where a player do the same as he/she thinks the other player will do: mutual cooperation yields a better outcome than unilateral defection, R > T > P > S. It is demonstrated that the importance of reciprocity and of the Shadow of the Future apply not only to the iterated Prisoner's Dilemma, but also to Chicken and more generally to any game in which individually rational choices lead to sub-optimal decisions. (Axelrod & Dion, 1988)

Well, Robert Axelrod went beyond the Prisoner's Dilemma assumptions by taking into account that examples of cooperating behaviors exist in reality. He tried to understand how cooperation can evolve, when a person should cooperate and when should be selfish, in an ongoing interaction with another person within a world of egoists without central authority.

The most famous answer to this questions was given over three hundred years ago by Thomas Hobbes: he argued that before governments existed, the state of nature was dominated by the problem of selfish individuals who competed on such ruthless terms that life was "solitary, poor, nasty, brutish, and short": cooperation could not develop without a central authority. Nevertheless, today nations interact without central authority and the question of cooperation is every day more urgent.

This is the reason why Axelrod investigated the issue in his book "The Evolution of Cooperation" (1984): the approach is to have some useful insight on how individuals will act in the aim of pursuing their own interests, followed by an analysis of what effects this will have for the system as a whole. The "Axelrod's Model" is described below.

1.2.1. The Axelrod's Model (1981)

One key fact is recognized: in many social and biological settings, the same individuals meet more than once.

That makes them able to recognize a previous interactant and remember some aspects of the prior outcomes¹²: then, within the Axelrod's Model, the strategic solution becomes an **Iterated Prisoner's Dilemma** with a much richer set of possible stable strategies. We can also rely on the more realistic assumption that the number of interactions is not fixed in advance, and the probability that, after the current interaction, the same two individuals will meet again is defined as "the shadow of the future", simplified as **w**. Another assumption is that choices are made simultaneously and with discrete time intervals¹³. For all value of **w**, the strategy of ALL D (unconditional defection) is evolutionarily stable: if everyone is using this strategy, no mutant strategy can invade the population. However, other strategies may be

¹² Moreover, discrimination among others may be among the most important of the abilities because it allows one to handle interactions with many individuals without having to treat them all the same, thus making possible the rewarding of cooperation from one individual and the punishing of defection from another (Axelrod & Hamilton, 1981).

¹³ This is equivalent to a continuous interaction over time, with the time period of the model corresponding to the minimum time between a change in behaviour by one side and a response by the other. (Axelrod & Hamilton, 1981)

evolutionarily stable as well. In fact, when w is sufficiently great, there is no single best strategy regardless of the behavior of the others in the population.

The very simplicity of the framework makes it possible to avoid many restrictive assumptions that would otherwise limit the analysis:

- 1. Players' payoffs need not be comparable at all;
- 2. Payoffs do not have to be symmetric;
- 3. Each payoff does not have to be measured on an absolute scale;
- Cooperation need not be considered desirable from the point of view of the rest of the world;
- No need to assume that players are rational: they don't try to maximize their reward, since their strategies may simply reflect standard operating procedures, rule of thumb, instincts, habits;
- 6. Players' actions are not necessarily conscious choices.

Of course, the abstract formulation of the model and of the cooperation problem puts aside many vital features that make any actual interaction unique. However, the value of an analysis without them is that it can help to clarify some of the subtle features of the interaction, to enrich our understanding.

The evolution of cooperation has been conceptualized in terms of three separate aspects (Robustness¹⁴, Stability¹⁵, and Initial Viability¹⁶), investigated through a computer tournament based on the Prisoner's Dilemma, played by game theorists in economics,

¹⁴ The aspect of robustness investigates what type of strategy can thrive in a variegated environment of more or less sophisticated strategies. The game as a computer tournament was played also in a second round, where 62 entries were submitted by computer hobbyists, and professors of evolutionary biology, physics, and computer science, as well as the five disciplines represented in the first round, from six countries. TIT FOR TAT was again submitted by the winner of the first round, the Professor A. Rapoport of the Institute for Advance Study (Vienna), who won again. (Axelrod & Hamilton, 1981)

¹⁵ The question of evolutionary stability deals with whether a strategy can resist invasion by a mutant strategy. When TIT FOR TAT plays another TIT FOR TAT, it gets a payoff of R each move for a total of $R + wR + w^2R$..., which is R/(1-w). ALL D playing with TIT FOR TAT gets T on the first move and P thereafter, so it cannot invade TIT FOR TAT if $R/(1-w) \ge T + wP/(1-w)$. Similarly, when alternation of D and C plays TIT FOR TAT, it gets a payoff of $T = wS + w^2T + s^2S$... $= \frac{T+wR}{1-w^2}$. Alternation of D and C thus cannot invade TIT FOR TAT if and only if $R/(1-w) \ge (T+wS)/(1-w^2)$. Hence, with reference to the magnitude of w, neither of this two strategies (ALL D and alternation of D and C) can invade TIT FOR TAT if and only if both $w \ge (T-R)/(T-P)$ and $w \ge (T-R)/(R-S)$. (Axelrod & Hamilton, 1981)

¹⁶ The question of initial viability raises the problem of how an evolutionary trend to cooperative behaviour could ever started in the first place. We can distinguish two case: (i) settings where individuals has partial interest in the partner's gains: in this case, we need a recalculation of the payoff matrix in such way that the inequalities T > R and P > S are eliminated; (ii) settings where everyone is using ALL D: in this case, if we suppose that a small group of individuals is using a strategy such as TIT FOR TAT and that the proportion of intra-cluster interactions is p, then the average score attained by the members of the cluster in playing this strategy is equal to $p\left[\frac{\pi}{1-w}\right] + (1-p)[S + \frac{w_F}{1-w}]$. When p and w are large enough, a cluster of TIT FOR TAT individuals can then become initially viable in an environment composed overwhelmingly of ALL D. (Axelrod & Hamilton, 1981)

sociology, political science and mathematics¹⁷. The result of the tournament was that the highest average score was attained by the simplest of all strategies submitted, the so-called **TIT FOR TAT**, a strategy of cooperation based on reciprocity¹⁸: cooperating on the first move and then doing whatever the other player did on the preceding move. The tournament also demonstrates that the evolution of cooperation requires that individuals have a sufficiently large chance to meet again so that they have a stake in their future interaction. If this is the case, cooperation can evolve in three stages:

- Cooperation can get started even in a world of unconditional defection (ALL D) and can evolve from small clusters of individuals grounding their decisions on reciprocity and have even a small proportion of their interactions with each other (**initial viability**)
- Strategy based on reciprocity can thrive in a world where many different kinds of strategies are being tried (**robustness**);
- Cooperation once established by basing on reciprocity can protect itself from invasion by less cooperative strategies (**stability**).

1.2.1.1. TIT FOR TAT STRATEGY

The success of TIT FOR TAT is that it is a very robust rule: it does very well over a wide range of environments. It benefits also from its own non-exploitability because three conditions are satisfied:

- The possibility of encountering TIT FOR TAT is salient;
- Once encountered, TIT FOR TAT is easy to recognized;
- Once recognized, TIT FOR TAT's non-exploitability is easy to appreciate.

¹⁷ The rules implied the payoff matrix and a game length of 200 moves. The 14 entries and a totally random strategy were paired with each other in a round robin tournament. (Axelrod & Hamilton, 1981)

¹⁸ The effectiveness of reciprocating strategies can be undercut by noise, to wit a faulty transmission of strategy choices. The lessons of the literature on noise in the Iterated Prisoner's Dilemma suggest that for a sufficiently small amounts of noise, unilateral generosity is the best response. However, for larger amounts of noise, there is a trade-off, since generosity can avoid unnecessary conflict, but on the other hand generosity invites exploitation. (Axelrod & Dion, 1988)

Figure 4 - The Four Main Features of TIT FO TAT Strategy (My elaboration from Axelrod, 1984)

1. DON'T BE Envious

People tend to resort to standard of comparison that they have available, and this is often the success of the other player relative to their own success. This standard leads to envy and to a Zero-sum game: it leads to attempts to rectify any advantage the other player has attained, but also to more defection and mutual punishment. So, envy is self-destructive. TIT FOR TAT won, not beating the other player, but eliciting behaviours allowing both to do well.

Example: A firm buying from a supplier doesn't have to be envious of supplier's profit. There is no point for not paying bills on time, etc., as it only encourages expensive retaliatory actions.

2. DON'T BE the First to defect

It pays to cooperate as long as the other player is cooperating. A population of nice rules is the hardest type to invade because they do so well with each other. However, this is only when w is high enough. Otherwise, it is no more a good idea. Short interactions are not the only condition which would make it pay to be the first to defect: also if cooperation will simply not be reciprocated. It is difficult to tell if there is someone who will reciprocate at first. But, if there has been enough time for many different strategies to be tried, then one can be fairly confident that there will be individuals out there who will reciprocate cooperation.

TIT FOR TAT

3. RECIPROCATE both cooperation and defection

The extraordinary success of TIT FOR TAT leads to some simple, but powerful advice: practice reciprocity. This simple rule is amazingly robust. In responding to a defection from the other player, it is a balance between punishing and being forgiving. But, is doing one-for-one the most effective balance? Hard to say, because it depends on the environment. Anyway, other choices are riskier: if the main danger is unending mutual recrimination, then a generous level of forgiveness is appropriate; if the main danger is from strategies that are good at exploiting easy going rules, then an excess of forgiveness is costly. The one-for-one response is likely to be quite effective in many settings.

4. DON'T BE Too Clever

Very sophisticated rules do not do better than the simple ones. A common problem is that complex method of making inference about the other player's behaviour give often wrong results. It could be useful in zero-sum games (like chess) but not in non-zero-sum games. His choices adapt to your own choices, each time, and it is a hard road to try to model this ongoing path. Also the «permanent retaliation» is not suggested because it does well only with nice rules, by losing the opportunity to change the behaviour of occasional defector. Also, too much complexity can appear to be total chaos: and being incomprehensible is very dangerous, because people can't trust you. So, one again, «make it simple» is the best choice.

But, which are the characteristics of TIT FOR TAT?

TIT FOR TAT has four main characteristics, which sound like recommendations for players (see Figure 4):

- 1. *Don't be* envious;
- 2. Don't be the first to defect;
- 3. *Reciprocate* both cooperation and defection;
- 4. *Don't be* too clever.

In the long run, TIT FOR TAT goes to fixation and this provides further evidence that it is a robust strategy that can thrive in a variegated environment. It is demonstrated that TIT FOR TAT is evolutionary stable if and only if the interactions between individuals have a sufficiently large probability of continuing, that is to say if we have both

$$w \ge \frac{T-R}{T-P}$$
 and $w \ge \frac{T-R}{R-S}$ (see footnote n.15)

Moreover, in an environment where ALL D is the primeval state and is evolutionarily stable, it is demonstrated that cooperation could gain a foothold by relying on clustering among interactants playing TIT FOR TAT strategies ^(see footnote n. 16). Indeed, it can reinforce each other in promoting the initial viability of reciprocal cooperation, as it gives each member a nontrivial probability of meeting another individual who will reciprocate the cooperation.

Thus, it benefits from its own clarity, and from its combination of being nice, retaliatory, forgiving, and clear. Its niceness prevents it from getting unnecessary trouble. Moreover, for a nice strategy to be collectively stable, it must be provoked by the very first defection of the other player¹⁹. Its retaliation discourages the other side from persisting whenever defection is tried. Its forgiveness helps restore mutual cooperation. Its clarity makes it intelligible to the other player, by encouraging at the same time long-term cooperation.

 $^{^{19}}$ If a nice strategy were not provoked by a defection on move n, then it would not be collectively stable because it could be invaded by a rule which defected only on move *n*. This also means that a nice rule can be collevtively stable if the future casts a large enough shadow and the rule itself is provocable (Axelrod, 1984).

"The Evolutionary Approach is based on a simple principle: whatever is successful is likely to appear more often in the future" (Axelrod, 1984)

The Axelrod's model discussed above, based on the iterated Prisoner's Dilemma and the effect of reciprocity, has fostered a wide literature concerning the evolution of cooperation and an active pursuing of examples of empirical application of the theory.

In his first book, Axelrod includes the contribution to the field by two other authors: Tony Ashworth and William D. Hamilton.

Ashworth is a British Sociologist, author of the book "Trench Warfare", thinker of the Liveand-Let-Alive System, showing **that cooperation can emerge even despite great antagonism between the players**. Indeed, he provides a comprehensive picture of the development and character of trench warfare on the Western Front in World War I, which had the nature of a Prisoner's Dilemma game, as we can read thereafter.

During the WWI's trench warfare, in a given locality, the two antagonist units facing each other represented the two players. The choice is always to shoot to kill or deliberately to shoot to avoid causing damage. In the short run, it is better to create damage now whether the enemy is shooting back or not. However, what made warfare so different from most other combat was that the same small units faced each other in immobile sectors for extended period of time. So, we have an Iterated Prisoner's Dilemma Game where conditional strategies are possible. By grounding our example on historical facts, we know that the first stage of the war was highly mobile and very bloody. But, as the lines established, nonaggression between the troops emerged spontaneously in many places along the front, and this strategy based on reciprocity turned out to be sustainable²⁰.

This is the Live-and-Let-Alive System. It demonstrated **that friendship is hardly necessary for cooperation based upon reciprocity to get started**. Under suitable circumstances, cooperation can develop even between antagonists. Moreover, what was crucial for the sustainability of the strategy was a fairly clear understanding by soldiers of the role of reciprocity in maintaining cooperation.

²⁰ However, in this case, in case of defection, the retaliation was something more that TIT FOR TAT: two-for-one or three-for-one was a common response to an act that went beyond what was considered acceptable (Axelrod, 1984).

So, we can state that this clear understanding is necessary to establish cooperation. However, William D. Hamilton showed that, actually, it is not true.

Hamilton, an English evolutionary biologist, studied the two extensions that now are developing on evolutionary theory in biological systems: genetical kinship theory and reciprocity theory. If the players are sufficiently closely related, altruism can benefit reproduction of the set, despite losses to the individual altruist (genetical kinship theory). Nevertheless, what is interesting in his findings is that conspicuous examples of cooperation also occur where relatedness is low or absent: here is the theory of reciprocity. His statement is based on the fact that, in many biological settings, the same two individuals can meet more than once. So, the assumption is that they have memory of the historical "meetings" with the same players. Actually, bacteria cannot "remember" or "interpret" a complex past sequence of changes, and they probably cannot distinguish alternative origins of adverse or beneficial changes. In those cases, when an organism is not able to recognize the individual with which he had previous interactions, a substitute mechanism is to make sure that all of its interactions are with the same player: this can be done by maintaining continuous contacts with the other²¹. On the other hand, another method is to guarantee the uniqueness of the pairing of players by employing a fixed place of meeting²². In species with a limited ability to discriminate between other members of the same species, reciprocal cooperation can be stable with the aid of a mechanism that reduces the amount of discrimination necessary, that is **territoriality**: something that makes clear that the other player is a "neighbor"²³. These mechanisms could operate even at microbial level. In his chapter, Hamilton formalizes in terms of game theory the Darwin's emphasis on individual advantage. This formulation establishes conditions under which **cooperation in biological systems based on reciprocity** can evolve even without foresight by the participants.

²¹ This method can be found in several situations of close association of mutual benefit between members of different species. For example, a hermit crab and its sea-anemone partner, a cicada and the colonies of micro-organisms housed in its body, or a tree and its mycorrhizal funghi (Hamilton, 1984).

 $^{^{22}}$ For example, the mutualism based on cleaning in which a small fish or a crustacean removes and eats parasites from the body of a larger fish that is its potential predator: it occurs in coastal and reef situations where animals live in fixed home ranges or territories (Hamilton, 1984).

 $^{^{23}}$ In the case of male territorial birds, songs are used to allow neighbours to recognized each other, by showing much more aggressive reactions when the song of an unfamiliar male is reproduced nearby (Hamilton (1984).

1.2.2. How to promote cooperation

According to his analysis, Axelrod gave us some suggestions on how we can succeed in promoting cooperation even by starting from a competitive environment; indeed, after all, mutual cooperation is good for both players in a Prisoner's Dilemma. He argues that we must not take the strategic setting as given, but to act to transform the strategic setting itself.

His advices ground on three main roads to go through: making the future more important relative to the present; changing the payoffs to the players of the four possible outcomes of a move; teaching the players the values, facts and skills that will promote cooperation. According to these general directions, he suggested five ways: (1) Enlarge the shadow of the future; (2) Change the payoffs; (3) Teach people to care about each other; (4) Teach reciprocity; (5) Improve recognition abilities.

| Enlarge the Shadow of the Future |
|--|
| Mutual cooperation can be stable if the future is sufficiently important relative to the present. Enlarge the shadow of the future means that probability to meet again increases. There are two basic ways of doing this: (1) by making the interactions more durable : this prolonged interaction allows patterns of cooperation which are based on reciprocity to be worth trying and allows them to become established; (2) by making interactions more frequent : the next interaction occurs sooner and hence the next move looms larger than it otherwise would, also because in this way the future will be more valuable. A good way to increase the frequency is to keep others away, but also hierarchy and organization are effective at concentrating the interactions between specific individuals. Even decomposing the interaction (by breaking down the issues into may stages) promotes the stability of cooperation, by making the gains from cheating at the current move less important than future benefits from cooperating on later moves. |
| |
| Change the Payoffs |
| Large changes in payoff structure can transform the interaction so that it is no longer even a Prisoner's Dilemma. If the punishment for defection is so great that cooperation is the best choice in the short run, no matter what the other player does, then there is no longer a dilemma. However, this transformation do not have to be drastic. Even a relatively small change can help make cooperation based on reciprocity stable, although the situation is still a Prisoner's Dilemma. The reason is that the conditions to stabilize cooperation are based on the relationship between w and the payoffs, not on the payoffs themselves. What is needed is w to be large enough relative to these payoffs. So, to promote cooperation by means of a payoffs' modification, it is not necessary to go so far as to eliminate the tension between the short-run incentive to defect and the longer-run incentive to achieve mutual cooperation. What is needed is just to make the latter one greater than the former one. |
| |
| |
| An excellent way to promote cooperation in a society is to teach people to care about the welfare of others. Altruism is a good name to give to the phenomenon of one person's utility being positively affected by another person's welfare. It should be recognized however that certain kinds of «generous» behaviour may actually take place for reasons other than altruism, for example, to create an obligation. From the point of view of the genetics of biological evolution, altruism can be sustained among kin, as a basis of genetical kinship theory. Altruism can be sustained also through socialization, but there is the risk to pay welfare costs in return. This reasoning suggests that the costs of altruism can be controlled by being altruistic to everyone at first, and thereafter only to those who show similar feelings. And this is something like reciprocity, actually. |
| |
| |
| A community using strategies based upon reciprocity can actually police itself. By guaranteeing the punishment of any individual who tries to be less than cooperative, the deviant strategy is made unprofitable. Therefore the deviant will not thrive and will not provide an attractive model for others to imitate. This self-policing feature gives you an extra private incentive to teach it to others – even those with whom you will never interact. Obviously, we want to teach reciprocity to whom you will interact to build a mutually rewarding relationship. But you also have a private advantage from another person using reciprocity even in fyou never interact with that person: the other's reciprocity helps to police the entire community by punishing those who try to be exploitive, by decreasing the number of uncooperative individuals you could meet in the future. Therefore, teaching the use of nice strategies based upon reciprocity helps the «pupil», the community and can indirectly help the «teacher». |
| |
| IMPROVE RECOGNITION ABILITIES The ability to recognize the other player from past interactions is necessary to sustain cooperation. Otherwise, a player could not use any form of reciprocity and hence could not encourage the other to cooperate. A way is to use a shortcut for recognition, like bacteria: an exclusive relationship with just one player or neighbours. Yet, even in human affairs, limits on the scope of cooperation are often due to the inability to recognize the identity or the actions of the other player. The ability to recognize defection when it occurs is not the only requirement for successful cooperation to emerge, but it is certainly an important one. Therefore, the scope of sustainable cooperation can be expanded by any improvements in the players' ability to recognize each other from the past, and to be confident about the prior actions that have actually been taken. |

Figure 5 - How to improve Cooperation (source: Axelrod, 1984)

1.2.3. Other advances in Cooperation theory based on Prisoner's Dilemma

After the first Axelrod's article and book, further insights have been gained, including information sharing that can support reputation, non-simultaneous play, the ability to offer hostages for performance, social networks of interaction, learning behaviour, envy, misunderstanding, and an option to exit.

| NEW INSIGHTS | Discussion |
|-------------------------------|--|
| TIMING OF CHOICE | We can have four ways to model the sequencing of moves between players: |
| | Standard Prisoner's Dilemma: simultaneous choices, they just learn the partner's behavior after knowing what he did on the previous move (Axelrod, 1984); |
| | Alternative Prisoner's Dilemma in which players take turns because they can not receive help at the same time: the leader move first and the follower move next, then the leaders moves again, and so on (Nowak and Sigmund, 1994); |
| | Bilateral Prisoner's Dilemma: neither or both have an opportunity to help the other in each round. Player 1 has a certain probability to move in each round, and the player 2 has an independent and possibly different probability to move in each round (Abell and Reyniers, 2000); |
| | The Single Resource Game: only one player at a time can get help, and the need is determined exogenously (Axelrod, 2000). |
| | In all cases, the best strategy to use depends partially on the other player's strategy. If the other player is likely to be responsive, and the payoff and shadow of the future are favorable, recommending a reciprocal strategy still seems like robust advice. |
| HOSTAGES | A player can promote cooperation by voluntarily providing a hostage (Raub and Weesie, 2000): it is intended to convince the other player (the trustor) that the trustee will effectively cooperate. Thus, it fosters trust in three ways: (1) by reducing the incentive of the trustee to abuse the trust; (2) by reducing the cost to the trustor if the trust is abused; (3) by serving as a useful signal about the characteristics of the trustee. |
| SOCIAL NETWORKS | Even reputation has an effect in promoting cooperation, through information sharing: if a trustor informs the next trustor, what is communicated is not only his or her own experience but also all the information obtained from previous trustor. This information transfer allows reputation to be established, providing incentive to cooperate even if a player may never play again with the same partner. |
| RATIONAL AND ADAPTIVE PLAY | Adaptive play can arise in the long run (Hegselmann and Flache, 2000). By assuming the propensity to cooperate as a function of the decisions taken by the player and the satisfaction derived from the resulting outcome, there is the possibility that an actor will stop learning and |

 Table 1 – Six Advances in Cooperation Theory (Our elaboration on Axelrod & Dion, 1984)

| | becomes committed to a particular choice once its propensity becomes sufficiently high. This can |
|------------------------------|---|
| | result in a mutual lock-in based on the notion of adaptive player. |
| | |
| Envy | Envy plays an interesting role in choosing strategies inside a Prisoner's Dilemma situation |
| | (Lehno, 2000). Be envious means to strive for a greater payoff than the other player, or, more |
| | restrictively, to avoid getting less than the other player. The suggestion is to act as provocable by |
| | a defection from the other player (like TIT FOR TAT, to a certain extent), to act the so-called |
| | Moderate Envy (to defect whenever the other player has defected more than oneself), and the so- |
| | called Sophisticated Envy (it gets out of the hopeless cycle of mutual defections by cooperating if |
| | the other player gets quite far ahead). However, if players tried to maximize the difference |
| | between their own score and the other player's score, the game turns into a zero sum context in |
| | which all opportunities to cooperate would vanish. |
| | |
| OPTION TO EXIT ²⁴ | In case that an option to exit is allowed – to escape from an unsatisfactory relationship – there is |
| | the possibility of clever opportunism: the most successful strategy is to cooperate until the other |
| | player defects, and then immediately get out from the game (Edk-Group, 2000). Nevertheless, |
| | there is also preferential (rather than random) selection, making cooperation more robust. If we |
| | also introduce a waiting penalty for exit, the level of cooperation depends on the size of the |
| | penalty itself as well as social structure determining partner selection. |
| | |

Actually, also Axelrod considers additional forms of social structure in his book, based on four factors: labels, reputation, regulation and territoriality.

1.2.3.1. LABELS, STEREOTYPES AND STATUS HIERARCHIES

The idea is that, when we begin to interact with someone who we have never known, we expect that his behaviour will be like that one of others, met in the past, that share the same observable characteristics. So, these features might allow a player to know something useful about the other player's strategy even before the interaction begins: they are like "**labels**". A label can be defined as a fixed characteristic of a player that can be observed by other players when the interaction begins. The expectations associated with a given label can be based also on second-hand experience, through the process of anecdotes' sharing. So, a strategy can determine a choice based not only on the history of interactions so far, but also on the label assigned to the other player.

One important, and sometimes disturbing, consequences is that they can lead to selfconfirming **stereotypes**, which are going to stabilize, even when they do not take into

²⁴ It can be assimilated to the case of ostracism: the hypothesis of forcing others to leave the game. (Axelrod & Dion, 1988)

account any objective differences. It can create majorities and minorities: in this case, while both groups suffer from the lack of mutual cooperation, the members of the minority group will suffer more, by seeking – as a result – defensive isolation.

Labels can also support **status hierarchies**, as it can lead to the following strategy: alternate defection and cooperation unless the other player defects even once, in which case never cooperate again. This is **being a bully** because you are often defecting, but never tolerating a defection from the other player. This sets up a status hierarchy based on the observable characteristic. The people near the top do well, and, conversely, the people near the bottom do poorly.

However, that is linked also to the need for high-status player to be concerned with their reputation.

1.2.3.2. REPUTATION AND DETERRENCE

A player's reputation is embodied in the beliefs of others about the strategy that the player will use. So, it is very linked to labels. Reputation allows you to know something about which strategy they use even before you have to make your first choice. But, how can we estimate how much could knowing the strategy first be valuable? A way to measure the value of each peace of information is to calculate how much better you could do with the information or without it. The issue can also be turned around: what is the value (or cost) of having other players know your strategy?

It depends on your strategy. If you are using an exploitable strategy (such as TIT for TWO-TATS) the cost could be very high. If you are using a strategy that can do the best with complete cooperation (such as TIT for TAT), we can have advantage to make it known to the others. However, having a firm reputation for using TIT for TAT is advantageous to a player, but it is not actually the best reputation to have. That is actually the reputation to be a bully. Fortunately, it is not easy to establish this kind of reputation, as it involves to defect a lot, by provoking the other player into retaliation. Also, even the other player can be trying to establish a reputation, and he may be unforgiving of the defections you use to try to establish your own reputation. The Prisoner's Dilemma tournament suggests that a good way for a player to appear untrainable is for the player to use the strategy of TIT for TAT. One purpose of having a reputation is to enable you to achieve deterrence by means of a credible threat and commitment.

1.2.3.3. REGULATION AND STANDARDS

Take the view that a central authority exists. To be effective, it must elicit rules' compliance from the majority of the governed, by setting and enforcing norms: but in a way that it pays for most of the governed to obey most of the time. It has also to establish the toughness of the standards. But, Governments have also another characteristic: they are based on specific territories.

1.2.3.4. TERRITORIALITY

We know that usually individuals interact more with their neighbors rather than any other else. A neightbor can provide a role model: if he is doing well, his behavior can be imitated. This is the way successful strategies can spread throughout a population in a given territory.

1.3. The Complexity of Cooperation

What we have understood so far is, for sure, that dealing with modeling collaboration is very complex: this brought about attempts to include these elements of complexity into models as more as possible.

This is the reason for the second Axelrod's book: "The Complexity of Cooperation: Agent-Based models of Competition and Collaboration".

While the main motivation of "The evolution of cooperation", written during the Cold War, was to help to promote cooperation between two sides of a bipolar world, the second book tries to go beyond the basic paradigm of the Prisoner's Dilemma: it includes an analysis of strategies that evolve automatically, strategies designed to cope with the possibility of misunderstandings between the players or mis-implementation of a choice, strategies involving more than one choice with a short-run cost and a possible long-run gain, as well as collaborations to enforce norms and industrial standards. However, since the expansion of the potential forms of collaboration implies in turn also the expansion of potential forms of competition, the book covers also the conflicts between violators and enforcers of norms,

competition among companies, context among organizations for wealth and membership and competing pools of social influence for cultural change. His findings are based on the Agentbased Model method, which has the aim to enrich our understanding of complex social systems' properties through the analysis of simulations (of agents and their interactions)²⁵.

The main advances cover the following topics:

- 1.3.1. The Genetic Algorithm for strategies' evolution
- Coping with Noise
- Norms and Metanorms Game
- The Landscape Theory of Aggregation
- The Tribute Model
- Disseminating culture

1.3.1. The Genetic Algorithm for strategies' evolution

Axelrod was wondering if the tournament results were too influenced by the previous expectation of players about the others' potential submissions, and if TIT for TAT could be actually stable in a setting without preconceptions. A way to answer to these questions came from the Holland's Genetic Algorithm (1975) who was tested within the framework of the well-known computer tournament where TIT for TAT strategy won.

The Genetic Algorithm²⁶ has demonstrated to be suitable to understand rich social settings, as it is very successful in discovering complex and effective strategies that are well adapted to the complex environment. The simulated environment for the demonstration was represented by the Axelrod's computer tournaments.

The outline of the simulation program works as depicted in the Figure below:

²⁵ It does not aim to provide an accurate representation of a particular empirical application, just to help our understanding, by adhering to the KISS principle, "keep it simple, stupit" (Axelrod, 1997)

²⁶ The idea is based on the way in which a chromosome serves a dual purpose: it provides both a representation of what organism will become, and also the actual material that can be transformed to yield new genetic material for the next generation (Axelrod, 1997).

| The basic Simulation | |
|--|-----------------------------------|
| I. Set up initial population with random chromosomes ²⁷ | |
| II. For each of 50 generations | |
| A. For each of 20 individuals | |
| 1. For each of 8 representatives | |
| a. Use premise part of chromosome a | as individual's assumption about |
| the three previous moves ²⁸ | - |
| b. For each of 151 moves | |
| 1) Make the individual's choice | ce of cooperate (C) or defect (D) |
| based upon the gene that | encodes what to do given the |
| three previous moves | |
| 2) Make the representative's | choice of C or D based upon its |
| own strategy applied to the | history of the game so far |
| 3) Update the individual's sc | ore based upon outcome of this |
| move (the Prisoner's Dilem | ima outcomes) |
| B. Reproduce the next generation | |
| 1. For each individual assign the likely | number of matings based upon |
| the scaling function (1 for an average sc | core, 2 for a score one standard |
| deviation above average, and so on) ²⁹ | |
| 2. For each of 10 matings construct two | offspring from the two selected |
| parents ³⁰ using crossover ³¹ and mutation ³² | |

Figure 6 – The Genetic Algorithm (Axelrod, 1997)

In this way, a new population is created, with the feature of displaying patterns of behavior that are more like those of the successful individuals of the previous generation, and less like those of the unsuccessful ones. With each new generation, the individuals with relatively high scores will be more likely to pass on parts of their strategies, whereas the relatively unsuccessful individuals will be less likely to have any parts of their strategies passed on.

By applying this algorithm to the tournament, the results are quite remarkable: from a random start, the algorithm evolved populations whose median member was just as

²⁷ An initial population is chosen. In the case of the Axelrod's computer tournament the initial individuals can be represented by random strings of seventy C's and D's (Axelrod, 1997).

²⁸ Each individual run to determine its effectiveness. In the present context this means that each individual player uses the strategy defined by its chromosome to play an iterated Prisoner's Dilemma with other strategies, and the individual's score is its average over all the games it plays (Axelrod, 1997).

²⁹ The relatively successful individuals are selected to have more offspring. The method used is to give an average individual one mating, and to give two matings to an individual who is one standard deviation more effective than the average. An individual who is one standard deviation below the population average would then get no matings (Axelrod, 1997).

³⁰ The successful individuals are then randomly paired off to produce two offspring per mating. For convenience, a constant population size is maintained. The strategy of an offspring is determined from the strategies of the two parents. This is done by using two genetic operators: crossover and mutation (Axelrod, 1997).

³¹ Crossover is a way of constructing the chromosomes of the two offsprings from the chromosomes of the two parents, by selecting one or more places to break the parents' chromosomes (Axelrod, 1997).

³² Mutation in the offspring occurs by randomly changing a very small proportion of the C's to D's or vice versa (Axelrod, 1997).

successful as the best rule in the tournament, TIT FOR TAT. Most of the strategies that evolved actually resemble it, having quite the same successful patterns:

- Continue to cooperate after three mutual cooperations
- Be provocable: defect when the other defect out of the blue
- Accept an apology: continue to cooperate after cooperation has been restored
- Forget: cooperate when mutual cooperation has been restored after an exploitation
- Accept a rut: defect after three mutual defections

We have also to say that the median rule did actually better than TIT FOR TAT. This is a remarkable achievement because it breaks down the most important advice developed in the computer tournament, namely, "TO BE NICE", never to be the first to defect. These highly effective rules always defect on the very first move, and sometimes on the second move as well, and use the choices of the other players to discriminate what should be done next. However, this rule is not so accurate to say that it is better than TIT FOR TAT, in every environments. Indeed, it is important to point out that the environment was taken as given, fixed, and the genetic algorithm reproduces the way individuals try to adapt to a certain environment.

1.3.2. Coping with Noise

Noise, interpreted as the emergence of random errors in implementing a choice, is a common problem in real world interactions³³. Thus, the best way to coping with noise has become a vital research question in game theory, especially in the context of the iterated Prisoner's Dilemma. Three different approaches have been proposed:

- GENEROSITY: it involves allowing some percentage of the other player's defection to go unpunished;
- 2. CONTRITION: it involves a modification of TFT strategy to avoid responding to the other player's defection after its own unintended defection;
- 3. PAVLOV (Win-Stay, Lose-Shift): it involves the principle that if the most recent payoff was high, the same choice would be repeated, but otherwise the choice would be changed.

³³ Indeed, when noise occurs some unintended defections can happen, by undercutting the effectiveness of simple reciprocating strategies (Axelrod, 1997).

The Axelrod's computer tournament was tested again by introducing these modifications. The results showed that Generosity is effective at stopping the continuing echo of a single error, whether the error was one's own or the other player's. The level of generosity determines how quickly an error can be corrected and cooperation restored. The problem is that generosity requires a tradeoff between the speed of error correction and the risk of exploitation (Axelrod & Dion, 1988).

Contrition is effective at correcting one's own error, but not the error of the other player. On the other hand, it is very effective when the environment becomes dominated by rules that are successful in the noisy environment. As population becomes adapted to noise, contrition becomes more and more effective. In a population adapted to noise, correcting one's own error is sufficient because the players one meets are also likely to be good at correcting their own errors.

Unfortunately, for a player using Pavlov, its willingness to cooperate after a mutual defection can give the other player an incentive to defect all the time. The tournament and the ecological analysis both show that although Pavlov may do well with its own twin, its success is not robust.

Therefore, in conclusion, he argues that, in presence of noise, reciprocity still works if we cope with it through generosity or contrition. When population of strategies one is likely to meet has not adapted to the presence of noise, a strategy like Generous TIT FOR TAT is likely to be effective. If the population of strategies has already adapted to noise, then a strategy like Contrite TIT FOR TAT is likely to be more effective because it can correct its own errors and restore mutual cooperation almost immediately.

1.3.3. Norms and Metanorms Game

Norms provide a powerful mechanism for regulating conflict in groups, even when there are more than two people and no central authority. Axelrod investigated the conditions under which norms can evolve and prove stable. For the purpose, he introduced the **Norms Game** and tried to simulate it inside the computer tournament.

According to Axelrod, it begins when an individual has an opportunity to defect and this opportunity is accompanied by a known chance to be discovered, called *S*. If the player defect, the payoff is equal to 3 (T: temptation to defect), and the others are hurt with a payoff equal to -1



Figure 7 - The Norms Game (Axelrod, 1997)

(H: hurt payoff). If the players does not defect, no one gets anything. So far, the game is something similar to the Prisoner's Dilemma. The difference starts from the next step: if the player defects, some of the others may see the defection, and they may choose to punish the defector. If the defector is punished (P) the payoff is equal to -9, but, as the act of punishing is typically somewhat costly, the punisher has to pay an enforcement cost (*E*) equal to -2. So, we have two dimensions of the player's strategy: Boldness (*B_i*) and Vengefulness (*V_i*). Boldness determines when the player will defect: when the chance of being discovered is less than *B_i*, or *S* < *B_i*. Vengefulness is the probability that the player will punish someone who is defecting: the greater the *V_i*, the more likely he or she will be punish someone who is spotted defecting.

By means of the Norms Game's simulation, the results showed a common pattern: the first thing to happen is a dramatic fall in Boldness, since when there is enough vengefulness in the population it is very costly to be bold. Once that the boldness level falls, the main trend is a lowering of vengefulness, as to be vengeful and punish an observed defection requires paying an enforcement cost without any direct return to the individual. Finally, once the vengefulness level has fallen nearly to zero, the players can be bold with impunity: this increase in boldness destroys whatever restraint was established in first stage of the process, and this becomes the stable situation in the norms game. The reason is that there was nothing pursuing to establish the settled norms.



Therefore, Axelrod introduced another model trying to provide an incentive to be vengeful, the **Metanorms Game**. It involves a simple principle: punish those who do not support it, to wit

Figure 8 - Metanorms Game (Axelrod, 1997)

who refuses to punish the defectors. This is what Axelrod defined as "metanorm". So, the Metanorms Game is based upon an extension of the Norms Game. By performing the tournament again, with the above modifications, the result was that vengefulness quickly increased to very high levels, and this in turn drove down boldness³⁴. However, this results depends on the population's starting with a sufficiently high level of vengefulness. Otherwise the norm still collapses. So, if the norms game collapses no matter what the initial conditions are, the metanorms game can prevent defection if the initial conditions are favorable enough.

Nevertheless, to punish defection may not be enough to maintain a norm or to establish it. Hence, Axelrod suggests specific methods for modeling the process by which a norm can be supported, as depicted in table below.

| METHODS TO SUPPORT NORMS | |
|--------------------------|--|
| Dominance | We mean the dominance of one group over another, by assuming that defection of a player only hurt the members of the other group and are therefore only punished by them. Simulations prove that resistance to punishment and increased size can help one group, but only if there are metanorms. Otherwise, even members of the stronger group tend to be free riders, with no p rivate incentive to bear enforcement costs, by leading to low vengefulness and high boldness in both groups. When metanorms are added, it becomes relatively easier for the strong group to keep the weak group from being bold, while it is not so easy for the weak group to keep the strong one from defecting. |
| INTERNALIZATION | Internalizing norms means that violating an established norm is psychologically painful even if the direct material benefits are positive. In terms of the norms game, this type of internalization means that the temptation to defect, T, is negative rather than positive: if everyone internalizes a given norm this strongly, there is no incentive to defect and the norm remains stable. Clearly, it is rare for everyone in a group to have such an internalized situation. Thus, we have to look to internalization not only to reduce incentive to defect, but also to increase incentive to punish someone else who does defect. |

³⁴ The logici s the following: at first there was a moderate amount of vengefulness in the population. This meant that a player had a strong incentive to be vengeful and to escape punishment for not punishing an observed defection. Moreover, when each of the players is vengeful out of self-protection, it does not pay anyone to be bold. Thus, the entire system is self-policing, and the norms become established (Axelrod, 1997).

| DETERRENCE | It is necessary to induce players to do more forward-looking calculations as well as backward-looking comparisons with others. A person can realize that even if punishing a defection is costly now, it might have long-term gains by discouraging other defections later. |
|--------------|---|
| SOCIAL PROOF | The actions of others provide information about what is proper for us, even if we do not know the reasons. Indeed, they have several functions: (1) they provide information about the boldness level of others, the vengefulness of the population; (2) they might contains clues about what is the best course of action even if there is no vengefulness. They are valuable information about how our behavior should be. Finally, in many cases, by conforming to the actions of those around us, we fulfill a psychological need to be part of a group. |
| Membership | Being voluntary member of a group working together for a common purpose can support the enforcement of norms. Indeed: (1) it directly affect the individual's utility function, making a defection less attractive because to defect against a voluntarily accepted commitment would tend to lower one's self-esteem; (2) it allows like-minded people to interact with each other, and this self-selection tends to make it much easier for the members to enforce the norm implicit in the agreement to form or join a group; (3) this agreements help to define what is expected of the participants, thereby clarifying when a defection occurs and when a punishment is called for. Moreover, it is not easy for a bold individual to join a group and then exploit it, since defector will be isolated and it is relatively easy for others to be vengeful. Typically, the larger is the number of members in a group, the greater would be the benefit from cooperation. |
| LAW | As norms become firmer, there is growing support to formalize it through the promulgation of laws. Laws support norms because: (1) they supplement private enforcement mechanisms with the strength of the state; (2) many people respect laws and take very seriously the idea that the law mandates a specific act; (3) they tend to define obligations much more clearly than does an informal norm. So, social norms and laws are often mutually supporting: social norms are often best at preventing numerous defections where the cost of enforcement is law; laws often function best to prevent rare but large defections because substantial resources are available for enforcement. |
| REPUTATION | Violating a norm would provide a signal about the type of person you are. This is an example of the signalling principle: a violation of a norm is not only a bit of behaviour having a payoff for the defector and for the others, but also a signal containing information about the future behaviour of the defector in a wide variety of situations. |

Figure 9 - Supporting norms: suggested methods (Axelrod, 1997)

1.3.4. The Landscape Theory of Aggregation

Axelrod, in his second book, presents a new formal theory of aggregation, called Landscape Theory. Aggregation is intended as the organization of elements of a system in patterns that tend to put highly compatible elements together and less compatible elements apart. This theory uses abstract concepts from the physical sciences and biology that have proved useful in studying the dynamics of complex systems. Landscape theory can be useful³⁵ to understand the possible ways many elements can fit together, to predict which configurations are most likely to occur, how much dissatisfaction with the outcome is inevitable and how the system will respond to changes in the relationship between the elements³⁶. To be simple, we can say that mainly it wants to predict how actors will form alignments.

³⁵ However, in order to be useful, a theory of aggregation should have the following properties: (1) It should provide a coherent explanation of why some particular aggregations form in a given system; (2) It should illuminate the dynamics of aggregation to provide a deeper understanding of the actual process involved and the end result; (3) It should be general enough to apply to many domains of politics and society; (4) It should be simple enough to illuminate some fundamental aspects of aggregation; (5) It should be capable of being operationalized so that its predictions can be tested (Axelrod, 1997).

³⁶ Landscape theory can be used to analyse a wide variety of aggregation problems that have previously been considered in isolation: international alignments, alliances of business firms to set standards, coalitions of political parties in parliaments, social networks, social cleavages in democracies and organizational structures (Axelrod, 1997).
The theory makes two basic assumptions, as it is difficult for a wide leadership to assess the value of each potential alignment: (1) an actor is myopic in his assessments, that is to say it valuates independently from the other members of the systems; (2) adjustments to alignments take place by incremental movement of individual actors³⁷.

It begins with a set of *n* actors, and we can distinguish four properties:

- The **Size** of the actor (*s_i* > 0): it represents the importance of that actor in comparison to the others;
- The **Propensity** to work together (*p_{ij}*), between the actor *i* and the actor *j*: it is a measure of how willing the two actors are to be in the same coalition together. It is positive and large if they get along well together and negative if they have many sources of potential conflicts. The theory assumes that the propensity is symmetric, so that *p_{ij}* = *p_{ji}*;
- The **Configuration** (*X*): it is a placement of each actor into one and only one grouping. A specific configuration determines the Distance between two actors;
- The **Distance** between two actors (*d_{ij}*): in the simplest version of the theory all actors are assumed to be in one of two possible groupings, so we can let distance be 0 if they are in the same grouping, and 1 if they are in different groupings.

Using distance (depending on configuration) and propensity, it is possible to determine a measure of Frustration, $F_i(x)$: how poorly or well a given configuration satisfies the propensities of a given actor to be near or far from each other else. An actor wants to switch side when frustration is less on the other side.

$$F_i(X) = \sum_{j \neq i} s_j p_{ij} d_{ij}(X)$$

The summation is taken for every actor except when j = i. Frustration can be minimized if: (a) it is in the same alliance as those countries with which it has a positive propensity to align, because otherwise $p_{ij} > 0$ and $d_{ij} > 0$; (b) it is in a different alliance from those countries with which it has negative propensity to align, because this would take $p_{ij} < 0$ and $d_{ij} > 0$.

³⁷ It is appropriate when information regarding payoffss is uncertain, resulting in casual ambiguity between alignment actions and payoffs, and a consequent increase in negotiation costs and a reduction in the ability of nations to use side payments to arrive at an optimal solution (Axelrod, 1997).

The next step is to define the energy, E, of an entire configuration, X, as the weighted sum of the frustrations of each actor in that configuration, where the weights are the size of the actors.

$$E(X) = \sum_{i} s_{i} F_{i}(X)$$

That is to say,

$$E(X) = \sum_{i} s_{i} s_{j} p_{ij} d_{ij}(X)$$

For all ordered pairs of distinct actors. It captures the idea that energy is lower and configuration is better when actors that want to work together are in the same grouping, and those that want to work against each other are in different groupings. Size plays a role

because having a proper relationship with a large actor is more important than having a proper relationship with a small one. Then, given the energy of each configuration, it is possible to construct an "energy landscape": a graph that has a point for each possible configuration and a height above this point for the energy of that configuration. Adjacent points on the landscape are those that differ in the alignment of a single actor. This leads to these predictions:



Figure 10 - The Energy Landscape: an example (Axelrod, 1997)

- From a given starting configuration, the configuration will change according to the principle of downward movement to an adjacent configuration;
- Consequently, the only stable configurations are those at the local minimum in the landscape;
- With symmetric propensities there can be no cycles of configurations (such as moving from X to Y to Z and then back to X).

The implications of this approach are: the equilibrium reached need not be a global optimum; there may not be any configuration that completely satisfies everyone; local optimum can depend on the history of the system.

To summaries, landscape theory begins with sizes and pairwise propensities that are used to calculate the energy of each possible configuration and then uses the resulting landscape to make predictions about the dynamics of the system.

1.3.5. Standard Setting

Axelrod tried, together with S. Bennet³⁸, W. Mitchel, R. Thomas³⁹ and E. Bruderer⁴⁰, to apply the Landscape Theory to a business case⁴¹: nine computer companies that were forming competing alliances, each seeking to establish standards for the UNIX operating system. The ability to impose technical standards on an emerging technology is often the key to its commercial success.

Their basic assumptions are that a firm prefers: (1) to join a large standard setting alliance in order to increase the probability of successfully developing and sponsoring a compatibility standard; (2) to avoid allying with rivals, especially close rivals, in order to maximize its own benefits from the alliance's effort. By starting from those, they develop a method for identifying the composition of standard-setting alliances.

Standards can develop in a de jure manner – when a regulatory body with the force of law sets standards – or in a de facto manner – when market forces determine standards. The first one are certainly the simplest means by which standards develop. However, de facto standards are needed if there is no authoritative standard-setting body. The danger is that this type of standard chosen by the market can leave the firm in disadvantage because it may be partially or completely incompatible with the firm's technology. To avoid it, firms have incentives to sponsor the facto standards in the absence of enforceable de jure ones, by

³⁸ Axelrod's graduate student

³⁹ Two professors in the Business School at Michigan

⁴⁰ Mitchel and Thomas's graduate student

⁴¹ Actually, it was difficult to get this article published: some of the reviewers did not take the idea that an approach other than game theory could be helpful for the understanding of how actors make strategic choices. They preferred a rational-choice explanation to one that was motivated by actors with bounded rationality. "it is true that the strategic choices could be put in game theory terms using the concept of Nash equilibria. Indeed, we revised the description of the business case to highlight this fact. The point, however, is that virtually all of the power of the landscape theory is in the determination of preferences (or affinities) rather than in the justification of the strategic choice. Game theory of course assumes preferences are given, and does not worry about where they come from. In fact, something of a paradigm shift is required to imagine that nations or business firms choose sides based upon compatibility with others rather than on the basis of forward-looking strategic calculations" (Axelrod, 1997).

promoting its proprietary methods or by entering into an alliance to develop and promote them favored by a coalition of firms⁴².

We must distinguish between implicit alliance and explicit ones. Implicit alliance may develop when a firms enters into a second-sourcing or licensing agreement with other firms to produce the sponsoring firm's technology⁴³. Explicit alliances often develop when the technology is rapidly evolving, there is no dominant firm, or there are competing technologies⁴⁴.

But, how to choose among competing standard-setting alliances?

It is very difficult at the beginning to determine the potential profit or gain resulting from different alliances, and so, strict profit maximization seems not to be appropriate⁴⁵. Instead, a firm is concerned with whether it will do better in one alliance rather than in another, by ranking preferences over them: therefore, utility maximization based on preferences is a more appropriate method, as an approximation to a profit maximization strategy for the allianceselection problem. The alliance should be as large as possible, because the probability that the technology will be adopted increases. Moreover, aggregate size will often conflict with competitive consideration during the process of setting standards: we assume that firms desire not to be allied with standard setting rivals, as they may be ultimately able to engage in effective price or product competition in the post-adoption market for the standardized good. The intensity of rivalry between two firms increases with the extent to which the firms offer functionally equivalent but incompatible technology and have similar market segmentation profiles. To simplify the analysis, the authors defined the intensity of rivalry to be either close or distant. Two firms are rivals if the adoption of a standard requires at least one of the pair to abandon a key proprietary technology. A proprietary technology is key if the firms' installed base in at least one segment would incur substantial switching costs if the technology were no longer available due to a standard being established. Firms are also close

⁴² The need for a large installed base suggests that it is difficult for a single company to sponsor successfully its proprietary own technology as a standard. Only dominant firms, which exert substantial market power, can do it successfully and create a bandwagon of adoption (Axelrod, 1997).

⁴³ The sponsoring firm may offer technology licenses at a low or zero cost in order to induce other firms to adopt its technology (Axelrod, 1997).

⁴⁴ An explicit alliance allows a member to have input and control aver the developing standard, to reduce R&D costs by spreading them over multiple firms, and to combine the alliance members' variety of specialties (Axelrod, 1997).

⁴⁵ For complex alliance composition problems, it is virtually impossible to determine complete payoff functions as game theory traditionally requires. This is a problem not only for researchers but also for firms (Axelrod, 1997).

rivals if they have similar market segmentation profiles and possess complementary technical and market-related skills. They also assume that the aggregate size and rivalry influences are linear functions of the firm size⁴⁶.

Their approach first defines utility in terms of pairwise relations between firms and then uses the utility metric to estimate the value of an alliance configuration, by providing an indirect and empirically tractable route to estimating how firm's alliance choice may affect its profitability.

The alliance size and rivalry considerations can be combined to calculate the utility to firm *i* of joining alliance A^{47} :

$$U_i(A) = \sum_{j \in A} s_j - \left[\alpha \sum_{j \in D} s_j + (\alpha + \beta) \sum_{j \in C} s_j \right]$$

Where,

 S_j = size of the firm j

C and D = partitions of the alliance A into Close and Distant rivals of i

 α = disincentive to ally with any kind of rival. α > 0

 β = additional disincentive to ally with close rivals. β > 0

We can simplify the equation as:

$$U_i(A) = \sum_{j \in A} s_j p_{ij}$$

Where p_{ij} is the propensity of two firms to ally⁴⁸: it is $1 - \alpha$ if i an j are distant rivals, and $1 - (\alpha + \beta)$ if they are close rivals. The major questions for them is what will be the

⁴⁶ It is a plausible approximation actually, but may not be appropriate if a bandwagon for adoption develops once the standard has garnered a large proportion of the market or installed base (Axelrod, 1997).

⁴⁷ This specification of utility treats a firma s myopic in the sense that it bases its evaluation of an alliance only on pairwise relationships between itself and potential alliance partners (Axelrod, 1997).

⁴⁸ Propensities are simmetric, $p_{ij} = p_{ji}$ (Axelrod, 2000).

composition of the alliances that actually form? To answer they make a weak behavioral assumption that a stable alliance configuration will have to be a Nash equilibrium. Stated formally, let an alliance configuration, X, be a partition of the firms in two sets, A and B (where B may be empty). Then X is a Nash equilibrium if and only if for all I in A, $U_i(A) \ge U_i(B + \{i\})$. However, this concept of equilibrium, in this case, typically reduces the predicted alliance configurations to a small list, because, given symmetric properties, the entire alliance configuration "improves" whenever a firm changes sides in an alliance configuration in order to improve its utility. The improvement can be measured by a single metric, by defining the energy of an alliance configuration, according to the Landscape Theory:

$$E(X) = \sum_{i} \sum_{j} s_{i} s_{j} p_{ij} d_{ij}(X)$$

Where $d_{ij}(X)=0$ if they are in the same alliance and $d_{ij}(X)=1$ if they are in different alliances. An alliance configuration is a Nash equilibrium if and only if no firm can switch alliances without increasing the energy of the configuration.

Then they illustrated the effectiveness of their methodology by applying it to the 1988 efforts to create and sponsor UNIX operating system standards: they estimated with a high degree of robustness the probable alliance configurations and identified motivations of individual firms that supported the predicted alliance configurations.

1.3.6. The Tribute Model

In the attempt to understand the dynamics of the aggregation and disaggregation of political actors, and how new political actors can emerge from an aggregation of small political actors, Axelrod developed the so-called Tribute Model.

Unlike his previous work on Prisoner's Dilemma, the Tribute Model is based upon extortion rather that cooperation. In a "war" context, the hearth of the model is a tribute system where an actor can extract resources from others through tribute payments and use these resources to extract still more resources. Alliances are also allowed and actors can work together. Actions are based upon simple decision rules rather than game-theoretic calculations of optimal choice, because rational calculations would be virtually impossible to make in such a complex setting. They mainly based on historical experience gathered from prior interactions.

The model is shaped like that: ten actors – independent political units – arranged on a line, which is wrapped into a cycle, to avoid introducing arbitrary distinction between actors and to give two neighbors each. There is one resource in the model, called wealth: each actor is given some initial wealth with uniform distribution according to some parameters decided arbitrarily. The basic cycle is called a year, when three actors are chosen one after another at random to become active: be active means that they can demand tribute from one of the other actors. Initially the target should be the neighbor, but later this restriction will be relaxed when alliance are considered. The model is based upon a dynamic of "pay or else": the target can pay tribute or fight. There is also the possibility to make alliances: the key idea is that actors develop degrees of commitment to each other, as a result to the choice of paying or fighting. The basic idea is also that if two elementary actors fight, another adjacent actor will join the side to which it has greater commitment. If it has equal commitment, it stays neutral. Clearly, initially no one has commitment to others, as it will increase (between actor *i* and actor *j*) in case of: (1) Subservience – *i* pays tribute to *j*; (2) Protection – *i* receives tribute from *i*; (3) **Friendship** – *i* fights on the same side as *j*. On the other end, commitment decreases in case of **Hostility**, when *i* fights on the opposite side as *j*. the final part of the model deals with coordination of actors: coordinated action is assumed to require contiguity. Thus, an actor is an eligible target for a demander only if everyone between them joins the demander. In this game, commitments and wealth represent common knowledge.

So, Axelrod tried to simulate the game through a computer software, and he found that it is possible to use simple local rules to generate higher levels of organization from elementary actors. In particular, the dynamic of "pay or else" combined with mechanisms to increase and decrease commitments can lead to clusters of actors that behave largely according to the criteria for independent political states. Finally, he argued that a simulation model like the Tribute model can lead to insights into where there might be policy leverage in the real world.

1.3.7. Disseminating culture

Finally, Axelrod introduced also an approach to model social influence: the way people tend to change each other in the very process of interaction. It deals with how people become more similar as they interact, but also provides an explanation of why the tendency to converge stops before it reaches completion. The most generic term for the things over which people influence each other is Culture. It can thus be used to indicate the set of individual attributes that are subject to social influence. The process by which people can become similar to each other or retain their differences is central to a variety of important topics, such as state formation, succession conflict, transnational integration, domestic cleavages. Everyone has a different culture, and differences among each other are explained by social differentiation⁴⁹, fads and fashion⁵⁰, preference for extreme views⁵¹, drift⁵², geographic isolation⁵³, specialization⁵⁴, and changing environment or technology⁵⁵.

The methodology of the Axelrod's study on social influence is based on three principles: (1) Agent-based modeling; (2) No central authority; (3) Adaptive rather than rational agents.

The model describes culture as a list of features or dimensions of culture. For each feature there is a set of traits, which are the alternative values the feature may have. For simplicity, the supposition is that there are five features and each has ten possible traits. This abstract formulation means that two individuals have the same culture if they have the same traits for each of the five features. The formulation allows one to define the degree of cultural similarity between two individuals as the percentage of their features that have the identical trait. The model includes a geographic distribution of individual agents. A simple example could be a ten by ten grid, by standing for a set of 100 sites, assumed as the basic actors of the model. Each of them can interact only with its immediate neighbors (typically four). The process of social influence in the model can be described as a series of events: agents who

⁴⁹ Groups actively differentiate themselves from each other. People who identify with one group often emphasize and even promote differences with members of other groups (Axelrod, 1997).

⁵⁰ When people want to differentiate from the other, fads dominate. When people want to be different but others want to copy them, the result is fashion: a never-ending chase of followers running after the leaders (Axelrod, 1997).

⁵¹ Recent models have shown how this mechanism can lead to polarization and clustering (Axelrod, 1997).

⁵² There may be random changes in individual traits, sometimes leading to differentiation among groups (Axelrod, 1997).

⁵³ If carried to extreme, geographic or other forms of voluntarily or imposed segregation can sustain differences by reducing interactions between members of different groups (Axelrod, 1997).

⁵⁴ People may have interests that are at least partially resistant to social influence, by having a persistent effect on the individual (Axelrod, 1997).

⁵⁵ When the environment is constantly changing, the response may be constantly changing as well. If the environment is changing faster thanpeople can respond to it, then differences may persist as different people or groups change in different ways (Axelrod, 1997).

are similar to each other are likely to interact and then become even more similar. This is implemented by assuming that the chance of interaction is proportional to the cultural similarity two neighbors already have. The entire dynamics of the model is based upon two main steps:

- 1. At random, pick a site to be active, and pick one of its neighbours
- 2. With probability equal to their cultural similarity, these two sites interact. An interactions consists of selecting at random a feature on which the active site and its neighbour differ (if there is one), and changing the active site's trait on this feature to the neighbour's trait on this feature.

To understand how cultural regions develop we have to shift our attention from the details of

the culture at each site to the cultural similarities between adjacent sites.

Figure 11 shows the cultural distances between adjacent sites moving from the start of the game till the occurrence of 80,000 "events" between actors. Cultural similarities are coded according to the lines' color: Black for similarity \leq 20%; Dark Gray if =40%; Gray for 60%, Light Gray for 80%; White for 100%.



Figure 11 - Map of Cultural Similarities (Axelrod, 1997)

So, Figure 11 shows that:

- At the beginning, most neighbours sites have little in common and are unlikely to interact (quadrant a). However when two sites interact they become more similar and more likely to interact in the future;
- 2. Specific cultural features tend to be shared over time and over a larger and larger area: regions start to form (quadrant a and b);

3. Eventually, no further change is possible, since we arrive at a situation where every pair of neighbouring sites have cultures that are either identical or completely different. If they are identical, further interactions will not cause changes. If they are completely different, they will not even interact.

Initially there are many regions in the whole setting and eventually there are only a few regions, and, for society, a very important question is how many cultural regions will survive. The model can be used to explore how the number of stable regions depends on various factors such as the scope of cultural possibilities, the range of interactions, and the size of geographic territory.



Figure 12 - Factors affecting the number of stable regions (Axelrod, 1997)

The social influence model illustrates three fundamental points:

- Local convergence can lead to global polarization;
- The interplay between different features of culture can shape the process of social influence;

• Even simple mechanisms of change can give counterintuitive results, as shown by the present model, in which large territories generate surprisingly little polarization.

Thus, the model shows how individual or group differences can be durable despite tendencies towards convergence.

1.4. Coordination Games: from Individuals to Teams

So far, the considered literature has been focus on general cooperative models on individual basis and on the Prisoner's Dilemma game. As we already said before, payoffs in the matrix are the determinant of this specific game, and if we change them we can also change the rules and consequences of the game itself. That is the way how we can come up with the so-called Coordination Games⁵⁶.

| | Х | Y | |
|---|-----|-----|---|
| Х | 0,0 | 1,1 | |
| Y | 1,1 | 0,0 | |
| | Х | Y | - |
| Х | 1,1 | 0,0 | |
| Y | 0,0 | 1,1 | |

Figure 13 - Payoff Matrix in Pure Coordination Games

Coordination games represent a large class of environments where there are multiple equilibria, where

players choose the same corresponding strategies. Pure coordination games are games with multiple equilibria where players have identical preferences over the set of possible outcomes, and where salient aspects of the equilibrium are removed to the extent possible. In Figure 13 we can see the structure of the payoff matrix: Nash equilibria are in the diagonal from top left to bottom right, or vice versa.

John B. Van Huyck (1990) asserted that sometimes inefficient outcomes are not due to conflicting objectives as in Prisoner's Dilemma games or to asymmetric information as in Moral Hazard games, but to coordination failures resulting from strategic uncertainty. Within his experiment, some subjects concluded that is too risky too choose payoff-dominant action (that is to say the most efficient outcome) and most subjects focused on outcomes in earlier period games. So, it is very unlikely to arise, even in the repeated play. However, he also

⁵⁶ Coordination games are a formalization of the idea of a coordination problem, which is widespread in the social sciences, including economics, meaning situations in which all parties can realize mutual gains, but only by making mutually consistent decisions. A common application is the choice of technological standards (van Huyck, 1990).

found that it is possible for players to coordinate in repeated games when the number of players is not small.

In a 1992-article Cooper, DeJong, Forsythe and Ross argue that communication is another important factor that can prevent coordination failure. They consider two types of experimental coordination games with nonbinding, pre-play communication. Their results indicate that the lack of communication between individuals is not the source of the coordination problems every time. Indeed, they assert that one-way communication is preferred in games of conflict, while two-way communication is needed to resolve coordination problems in games, where strategic uncertainty leads to coordination failures (Cooper, et al., 1992).

Anderson, Goeree and Holt (2001), dealt with the minimum-effort coordination game⁵⁷ and try to analyze what happens when some "noise" is introduced in the framework. They argue that efforts should be lower when effort is more costly, or when there are more players. But here there is a sort of dilemma for the individual, since better outcomes usually require higher effort entailing more risk. The noise which is introduced can be interpreted as the "uncertainty about others' actions", so it is more difficult to observe, analyze and understand other people's behavior and to make the best choice. So, they state that in a minimum-effort coordination game with a continuum of Pareto-ranked Nash outcomes, the introduction of even a very small amount of noise results in a unique equilibrium distribution over effort choices.

A further step in this field has been done by Feri, Irlenbusch and Sutter, in a 2008-working paper dealing with efficiency gains coming from team-based coordination. In the paper they try to examine if individuals or team decision-making has any influence on coordination failure or success⁵⁸. In their model, team members can communicate with each other before making a decision, characterizing team decision-making in many contexts, and they studied what happens in six different coordination games, belonging to two different classes:

⁵⁷Minimum-effort coordination games results from perfect complementarity of players' effort levels, and any common effort constitutes a Nash equilibrium. The model is shaped like that: it is an n-person coordination game in which each player i chooses an effort level, xi, when I goes from 1 to n. Production is seen as a "team" structure when each player's effort increases the marginal products of one or more of the others' effort inputs. When efforts are perfect complements, the common part of the payoff is determined by the minimum of the n effort levels. The importance of this game is related to the fact that any common effort level is a Nash equilibrium, since a costly unilateral increase in effort will not affect the minimum effort, while a unilateral decrease reduces the minimum by more than the cost saving. Therefore, the payoff structure produces a continuum of pure-strategy Nash equilibria (Anderson, et al., 2001).

⁵⁸ They present a large-scale experimental study with 825 participants participating in the computerized experiment (Feri, et al., 2008).

Weakest Link Games and Average Opinion Games. In Weakest Link Games, payoffs depend on the minimum number chosen within a group; often, the overall productivity of an organization depends on the individual/unit doing the worst job⁵⁹. In Average Opinion Games, a decision-maker's payoffs is increasing in the median number chosen in his group, but decreasing in the absolute difference between the own number and the group median⁶⁰.

According to them, firms and organizations may be successful at sustaining efficient coordination not only through financial incentives, communication and a "managed growth" of group size, but also by setting up teams that coordinate internally at first, but then coordinate also across teams⁶¹. They also make a difference between the two similar but different terms "teams" and "groups": the group is the entity of players interacting with each other; the team is a group which is committed to pursue a joint team decision by obtaining agreement by all team members. Their results show that team decisions are more driven by a concern for monetary payoffs than individual decisions: the fact to becoming a group member shift their decision towards those that are more favorable and profitable for the group. They also conclude that teams are more sensitive in their decisions to the attraction of different strategies, they consider foregone payoffs (of non-chosen strategy) more strongly when updating attractions, and they focus more on strategies with higher payoffs. Thus, that is to say that they facilitate the coordination on more efficient equilibria. As a consequence their suggestion is that firms and organization should set up teams as a tool to enhance efficient interactions inside an organization and even in networks between organizations.

As for communication within and between teams, Cason, Sheremeta and Zhang (2012) argued that there exist environments where communication can either enhance or damage efficiency. Indeed, they found that allowing intra-group communication leads to more

⁵⁹ Feri, Irlenbusch and Sutter consider two weakest link games: (1) "WL-base", where the best response is to match the action of the weakest link, and in this case we have the Highest Payoff but the Least Efficient Equilibrium; (2) "WL-risk", which reinforces the attraction of the maximum-criterion as a selection device, and we have a trade-off between doing a stress test of relative importance of payoff dominance and taking a secure action (Feri, et al., 2008).

⁶⁰ They consider four average opinion games: (1) "AO-base", where payoff dominant equilibrium when all decision-makers choose "7" but the action maximizing payoffs is "3"; (2) "AO-pay", where all payoffs outside the diagonal are set to "0" and the application of the maximum criterium can no longer help in discriminating between the different equilibria; (3) "AO-risk", where the equilibria are no longer Pareto-raked and payoff dominance provide no guidance, yet the maximum criterion suggests "4"; (4) "Separatrix" or "Continental Divide Game", where we have two symmetric strict equilibria, (3....3) and (12....12), adaptive behaviours in the repeated game will lead to the Pareto dominant equilibrium (3....3), when the first-raked relation is "7" or lower, but the payoff of (12....12) is "8" or higher (Feri, et al., 2008).

⁶¹ To confirm it, they apply the Experience Weighted Attraction (EWA) Learning Model by Camerer and Ho: players' strategies have attractions reflecting the initial predispositions and are updated by taking into account past outcomes. It integrates reinforcement learning model and belief-based model (Feri, et al., 2008).

aggressive competition and greater coordination than control treatments without any communication; nevertheless, allowing inter-group communication leads to less destructive competition. As a result, intra-group communication decreases while inter-group communication increases payoffs (Cason, et al., 2012).

In conclusion, one of the most recent findings in coordination games' studies is the 2014article by Jackson and Xing, introducing the issue of cultures' interaction in coordination games. Indeed, in many settings individuals interact with new people over time, operating through social norms guiding behaviors and helping them in coordinating, when there are multiple possible stable equilibria. They investigate through an experiment the influences of study participants' backgrounds on their behaviors in one-shot coordination games⁶². At the end, they found that participants' predictions of how others would play were more accurate when the other player belonged to the same population, and that they coordinated significantly more frequently and earned significantly higher payoffs rather than in the case they match with other participants across different populations.

1.5. Concluding Remarks

In this Chapter, we introduced the main topic of our discussion, Collaborative Action Models, belonging to a broad interdisciplinary field of study known as Cooperation Theory. We also introduced the main starting questions driving our thesis' curiosity and development:

What could stop the self-interested behavior of the individual from damaging the interests of the group? What could deceive actors in making sub-optimal decisions?

Among the main narratives encompassing the above-mentioned social dilemmas, including Public Goods and the Tragedy of the Commons, we decided to focus our discussion on the Prisoner's Dilemma Game. Indeed, it represents the most elegant embodiment of the problem of achieving mutual cooperation, and tensions between individual short-term interests and the interests of the group in the long run. However, we found that Robert Axelrod tried to understand how cooperation can evolve, when a person should be selfish or not in an ongoing interaction with another person, within a world of egoists without a central authority. He

 $^{^{62}}$ The game considered is a variation of a battle-of-the- sexes game and participants have three possible strategies: (1) they both choose the same strategy, so that they earn a positive payoff; (2) they choose different strategies, and they earn nothing; (3) they chose equal payoffs, the only symmetric outcome among the three (Jackson & Xing, 2014).

introduced the Axelrod's Model, based on an Iterated Prisoner's Dilemma Game, where the same individuals can meet more than once. This probability is called "shadow of the future". He argued that TIT FOR TAT strategy, based on reciprocity, is the best strategy to undertake in this situation, as it is proven to be evolutionarily stable. Although, it is true if, and only if, interactions have a sufficiently large "shadow of the future". It has also been demonstrated (T. Ashworth) that cooperation can emerge even despite great antagonism between the players, and that (W. D. Hamilton) cooperation based on reciprocity – at least in biological systems – can evolve without foresight by participants.

After the "Evolution of Cooperation" envisaged by Axelrod, through the use of cooperation strategies based on reciprocity, many advances have been proposed by various authors (timing of choice, hostages, social networks, rational and adaptive play, envy, option to exit) and by Axelrod himself (labels, reputation and deterrence, regulation and standards, territoriality). However, he also recognizes the complexity of the issue and the difficulty in modelling these dynamics. That is the reason why he wrote also his second book "The Complexity of Cooperation", by going beyond the basic paradigm of the Prisoner's Dilemma. He introduces a discussion on the evolution of cooperation based on the Genetic Algorithm, resulting with successful strategies strongly resembling TIT FOR TAT. He also argues that in presence of "noise", reciprocity still works with the configurations of Generosity or Contrition, according to the environment's degree of adaptation to the presence of noise. He introduced the Norms Game and the Metanorms Game, by sustaining that, while the former is always destined to collapse, the latter can prevent defection if the initial conditions are favorable enough to maintain or establish a norm (through dominance, internalization, deterrence, social proof, membership, law or reputation). He also presents a new formal theory of aggregation, called Landscape Theory, which has the aim to forecast the energy (that is to say the "effort needed") of each possible configuration (or "partnership") in order to use the resulting "landscape" to make predictions about system's dynamics. He and his team applied the model to the 1988-efforts to create and sponsoring UNIX operative system standard, and succeeded in estimating with high degree of robustness the probable alliance configurations and underlying motivations. Even another model is an Axelrod's creation, the Tribute model, conceived to understand the dynamics of the aggregation and disaggregation of political actors. He found that it is possible to use simple

local rules to generate high levels of organization from elementary actors, particularly thanks to the dynamics of "pay or else" and the commitment's increase-decrease mechanism. Finally, he also faces the problem of social influence and tries to model the way people tend to change each other in the very process of interaction. He found that Culture is a drivingforce influencing people behavior, and that people can change each other by putting "cultural factors" interacting together. This process leads to a homogenization of neighbor cultures, albeit some different cultural regions will survive, depending on the scope of cultural possibility, the range of interaction and the size of the territory.

Overall, besides his more complex discussion on cooperative behavior, Axelrod still suggests five options to promote cooperation: (1) Enlarge the "shadow of the future"; (2) Change the payoffs; (3) Teach people to care about each other; (4) Teach reciprocity; (5) Improve recognition abilities.

It also seems that talking about the Iterated Prisoner's Dilemma Game, we need a form of coordination. Thus, we focused on Coordination games, where the payoff matrix is slightly different from the Prisoner's Dilemma's. Lack of coordination among individuals and teams, can be caused by mainly by strategic uncertainty – not only by conflicts. Thus, communication intra and inter-group is fostered to strike a balance between competition and cooperation. It is also recommended, for firms and organizations, to be successful at sustaining coordination also by setting up "teams" – not just "groups" – coordinating internally at first, but then coordinating also across teams, to enhance efficient interactions around individuals, to pass through coordination among teams, and to end up with interactions among multiple organizations.

We will see that the Iterated Prisoner's Dilemma Model could be also interpreted as a Coordination Game, as multiple Nash equilibria exist in both cases. However, to come up with this insight, there is still such a long way to walk through. As a first step in this direction, we need to be curious and to investigate which Models of Cooperation between firms have been conceived by different economic disciplines so far. We will thereby have a major understanding on how they differently perceive and interpret Cooperation and its evolving dynamics.

2. CHAPTER TWO – MODELS OF COOPERATION BETWEEN FIRMS

The previous discussion started from the Prisoner's Dilemma Game and followed with the Axelrod's models based on reciprocity and further advances, considered an environment where actors are represented by individuals. Thereafter, we discussed Coordination Games, and we broadened the perspective from individuals, to coordination among teams, to end up with interactions among multiple organizations. Indeed, we can state that the cooperative models investigated so far represent general models on how cooperation evolves.

By increasing specificity in the analysis, we have also to admit that, if we consider **organizations of individuals**, such as firms, and even relationships and games among more than one firm, we should take into account not only the inter-firm dynamics but also the intra-organizational decision-making's processes, and the relationships between the members of the organization itself.

Our thesis will try to cover both these topics, by developing different discussions with reference to both collaboration between firms and within firms. Cooperation within firms will be treated in details in Chapter Three, when we will consider fluxes of information and exchanges taking place when cooperation tries to establish; we will see also how these fluxes could be important even in cooperation between firms.

The present chapter will cover cooperation between firms from an "entitative" point of view as defined in the Introduction: it contains a sort of screening on several existing inter-firm cooperative models developed in different but related disciplines, to involve different viewpoints. Therefore, this chapter takes a higher but simplified perspective on how cooperation works between firms, by considering only the final decisions taken by the **firm as a single entity**, without discussing on the way and the reasons these decisions have been approved.

2.1. Theories on Inter-Firm Cooperation

Here is a screening on different theories on cooperation between firms developed within three different disciplines: Managerial, Financial and Industrial. The aim is to understand how cooperation is differently perceived by various perspective and how different models can differ or converge.

The managerial perspective will encompass the way enterprise dynamics can affect cooperation and the relevant variables to manage in order to make it evolve effectively. Cooperation is also valuable for firms from a financial point of view, particularly in case of Mergers & Acquisition (M&A) between big corporations, where financial aspects are always considered before deciding to proceed or not. Finally, when thinking about creating new networks, being part



of a new group, collaborate with other actors, we are necessarily talking about strategic choices shaping dynamics and competitive behaviors in the market-place. Thus, a broader industrial perspective is then studied, by considering the implications that cooperation among firms can create in the organization of their reference industry, by using a micro-economic approach.

2.1.1. A Managerial perspective: Models on how corporate dynamics influence Cooperation

Inter-firm cooperation has attracted substantial attention from management and organization researchers, since, over the past few decades, cooperative practices among businesses have become widespread and central to strategy. Many authors argue that, in order to benefit fully from inter-firm cooperation, firms should avoid opportunism by selecting good partners, establishing appropriate governance forms and contractual terms, managing cooperative processes cautiously.

In this section we will encompass the content of **two interesting academic articles** about the development of cooperative Inter-Organizational Relationships (IORs) and the elements that could influence them: the P. S. Ring and A. H. van de Ven's 1994-article about the development of cooperative inter-organizational relationships, and the Steven S.Lui and Hang-yue Ngo' 2005-article on an action-pattern model on inter-firm cooperation. Finally we will also consider the case when firms coming from different countries cooperate together, in an International Inter-Organizational Relationship. In this case, cultural issues are particularly important since intercultural communication affect the way firms can collaborate together and understand each other: we will review different models to classify cultural dimensions, as we would like to remember that also Axelrod created a model based on the identification of some cultural properties.

2.1.1.1. A PROCESS FRAMEWORK FOR THE DEVELOPMENT OF COOPERATIVE INTER-ORGANIZATIONAL RELATIONSHIPS

How a cooperative relationship emerges, develop and dissolves, and how the level of collaboration varies over time is defined by the cooperative process, investigated by **P. S. Ring**⁶³ and **A. H. van de Ven**⁶⁴ in a 1994-paper. Their work has attracted many interests in the field and has represented the base of many academic articles, as it shaded a light into the definition of the Cooperative Equilibrium by focusing on the analysis of cooperative processes. Indeed, they asserted that as long as the actions of both firms adhere to both the explicit and implicit guidelines, the partnership continues with repetitive sequences of interactions, like a system in dynamic equilibrium.

According to them, the four key concepts defining the starting conditions⁶⁵ of the collaboration are:

1. **Uncertainties** inherent in a cooperative IOR, that can be distinguished into: (1) uncertainty regarding future states of nature; (2) uncertainty whether the parties will

⁶³ Peter Smith Ring is a Professor at College of Business Administration at Loyola Marymount University (Los Angeles), with interests in the role of trust in inter-organizational relationships, the structure of inter-organizational governance,

and processes associated with transacting within and between organizations.

⁶⁴ Andrew H. Van de Ven is Professor of Organizational Innovation and Change in the Carlson School of the University of Minnesota, with interests in management of innovation and change, organizational processes that facilitate them, and inter-organizational relationships.

⁶⁵ Social-psychological literature seems to assert that "identity" and "inclusion" are two fundamental forces that motivate human thought and action. Thus, they can be seen as the basis for an explanation of the development of inter-organizational relationships, that are inevitably based on the motivational and cognitive predispositions of individuals to engage in sense making and bonding processes (Ring & van de Ven, 1994).

be able to rely on trust⁶⁶ as a counter to the problems of adverse selection and moral hazard;

- 2. Efficiency and equity⁶⁷ criteria for assessing a cooperative IOR, in order to preserve a reputation for fair dealing that will enable the partners to continue the transactions under high uncertainty;
- Need for internal resolution of disputes, resulting in the turn over time of informal psychological contracts into formal legal contracts, especially in "high-commitment relations" because of the parties' ability to rely on trust that stems from prior fair dealing;
- 4. **Importance of role relationships** in cooperative IORs, as they define the individual perception of the previous three key concepts.



Figure 15 – Ring & van de Ven Propositions for the three phases of IOR's life (Our elaboration on Ring & van de Ven, 1994)

⁶⁶ Two views on trust can be found in the management and sociology literatures: (a) a business risk view based on confidence in the predictability of one's expectations and (b) a view based on confidence in another's goodwill (Ring & van de Ven, 1994).

⁶⁷ With term equity, the authors mean "fair dealing", which is based on reciprocity, although a perfect equivalence in *quid pro quo* is not necessary. Morover, benefits received have to be proportional to the investments done. They precisely assume that "the initial lower bounds defining fair dealing typically will be based on norms and precedents established in public forums for conflict resolution (e.g., law, courts, and third-party arbitration)" (Ring & van de Ven, 1994).

They define a process framework depicting the development of a cooperative inter-firm relationship, constructed on three steps: (1) **Negotiation Stage**⁶⁸, (2) **Commitments Stage**⁶⁹, (3) **Executions Stage**⁷⁰. (See Figure 16). As IORs are often of long-term, it is likely that misunderstandings, conflicts and changing expectations among the parties will occur (the so-called **Disruptive Events**), by forcing to **Renegotiations** to preserve the ongoing relationship; otherwise, the parties may conclude that the relationship should be terminated, by entering the final cycle of the cooperative process. By analyzing the way a IOR can emerge, evolve and dissolve, the authors state a number of propositions, listed in *Figure 15*.



Figure 16 - Process Framework of the Development of Cooperative IORs (Source: Ring & van de Ven, 1994)

⁶⁸ Negotiations Stage: the parties establish the formal bargaining processes and choose their own behaviour. They also develop joint expectations about their motivations, possible investments, and perceived uncertainties of the business deal undertaken (Ring & van de Ven, 1994).

⁶⁹ Commitments Stage: the parties reach an agreement on the obligations and rules for future action in the relationship (Ring & van de Ven, 1994).

⁷⁰ Executions Stage: the commitments and rules of action are carried into effect (Ring & van de Ven, 1994).

2.1.1.2. AN ACTION PATTERN MODEL OF INTER-FIRM COOPERATION

The framework depicted above has been the foundational background of the 2005-article of **Steven S.Lui**⁷¹ and **Hang-yue Ngo**⁷², who proposed a new theoretical model (2005) to analyze interactions between partners and the resulting emerging action patterns. Their model not only includes the already mentioned concepts of Cooperative Equilibrium and Disruptive Events, but also adds reflections about the five strategic responses to external institutional processes (the so-called Action Types - originally introduced by Oliver C. in a 1991-article), and Action Pattern constructs representing the key dimensions of cooperative processes.

The **Action Types** are Acquiescing⁷³, Compromising⁷⁴, Avoiding⁷⁵, Defying⁷⁶ and Manipulating⁷⁷. Each represents a singular strategic response.

On the other hand, the **Action Patterns** are Action Acquiescence⁷⁸, Action Simplicity⁷⁹, and Action Reciprocity⁸⁰. They are based on the types, number and sequences of the five Action Types.

It is interesting the investigation on two distinct effects: (1) the Effect of partner relationships' characteristics on Actions Patterns, and (2) the Effect of transaction costs.

With reference to the first point, the authors affirm that the way Action Patterns can emerge and evolve is influenced by the real relationship linking partners, and by the specific aspects

⁷¹ Steven S. Lui is Associated Professor of Global Business Environment and Chinese Business and Management at the The Chinese University of Hong Kong.

⁷² Hang-yue Ngo is Professor in the fields of Business Administration and Economics, Psychology and International Economics at the Chinese University of Hong Kong.

⁷³ Acquiescence: the extended definition of Lui&Ngo is "Follow the request/action of the initiator, even at the expense of one's own short-term interests. Firms may do this out of habit (established norm) or strategically to enhance the relationship with the partnering firms". (Lui & Ngo, 2005).

⁷⁴ Compromise: the extended definition of Lui&Ngo is "Conform to the minimum while partially seeking to change the request/action of the initiator. Firms bargain with their partners, trying to seek concession from them". (Lui & Ngo, 2005).

⁷⁵ Avoid: the extended definition of Lui&Ngo is "Do not intend to fulfil the request, but conceal this non-cooperation instead of showing defiance. Firms reduce their contact with their partners on the issue so that they can delay their response". (Lui & Ngo, 2005).

⁷⁶ Defy: the extended definition of Lui&Ngo is "Dismiss and challenge the action of the other partners. This involves rejecting and denouncing the cooperative relationship. This is similar to opportunistic behavior depicted in transaction cost theory. In extreme cases, this may lead to the termination of the cooperative relationship". (Lui & Ngo, 2005).

⁷⁷ Manipulate: the extended definition of Lui&Ngo is "Act to influence or change the action of partners, with the aims of overpowering the initiators, and shaping and redefining their actions". (Lui & Ngo, 2005).

 $^{^{78}}$ Action Acquiescence: it refers to the degree to which a partner acts to accept another's specific requests or policies. A process with high action acquiescence indicates that partners cooperate, as they tend to adjust their actions taking into account the interests of the other. (Lui & Ngo, 2005).

⁷⁹ Action Simplicity: it refers to the degree of specialization of firms towards their partners in terms of the actions taken towards them. Low action simplicity implies complicated behavioural patterns, where firms take a wide range of actions when dealing with their partners. High action simplicity implies consistency in the actions undertaken (Lui & Ngo, 2005).

⁸⁰ Action Reciprocity: it refers to the extent that firm reciprocate the actions of their partners. High action reciprocity describes the TIT FOR TAT strategy in an iterated Prisoner's Dilemma situation (Lui & Ngo, 2005).

characterizing it. In particular, there are three partner relationship characteristics that have been proven to be salient and likely to influence action patterns:

- Inter-organizational trust: trust can denote both a form of behavior and a state of expectation towards one's partner. It also represents a calculated probability of risk associated with the cooperating partner. The characteristic is positively related both to action acquiescence and action simplicity, but negatively related to action reciprocity;
- Asymmetric dependence: it refers to the relative dependence between two partnering firms, by reflecting the extent to which one partner can influence the decisions of the other through an unequal distribution of power in a partnership. It is negatively related both to action acquiescence and to action simplicity, but positively related to action reciprocity.
- **Firm similarity**: it refers to the extent to which the culture and processes of partner firms are similar. When firms with similar cultures and processes become partners, the organizational fit between them helps achieve synergy through closer cooperation. It is positively related both to action acquiescence and to action simplicity, but negatively related to action reciprocity.

The relationships discussed above may be mitigated by the effect of **transaction costs' characteristics** of a partnership, by mitigating opportunistic behaviors. Asset Specificity and Partner Reputation are considered two important transaction costs variables. **Asset Specificity** refers to the non-recoverable and idiosyncratic investment that firms make in a relationship. **Partners' Reputation** refers to the evaluation of one's partner in terms of its affect, esteem and knowledge, by providing information about partner's trustworthiness and by acting as an informal safeguard against opportunism⁸¹. Both of them mitigate all the relationships between Action Patterns and relationship's characteristics mentioned above.

⁸¹ The influence of reputation is particularly salient in an environment of incomplete and ambiguous information, where it is difficult for trust to develop. Reputation establishes a psychological contract with firm's stakeholders (Lui & Ngo, 2005).

| Action Pattern Relationship's Char. | Action Acquiescence | Action Simplicity | Action Reciprocity | Acast Considiate |
|--|------------------------|----------------------|-----------------------|---------------------------------------|
| Inter-Organizational Trust | + | + | - | Asset Specificity |
| Asymmetric Dependence | - | - | + | Mitigated by Transactions' Cost |
| Firm Similarity | + | + | - | Partner Reputation |



2.1.1.3. THE DIMENSIONS OF CULTURE IN A CROSS-BORDER MANAGERIAL PERSPECTIVE

Culture is a concept that has been used in several social science disciplines to explain variations in human thoughts processes in different parts of the world. We have already seen a way culture is treated within a Game Theory perspective, in Chapter One, and how culture is supposed to spread and evolve in an environment made of very different individuals, and how they are supposed to interact. Now, we are taking a managerial perspective to deal with culture, because when more different firms cooperate together, it is possible that we are taking about an international environment: cooperation between firms coming from different countries. In this case, dealing with culture is fundamental for a safe and successful collaboration.

Over time, cultures evolve as societies adapt to their internal and external environments. It is clear that cultural variables affect how managers in a global corporation define their strategies. Moreover, convergence of cultures around the world is taking place continuously, but at a relatively slow pace.

Cultural dimensions are basic concepts that help us understanding how two or more cultures

might be different or similar along each dimension. Various frameworks have been developed, and we will briefly discuss these frameworks as presented by Phatak, Bhagat and Kashlak

| DIMENSIONS | EMPHASIS IN CULTURE | | | |
|----------------------|---------------------|-------------|-----------------|--|
| Relation to Nature | Subjugation | Harmony | Mastery | |
| Basic Human Nature | Evil | Mixed | Good | |
| Time Orientation | Past | Present | Future | |
| Space Orientation | Private | Mixed | Public | |
| Activity Orientation | Being | Thinking | Doing | |
| Relationships among | Hierarchical | Group-based | Individualistic | |

Figure 18 - Kluckhohn and Strodtbeck's Dimensions of Value Orientation (Source: Phatak, et al., 2009) (2009): (1) Kluckhohn and Strodtbeck's; (2) Hoftede's; (3) Trompenaars's; (4) Ronen and Shenkar's; (5) Schwartz's; (6) Hall's; (7) Triandis's.

Kluckhohn and Strodtbeck developed a framework based on the so-called "dimensions of value orientation"⁸²: Relation to nature⁸³, Basic human nature⁸⁴, Time orientation⁸⁵, Space orientation⁸⁶, Activity orientation⁸⁷, Relationship among people⁸⁸.

Geert Hoftede, a Dutch researcher, used five dimensions of culture to explain differences in behaviors from one culture to another⁸⁹: Individualism and Collectivism⁹⁰, Power Distance⁹¹, Uncertainty Avoidance⁹², Masculinity and Femininity⁹³, Time Orientation⁹⁴.

Fons Trompenaars⁹⁵, a European researcher, described cultural differences by using seven dimensions: Universalism vs Particuliarism⁹⁶, Individualism vs Collectivism⁹⁷, Neutral vs Affective relationships⁹⁸, Specific vs Diffused relationships⁹⁹, Achievement vs Ascription¹⁰⁰, Relationship to Time¹⁰¹, Relationship to Nature¹⁰².

⁸² It comes from the Kluckhohn and Strodtbeck's (1961) Values Orientation Theory, proposing that all human societies must answer a limited number of universal problems, that the value-based solutions are limited in number and universally known, but that different cultures have different preferences among them (Hills, 2002).

⁸³ Relation to nature concerns the extent to which a culture copes with its relation to nature most of the time by subjugating to it, being in harmony with it, or attempting to master it (Phatak, et al., 2009).

⁸⁴ Basic human nature reflects how cultures socialize individuals to develop beliefs about the inherent character of human beings (Phatak, et al., 2009).

⁸⁵ Time orientation reflects a society emphasis on the past, present or future. A past orientation emphasize customary, tradition-bound and time-honoured approaches. A present-oriented culture generally focuses on short-term approaches. A future-oriented society emphasizes long-term approaches (Phatak, et al., 2009).

⁸⁶ Space orientation it indicates how people define the concept of space in relation to other people (Phatak, et al., 2009).

⁸⁷ Activity orientation focuses on doing, being or thinking (Phatak, et al., 2009).

⁸⁸ Relationship among people refers to the extent to which a culture emphasizes individualistic, group-oriented or hierarchy-focused ways of relating to one another (Phatak, et al., 2009).

⁸⁹ Hoftede's work is based on questionnaires completed by IBM employees from 70 countries, one of the largest studies in international management even conducted (Phatak, et al., 2009).

⁹⁰ Individualism may be defined as a social pattern that consists of loosely linked individuals who view themselves as independent of groups and who are motivated by their own preferences and needs, rights and contracts. Collectivism may be defined as a social pattern consisting of closely linked individuals who see themselves as belonging to one or more groups and who are motivated by norms, duties, and obligations identified by these groups (Phatak, et al., 2009).

⁹¹ Power distance is defined as the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. Lower-level employees in low power distance societies follow procedures outlined by their superiors unless they disagree or feel that the directions are wrong. In high power distance countries, strict obedience to superiors is expected even when judgments are considered to be wrong (Phatak, et al., 2009).

⁹² Uncertainty avoidance is defined as the extent to which the members of a culture feel threatened by uncertain or unknown situations (Phatak, et al., 2009).

⁹³ Masculinity pertains to societies where social gender roles are clearly distinct, success and money are dominant values. Femininity pertains to societies where social gender roles overlap, the quality of life is dominant value (Phatak, et al., 2009). ⁹⁴ See note 85.

⁹⁵ Trompenaars conducted reseach with 15,000 managers from 28 countires, representing 47 national cultures (Phatak, et al., 2009).

⁹⁶ In cultures emphasizing a universalist orientation people believe in the definition of goodness or truth as being applicable to all situations. In particularistic societies people take the notion of situational forces more seriously, and judgments take into account contingencies that affect most circumstances (Phatak, et al., 2009).

⁹⁷ See note 90.

⁹⁸ In neutral cultures the tendency is to control one's emotion so that it does not interfere with judgment. Affective cultures encourage expression of emotions as one relates to others (Phatak, et al., 2009). ⁹⁹ In specific cultures individuals have large public spaces and relatively small private spaces. Members of diffused cultures draw no clear

distinction between public and private spaces (Phatak, et al., 2009).



Figure 19 – Trompenaars (on the left) and Ronen and Shenkar's Framework (on the right) (Ronen & Shenkar, 1985)

Ronen and Shenkar conducted a smallest-space analysis of data coming from different countries in the world, and they clustered them into a chart. Nine clusters were found based on employees attitudes toward importance of work roles, need fulfilment, job satisfaction, managerial and organizational variables and interpersonal orientation.

Shalom Schwartz, an Israeli cross-cultural researcher, grouped 56 human values in three different dimensions¹⁰³: Conservatism vs Autonomy¹⁰⁴, Hierarchy vs Egalitarianism¹⁰⁵, Mastery vs Harmony¹⁰⁶.

 ¹⁰⁰ Achievement cultures are those emphasizing competence in attaining position status and power. Ascription cultures are those where position status and power come from membership in groups (Phatak, et al., 2009).
 ¹⁰¹ Relationship to time involves two aspects: (1) the first aspect is similar to the Hoftede's framework, see note 94; (2) the second aspect is

¹⁰¹ Relationship to time involves two aspects: (1) the first aspect is similar to the Hoftede's framework, see note 94; (2) the second aspect is related to sequencial vs synchronic time orientation. In sequential cultures time is viewed as being linear and divided into segments that can then be divided and scheduled. In synchronic cultures time is viewed as circular and indivisible, and relationship are more important than schedules (Phatak, et al., 2009).

¹⁰² In internal-oriented cultures individuals can have control of situations. In external-oriented cultures individuals cannot control situations (Phatak, et al., 2009).

¹⁰³ Schwartz, after identifying these 56 values, constructed a method in which respondents from more than 50 countries in all regions of the world indicated the extent to which each value was a guiding principle in his or her life (Phatak, et al., 2009).

¹⁰⁴ In Countries where conservatism is emphasized, the maintaneance of the status quo and restraint of personal actions disrupting solidality, cohesiveness and traditional order are valued. Intellectual autonomy emphasizes independence of ideas and the rights of an individual to pursue his or her own intellectual goals. Affective autonomy focuses on individuals' right to have pleasurable experiences, such as enjoying life, having an exiting life, having a varied life, and pursuing pleasure (Phatak, et al., 2009).

¹⁰⁵ In Countries emphasizing hierarchy, individuals are socialized to respect the obligations and rules attached to social roles. Countries emphasizing tha value of egalitarianism reinforce the need for individuals to cooperate voluntarily and feel a sense of genuine concern for everyone's welfare (Phatak, et al., 2009).



Figure 20 – Schwartz's Value Dimensions (Phatak, et al., 2009)

Edward T. Hall, an American anthropologist, used the concept of context to explain cultural differences between countries. In high-context cultures (e.g. Japan, Spain, Middle-East) information is embedded in the social situation and is implicitly understood by those involved in the situation¹⁰⁷. In low-context cultures (e.g. Switzerland, Germany, USA) information tends to be explicitly stated¹⁰⁸. Hall founded the scholarly field of "intercultural communication"¹⁰⁹ during the 1951-1955 period (Rogers, et al., 2002). Hall's Paradigm for Intercultural Communication is made of six elements, now characterizing the field of intercultural communication, generally (Rogers, et al., 2002):

- 1. Intercultural communication had roots in anthropology and linguistics but it is quite different from them¹¹⁰;
- 2. Nonverbal communication, defined (by Hall) as communication that does not involve the exchange of words, is fundamental;
- 3. The out-of-awareness level of information-exchange is emphasized, especially in nonverbal communication;

¹⁰⁷ In High-context cultures the use of body language and tone of voice in conveying sentiments and messages is common (Phatak, et al., 2009).

¹⁰⁸ In Low-context cultures use of words to convey meaning is emphasized, and little information is left that is not explicitly stated (Phatak, et al., 2009).

¹⁰⁹ The term "intercultural communication" was used in the Hall's (1959) influential book "The Silent Language" and Hall is generally acknowledged to be the funder of the field. His work was influenced by: (1) cultural anthropology, (2) linguistics, (3) ethology, the study of animal behavior, and (4) Freudian psychoanalytic theory for the "out-of-awareness" level of human communication (Rogers, et al., 2002).

¹¹⁰ In the Foreign Service Institute, where Hall worked, scholars focused on intercultural communication, rather than on macro-level monocultural study, which Hall originally (and unsuccessfully) taught the FSI trainees (Rogers, et al., 2002).

- 4. His approach to intercultural communication accepts cultural differences and is nonjudgemental, reflecting a perspective from anthropological research and training;
- 5. In studying intercultural communication, participatory training methods were needed¹¹¹;
- 6. Intercultural communication began as a highly applied type of training¹¹².

Finally, Harry C. Triandis, a cross-cultural researcher, developed a framework around the concept of subjective culture, by analyzing the so-called "cultural syndrome", composed by: Cultural complexity¹¹³, Tightness vs Looseness¹¹⁴, Individualism vs Collectivism¹¹⁵. He was also the founder of the 1977-Triandis's Theory of Interpersonal Behavior (TIB), useful in explaining and understanding complex human behaviors, predominately those behaviors that are influenced by their social and physical environments¹¹⁶.



Figure 21 - Triandis's Theory of Interpersonal Behaviour (Ikart, 2005)

¹¹¹ Hall and his fellow trainers at the FSI used simulation games, exercises, and other participant-involving methods of experiential instruction (Rogers, et al., 2002).

¹¹² It was intended to ameliorate the lack of skills of U.S. American diplomats and development technicians (Rogers, et al., 2002).

¹¹³ Cultural complexity is largely determined by the ecology and history of the society (Phatak, et al., 2009).

¹¹⁴ Tightness vs looseness is concerned with the degree of enforcement of social norms in society. Tight cultures do not tolerate deviation from norms and expected role behaviors, and severe sanctions are imposed on those who violate expectations. He noticed that self-control and control of impulsive behaviors are learned more easily in cultures that are tight (Phatak, et al., 2009).
¹¹⁵ Triandis considers two aspects of Individualism vs Collectivism, horizontalness and verticalness. Horizontal collectivism emphasizes

¹¹⁵ Triandis considers two aspects of Individualism vs Collectivism, horizontalness and verticalness. Horizontal collectivism emphasizes interdependence of action and equality with others. Vertical collectivism emphasizes interdependence of action but the concept of being different from others. Horizontal individualism emphasizes independence of action and equality with others. Vertical individualism emphasizes independence of action and equality with others. Vertical individualism emphasizes independence of actions and the need to stand out from others (Phatak, et al., 2009).

¹¹⁶ The first level is concerned with the way personal characteristics and prior experiences shape personal attitudes, beliefs and social factors related to the behaviour. The second level explains how cognition, affect and social determinants and personal normative beliefs influence the formation of intentions concerning a specific behaviour. The third level states that intentions regarding the behaviour, prior experience and situational conditions predict whether the person will perform the specific behaviour in question (Ikart, 2005).

2.1.2. A Financial perspective: How Cooperation influences Corporate Value

From a financial perspective, we know that the final aim for firms is to increase their value in the market. In this field, cooperation is mainly involved in case of Mergers & Acquisitions (M&A). Many ways to evaluate the financial feasibility and convenience to proceed with a M&A have been developed and now we will focus on some interesting issues related to the way firms can



Figure 22 - Cooperation under a financial perspective

choose their "companions" in the operations, the drivers able to increase firms value and the elements able to endanger its pursuing or leading to a value destruction. What we will discuss is summarized in Figure 22. Finally, we will also see how to understand if a specific type of Joint Venture (the Research Joint Venture – RJV – for product innovation) has the right characteristics to be beneficial, or faces the risk to be in danger, by following John A. Aloysius's argumentations in his 2002-article.

2.1.2.1. HOW TO CHOOSE A COMPATIBLE "COMPANION": THE BALANCE MODEL

In a financial perspective, an interesting answer to the question "How can firms successfully choose a compatible companion?" has been given in 1976 by Farquhar & Rao. They introduced the Balance Model which could be a useful approach to identify the ideal profile of a possible partnering firm, by considering a series of "compatibility" attributes. The results coming from the use of the Balance Model depend on the characteristics of both firms under analysis, and of course on the degree of symbiosis between the two sets of characteristics. More specifically, the balance model has been developed for evaluating subsets where the choice criterion is one of balance among the attributes of items in the subset chosen. Using this approach the utility, or value, of a subset is a weighted combination of means and dispersion of the various essential attributes.

The essential attributes are gathered into two classes: (1) Non-balancing attributes, whose *mean* is wished to be optimized; the attributes for which the mean is maximized are called "desirable", otherwise those attributes for which the mean is minimized are called "undesirable"; (2) Balancing attributes, whose *dispersion* is wished to be optimized; the

attributes with a lower preferred dispersion are called "equi-balancing", otherwise those attributes with a higher preferred dispersion are called "counter-balancing". The authors identified one main problem which could be encountered by the user: to assess a decision-maker's preferences for subsets of items by examining his/her trade-off on the means and dispersion measures for various attributes.

The overall preference, U_{0j} , of a pair $(0,j)^{117}$, is calculated as follow:

$$U_{0j} = w_0 + \sum_{t=1}^{p} w_{1t} m_{jt} + \sum_{t=1}^{p} w_{2t} v_{jt}$$

Where:

P = the number of attributes on which the acquiring and the acquired firms can be described;

 m_{jt} = mean of the t-th attribute for the pair (0,j) of the acquiring firm and the j-th firm to be acquired; it is equal to $m_{jt} = (x_{jt} + x_{0t})/2$, where $x_0 = (x_{01}, x_{02}, ..., x_{0t})$ are the attributes of the acquiring firm, and $x_j = (x_{j1}, x_{j2}, ..., x_{jt})$ are the attributes of the j-th firm to be acquired, j=1,...,n.

 v_{jt} = variance of the t-th attribute for the pair (0,j) of the acquiring firm and the j-th firm to be acquired;

 w^{118} are the weights: (1) w_{1t} = weight for the means; (2) w_{2t} = weight for the variance; (3) w_0 = intercept to accommodate the idiosyncratic use of the scale by the decision-maker.

The necessary steps needed to perform this evaluation are summarized in the picture below.

 $^{^{117}}$ 0 is the firm the decision-maker belogs to, and j is the possible candidate (Rao, et al., 1991).

¹¹⁸ It is important to highlight that these weights can be estimated using regression methods with judgmental data on pairs of firms. In fact, once the weights have been estimated for a decision-maker, they can be used to evaluate potential acquisitions candidates and to draw inferences regarding the desirability of the various attributes in an acquisition candidate. The set of significant weights will belong to three subsets: S_1 (attributes for which only means are relevant), S_2 (attributes for which only variances are relevant), S_3 (attributes for which both means and variances are relevant).



Figure 23. The Balance Model: The screening process (Rao, et al., 1991)

2.1.2.2. DRIVERS FOR VALUE INCREASING M&A

M&A is widely believed to be on average an activity increasing the firm's net value (Gupta & Gerchak, 2002), as corroborated by a number of empirical evidences. Nevertheless, what is interesting is the related question of the extent to which different sources of value creation are associated with different acquisition strategies. It has been proposed by many authors that value creation stems from different drivers¹¹⁹ (Seth, 1990) and empirical evidence confirms that the value of the combined firm is typically larger than the sum of the values of each individual firm (Gupta & Gerchak, 2002). In particular, it is important to stress that **synergies** seem to be the major drivers for value creation through M&A. However, it is also recommended to **consider and manage transaction costs properly**, to be able to lower costs and higher success rate.

2.1.2.2.1. Synergies

If the value of the entire partnership between the combined entities is higher than the simple sum of the single partner firms' value, then we are facing the power of Synergies. In other

¹¹⁹ Market power in horizontal acquisitions, Economies of scale, Economies of scope, Coinsurance in conglomerate acquisitions, and Diversification of risk (Seth, 1990).

words, we can say that they are represented by the difference between the value of the combined firm and the value of a homemade portfolio of the two combining firms. Thus, a comparison of firms' Vi would represent a valid analysis of the existence of synergistic gains. The actual value of the combined firm after all gains are incorporated into stock prices, with E(Vi) the hypothetical combined value of the two firms if the acquisition would have never had take place. The percentage synergic gain in an acquisition, Si, is thus defined as:

$$Si = \frac{Vi - E(Vi)}{E(Vi)}$$

However, it could be better to measure abnormal returns to targets and bidders at the same time, not separately. We can consider each pair of combining firms as a single entity both before and after the acquisition, and then we can construct a time-series of combined daily returns for each pair. It is assumed that the following ex-post version of the capital asset pricing model represents the return-generating process¹²⁰:

$Rit - Rft = \beta i(Rmt - Rft) + \varepsilon it$

Where Rit = return for the i-th pair of combining firms over day t, Rmt = return on the market portfolio over day t, Rft = risk-free rate of return over day t, βi = systematic risk for the i-th pair of combining firms.

2.1.2.2.2. Managing Transaction Costs

The concept of Transaction costs (TCs) was introduced by R. H. Coase (1937) in the hope to design and optimize institutions organization and design. Actually, the Coase's approach is quite general, by focusing on the nature of the firm, that is to say what it is and how it behaves inside the market driven by the price mechanism which is characterized by some costs for performing transactions, negotiations and organizing activities. According to Coase, TCs can be identified as the expenses and costs paid by the actors of the transaction along with the whole process. Therefore, both sides of M&A have to pay the TCs in each stage of

¹²⁰ The daily return for the combined firm is computed as the percentage increase in the total market value of the equity of the combined entity, corrected for dividend payouts. The time-series of combined returns is then used to estimate regression coefficients for each combined firm (Seth, 1990).

the process. These costs may be reduced, but not completely. Naturally, a firm will tend to increase the number of transactions until the costs of organizing an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange on the open market or the costs of organizing in another firm¹²¹. As a consequence, TCs could be a measure of control for a M&A process, as they could contribute to reducing its uncertainty and improving the ratio of success.

TCs measurement models have been developed, and here we want to focus on that one introduced by S. Pi in 2013-article encompassing the evolution of transaction costs' theory. Pi makes a link between the different stages of a M&A requiring certain kinds of transactions and the related costs, respectively. In case of a successful M&A, the integration process could be divided into four stages: (1) Preparing the M&A (2) negotiation and contracting (3) property right transfer (4) integration. In turn, the stage of integration is composed by other four steps involving framework development, situation analysis, integration designing and its implementation. The Picture below shows the different stages and the related transaction costs.



Figure 24 - M&A transaction process model (Pi, 2013)

 TC_p represents the costs for preparing M&A, such as expenses for ensuring the willing of merger, searching information of the target, and planning the merger. TC_N are the costs for negotiation and contracting, and TC_c the costs of transferring, such as costs for ceremony of merger and legal procedures. Costs for integration are represented by TC_F (costs for

¹²¹ A firm will reach a point when the costs of organizing an extra transaction are equal to the costs involved in carrying out the transaction in the open market, or, to the costs of organizing by another firm. Again, a point must be reached when the loss caused by a resources' waste is equal to the marketing costs of the exchange transaction in the open market, or to the loss itself if the transaction was organized by another entrepreneur (Coase, 1937).

framework development), TC_A ¹²²(costs for situation analysis), TC_D (costs for integration designing), and finally TC_I (costs for implementation).

We can conclude that the whole Transaction Cost faced by the merging corporate, TC^{M} , is equal to (Pi, 2013): $TC^{M} = TC_{p} + TC_{N} + TC_{c} + TC_{F} + TC_{A} + TC_{D} + TC_{I}$

The equation provides calculation of the M&A process TCs also for the target corporate, with little adjust. The TCs for the whole process of M&A will be the sum of both. Notice that the TCs is not symmetrical and each side of M&A may cover different process TCs. In each sub-stage of integration, both sides will share the costs, according to the new property right structure (participation or share holding).

Therefore, merging corporate should choose a target satisfying the strategic objective and meanwhile causing the lowest TCs. Moreover, it is important to make sure that TCs will not become out of estimate and control. Otherwise, it can create losses resulting in the M&A failure. A proper management and control over all transactions costs is, therefore, a necessary tool to eventually succeed in M&A.

2.1.2.3. CAUSES FOR VALUE REDUCTION

We have just seen how M&A can contribute to the enhancement of corporate value, through the benefits of synergies, the right management of transaction costs. On the other hand, to really comprehend the actual impact of a M&A operation, we must also consider its drawbacks and shortcomings. Indeed, we need to know the factors we should pay attention to, in the view to avoid their negative impact. Agency costs and managers entrenchment are considered to be the major factors leading to a failure of M&A. Linking to them, hubris seems to be the underlying reason for managers to behave in a way affecting the M&A's outcome negatively, because of their overconfidence and self-overfaith.

2.1.2.3.1. Agency Costs and Managerial Entrenchment

We have "Agency Costs" managerial interests are not aligned to shareholders' interests, by exploiting the power they have given to managers through the agency agreement. The agency agreement allows the firm's owners to appoint the agent - that is to say "the manager" –,

 $m_{re_{a}} = \sum_{m} m_{re_{a}}, \quad (m=1,2...n)$

which should be responsible of the company's strategic direction. Practical examples of agency costs are cost of producing audited financial statements, implementing plans that reward managers for actions that increase investors' wealth, and other costs necessary for monitoring managerial behaviors.

Those behaviors bring about investment distortions: managers of firms with excess cash flow over-invest for the purpose of private benefits. Managers can make investments that are more valuable under themselves than under alternative managers. Those investments might not maximize shareholders value. Therefore, shareholders have a moral hazard in contracting with managers. This is how managerial entrenchment have birth. According to Weisbach (1988): "Managerial entrenchment occurs when managers gain so much power that they are able to use the firm to further satisfy their own interests rather than the interests of shareholders."

In firms with poor governance, characterized by the absence of effective monitoring and disciplining mechanism it is simpler, for managers, to act in their own best interests. They are more likely to adopt suboptimal strategies, such as engaging in activities that make managers seemingly indispensable, manipulating performance measures and resisting takeovers. These selfish behaviours lead to the incurrence of agency costs that can be reduced only by adopting appropriate external and internal governance practices such as managerial incentives, capital structure and dividend policies.

2.1.2.3.2. Hubris: another explanation of corporate takeovers

Despite the various ways available to us in order to decide if a M&A option is profitable or not, we can have some situations where rational choices cannot been done. It is intrinsic of human being and it is linked to theory of expectation, reasons for financial market failures and psychological dynamics of decision-makers inside firms. Indeed, as we have previously seen, Mergers and Acquisitions could also result into a destruction of corporate value, by taking into account the impact of agency cost and managerial entrenchment. Hubris has been considered to be another explanation of corporate takeovers. In particular, it is demonstrated that it can explain why bids are made even when there is a positive valuation error resulting in an estimated value above the current market price. In other words, bidding firms characterized by hubris simply pay too much for their targets (Roll, 1986). It follows that the identification of hubris existence in the M&A market is an essential contribution to the prediction of mergers' efficiency effects and to CEOs' motivation to progressively correct their overconfidence (Lin, et al., 2008).

Richard Roll¹²³ introduced the so-called Hubris Hypothesis in 1986, inside the well-known scientific article "The Hubris Hypothesis of Corporate Takeovers": it presented the principal empirical predictions of the hubris hypothesis and discussed supportive and disconfirming empirical results. To date, recent research has confirmed that hubris is one of the most cited reasons for M&A. The phenomenon depends on the overbearing presumption of bidders that their valuations are correct. The problem is that it is not likely to predict the final outcome of takeovers. Indeed, even though some firms are involved in many acquisitions, the "average individual bidder" has the opportunity to make only a few takeover offers during his career. So, there is little chance for them to really learn from their past errors. The possibility of contaminating information is a central problem in interpreting the price movement of a bidding firm on the announcement date of an intended acquisition. Bidders are activists in the takeover situation, and their announcements may convey as much information about their own prospects as about the takeover. To mention one example of the measurement problem, mergers are usually leverage-increasing events. Thus, to measure properly that part of the gain of a bidding firm, in a merger that is attributable to the merger per se and not to an increase in leverage, we ought to deduct the price increase that would have been obtained by the same firm through independently increasing its leverage by the same amount.

Hubris hypothesis is also clearly linked to psychological issue regarding managers' behavior and commitment to the firm itself. Roll pointed out that managers may be optimistic and overconfident in their valuation of target firms. Hence, they tend to engage in frequent transactions and they are inclined to overpay when acquiring targets. Researchers have extended the psychological literature to behavioral corporate finance and find that managers, as a special group, are more likely to exhibit optimism than ordinary people. Managers behave in an irrational way depending on their rate of entrenchment and overconfidence.

¹²³ Richard Roll holds the Joel Fried Chair in Applied Finance at UCLA Anderson. He has been a consultant for many corporations, law firms, and government agencies, and has served on several boards (Roll, 1986).
Indeed, J. B. Heaton in 2002 develops a model of "overconfident manager" without invoking any assumptions on agency cost and information asymmetry. He shows that overconfident managers will increase their investment sensitivity to free cash flow under the belief that market underestimates the firm's projects and thus the cost of external finance is too high. Also, According Hayward, Shepherd and Griffin (2006), the hubris account of overconfidence incorporates three separate and potentially independent psychological processes: (1) overconfidence in knowledge¹²⁴, (2) overconfidence in prediction¹²⁵, and (3) overconfidence in personal abilities¹²⁶. They also found that the size of the overconfidence depends on environmental complexity inherent in the opportunity (positive relationship), environmental dynamism inherent in the opportunity (positive relationship), business planning (it can strengthen both the two previous positive relationships), managerial experience in successful operations (positive relationship).

Moreover, it has been proved that the likelihood of failure increases when overconfident managers start their operations with smaller resource endowments, when they commit greater resources to focal opportunities, and when they reduce the liquidity of their operations.

2.1.2.4. RESEARCH JOINT VENTURE: A COOPERATIVE GAME FOR COMPETITORS

One of the most common form of cooperation for economic reasons is the case of Joint Venture, particularly R&D Joint Venture to engender new product innovation. This is an interesting phenomenon because we are talking about competitors who explicitly decide to work together through a "joint structure", by trying to cooperate.

John A. Aloysius¹²⁷ (2002) considers this situation in a financial perspective, with the aim to understand when cooperation is optimal in this framework, and when it is put into danger. Indeed, we have to take into account that, obviously, interests of each member firm may be

¹²⁴ The majority of judgment studies examine overconfidence in metacognition, that is, how accurately people assess their own knowledge. As a general rule, people are more certain than they should be that they know the correct answers to questions of geography, demography, or other aspects of general knowledge. Overconfidence is particularly likely when tasks are difficult and/or when judgments are made with high confidence, conditions that characterize those which founders face (Roll, 1986).

 $^{^{125}}$ Predictions are most likely to be overconfident when the target outcome is rare, when the evidence available is only weakly diagnostic, and/or when predictions are made with high confidence (Roll, 1986).

¹²⁶ Many studies in social psychology indicate that high confidence (and hence high overconfidence) is driven by actors' interpretation or construal of their experiences, including the cues that they take from others about such experiences, and is largely unaffected by the experiences of others or the features of the situation, even when consideration of others' experiences and situational features could help improve decision accuracy. Based on this evidence, we now relate overconfidence to founders' focal venture tasks and own experience at founding (Roll, 1986).

¹²⁷ John A. Aloysius is associate professor at the Walton College, department of Supply Chain Management. His research interests are related to retail technologies (including auto-ID technologies, mobility, and POS) and applications of cognitive and social psychology, behavioural economics.

in conflict with those of its collaborative partners, so that it is not so surprising the high failure rate for alliances of this sort.

Aloysius uses a cooperative game theoretic model, the so-called Joint Venture Game, in the aim to provide a decision-theoretic analysis which could help firms to consider both advantages and disadvantages of engaging in such types of collaborations.

The problem in the background is shaped like that (Aloysius, 2002):

- In a joint venture a prospective project is identified as a motive for future collaboration among two or more firms; the project has the potential to advance the state of the technology and/or create a new product or a new line of products;
- R&D budget of the firms is limited; any collection of firms have available the sum of the combined limited budgets of all firms belonging to the collection;
- The project is developed in a collaborative effort, through the combination of the technological resources of all member firms, which are assumed as perfectly transferable;
- A project is not funded unless the collective benefit is not less than the cost of the project; the decision criterion to determine the estimated cost is maximization of total profits (benefits less costs);
- The new technology developed from the joint venture will result in a product which will benefit member firms; this benefits will be divided according to ex-ante factors (e.g. brand loyalty, marketing power, as they allocate to each firm a predetermined share of the whole);
- We are in a market with differentiate products, so that benefits to the members are not independent across firms: it is dependent on the market share each firm can command and the sum of these is equal to the same determinate total benefit or economic rent available for appropriation by the firms with access to the same technology.

Within the joint venture game, we have a non-empty subset *S* of a set of players $N = \{1, 2, ..., n\}$, which is called Coalition. *v* is the Characteristic function, that is to say a real valued function defined on the coalitions. The Coalitional form is a set of players *N* along with a

characteristic function. The Core of the game (Nv) is the set of payoff vectors x = (x1, x2,, xn) satisfying $\sum_{i \in N} x_i = v(N)$ and $\sum_{i \in S} x_i \ge v(S)$, with $\forall S$ belonging to N. The Research budget for firm *i* is denoted by D_i . The total Benefit available for appropriation by all firms is represented by *B*. The Cost of funding the venture for firm *i* is denoted by Ci, and the cost of the coalition is given by *Minimum*_{*i* \in S} C_i , as he assumes that the technology is available at the least of the costs to the individual members of *S*. to have the different fractions we need a set of relative weights: W_i denotes the relative weight for firm *i*, and the market share that firm *i* receives given that it has access to the technology is equal to: $\frac{W_i}{\sum_{k \in S} W_k}$. If the firm does

not have access to the technology, the market share is equal to zero.

When another firm i enter the research joint venture, it shares costs with these firms who collectively contribute a fraction 1-f of the cost; that is to say that firm i contributes a fraction f. by taking into account that there are firms outside coalition S who also have access to the technology T created through the venture, the value of the coalition S is equal to:

$$\max\left[\frac{B\sum_{k\in S}W_k}{\sum_{k\in S\cup T}W_k-\min_{k\in S}C_k}\right]Y, \text{ where } \min_{k\in S}C_kY \leq \sum_{k\in S}D_k, Y\in\{0,1\}$$

If firm i enter the coalition Y=1 and S=0, otherwise the value to firm i as a participant in S is given by: $x_i(S) = B\left(\frac{W_i}{\sum_{k \in S \cup T} W_k}\right) - f\min_{k \in S} C_k$, with $0 \ge f \ge 1$.

To be practical, individual and group rationality demands that only $x_i(S)$ satisfying the core properties are the only acceptable outcome of the game, even if they will be also the result of the negotiations between the participating firms.

Aloysius identifies three variables very important for the conclusions about how cooperation evolves in joint ventures: (1) Funding ability; (2) Market power or Competitive advantage; (3) Technological capital.

Funding ability represents the ability of a firm to fund R&D, to wit its research budget. In other words, we have an advantage in funding ability over firm j if $D_i > D_j$. Competitive advantage stands for the ex-ante market share for each firm. In other words, we have a

competitive advantage over firm j if $W_i > W_j$. Technological capital denotes the ability of a firm to fund R&D at a lower cost than its competitors do. In other words, we have an advantage in technological capital over firm j if $C_i < C_j$.

By changing rules of asymmetries among these three factors, Aloysius demonstrates the following propositions (Aloysius, 2002):

- 1. "In a duopoly with stable market shares, if both firms have the same funding ability, competitive advantage, and have the same technological capital, then the firms always have incentive to cooperate in the joint venture game";
- 2. "If one of the firms in a duopoly which is symmetric with respect to market power and technological capital, has an advantage in funding ability, then the firm with the advantage may not have incentive to cooperate. However, a sufficient condition for cooperation is if the firm i at a disadvantage is able to fund the research on its own";
- 3. "If one of the firms has (i) a competitive advantage over the other firm, or (ii) an advantage in technological capital; all other factors being equal, the firms always have incentive to cooperate, but if one firm cannot profitably fund the research on its own, the other firm can appropriate all the profit from the joint venture".

Thus, to conclude, symmetric firms always have incentive to cooperate. The introduction of asymmetry in whatever form has instead the potential to end this cooperation. Moreover, if the weaker competitor can be forced to not enter the market, the stronger competitor has no incentive to cooperate. Nevertheless, in a similar scenario where the weaker competitor can be prevented from making a financially possible entry in the market, it is the weaker firm who may have no incentive to cooperate. To summaries, it is clear that "asymmetry" is a necessary condition for "non-cooperation". Aloysius tries also to formulate the necessary conditions for "cooperation", as follows:

- There must be a coalition able to fund a project: $\sum_{i \in S} D_i \ge \min_{i \in S} C_i$.
- These firms must be the minimal coalition: $\sum_{i/\in S} D_i < \min_{i/\in S} C_i$, or $\left(\frac{\sum_{i/\in S} W_i}{\sum_{i\in N} W_i}\right) B$;

This minimal coalition is able to exclude other firms outside the coalition from obtaining the technology: ∀≥ T ∈ S, ∑_{i∈T} D_i ≥ min_{i∈T} C_i and B ≥ min_{i∈T} C_i,

$$\Rightarrow \sum_{i \in N \setminus T} D_i \ge \min_{i \in N \setminus T} C_i \text{ and } \left(\frac{\sum_{i \in N \setminus T} W_i}{\sum_{i \in N} W_i} \right) B \ge \min_{i \in N \setminus T} C_i;$$

• The loss in revenues resulting from the inclusion of a firm from outside the coalition should be less than the savings in technological costs from including that firm:

$$\left(\frac{W_k}{\sum_{i \in S \cup \{k\}} W_i}\right) B < \min_{i \in S} C_i - C_k, \text{ where } \forall k \in N/S.$$

He concludes that, even if cooperation by firms may be theoretically optimal, negotiations and bargaining are necessary to provide an acceptable outcome to all parties involved. Indeed, it depends very much on the actual allocations of benefits to individual firms, which in turn depends on the specific cost sharing scheme agreed upon by them. In some cases, firms will not even have incentive regardless of the sharing scheme used by the firms, but this does not necessarily preclude collaboration. It implies that it may not be stable. Moreover, in an oligopoly with more than two firms, the potential to collaborate with firms outside the coalition may further destabilize the existing venture. In an oligopoly, finally, the necessary conditions for cooperation imply that all firms cannot be excluded from competing in the product market and what is optimal for them is to cooperate only in a single joint venture.

2.1.3. An Industrial perspective: How Cooperation influences Industrial Dynamics

After analyzing cooperation models under a managerial and a financial perspective, it is now the time to take a broader perspective by considering the industrial environment and the different dynamics that the presence of cooperation can bring about. We will try to analyze these issues by having as a surrounding background the strategic competitive environment: in this way, understanding





consequences for each competitive force could be easier. That background will be represented by the evergreen Porter's Five-forces Model (Porter, 2008):

- **1. Direct Competitors**
- 2. New Entrants
- 3. Substitutes
- 4. Suppliers
- 5. Buyers

For the discussion, P. Belleflamme and M. Peitz will represent the referring literature, with their academic book "Industrial Organization: Markets and Strategies" (2010). Let's analyze each competitive force separately.

2.1.3.1. DIRECT COMPETITORS AND SUBSTITUTES

From a Direct Competitors and Substitutes' perspective, two kinds of cooperation in the market have been modelized: Collusion and Horizontal Mergers.

2.1.3.1.1. Cartels and Tacit Collusion

Collusions represent price-fixing agreement. We have to distinguish between explicit and explicit cartels: for explicit cartels to work, firms must enter into (long-term) binding agreements so as to form a joint profit-maximizing entity; tacit cartels, instead are that ones enforced in the absence of binding agreements, whereby collusion emerges as the non-cooperative (but coordinated) equilibrium of a situation of repeated competition.

There is a consensus that collusive agreements are welfare reducing and should therefore be forbidden, as many competition and antitrust laws are doing. However, it is under everyone's eyes that cartels continue to form and operate in a vast array of industries.

2.1.3.1.1.1. Explicit Collusions

When firms within an industry form a cartel, they eliminate the existing competition between them, by leading to an output reduction or a price increase. Since this collusive behavior also benefits companies outside the cartel, it can be seen as a public good as well: one can therefore conjecture that firms will tend to free-ride on the cartels formed by other firms, making them unstable. However, the stability of a cartel depends on the institutional procedures of group and network formation, and we can distinguish among three procedures: (1) Simultaneous Cartel Formation¹²⁸, (2) Sequential Cartel Formation¹²⁹, (3) Network of Market Sharing Agreements¹³⁰. We assume that we play in a Cournot-shaped market¹³¹.

Figure 26 – Explicit Collusions: Procedures of Groups and Networks formation (Source: Belleflamme & Peitz, 2010)

Simultaneous Cartel Formation

Firms decide simultaneously whether or not to participate in a single-industry wide cartel. If a firm joints, it jointly chooses with the other cartel members the quantity maximizing their joint profit. In this case, it is demonstrated that, in a Cournot market with homogeneous goods and constant marginal costs, if there are at least three firms in the industry, all firms remain independent, as each member will have an incentive to leave the cartel; if there are just two firms, these two form a cartel. Indeed, the formation of a cartel induces positive externalities on the firms outside it and all firms preferred to free-ride. However, if firms produce horizontally differentiated goods competition is relaxed and so is the free-riding incentive. In this case, if good are sufficiently differentiated, it is possible to find stable cartels comprising not all firms but a strict subset of them. This depends on two conditions: (1) Internal Stability (no cartel member has an incentive to leave the cartel; (2) External Stability (no outside firm find profitable to join the cartel).

Sequential Cartel Formation



Multiple cartels form endogenously in a sequential way and with exclusive membership; here each firm anticipates how its decision will affect the behavior of firms choosing actions subsequently in the game. So, we assume that the production stage here is preceded by a cartel formation stage: the first firm proposes the formation of a cartel and all the prospective members of this cartel sequentially respond in turn to the proposal. If they all agree, the cartel is formed in the order initially determined. If at least one firm rejects, the cartel is not formed and the first firm makes a counteroffer. To be sure that the cartel will eventually be formed, we assume that firms will have zero profit if the game is playied infinitely. The game has complete information and infinite horizon, and we thus use the solution concept of a stationary perfect equilibrium. Moreover, as the game is only played among the remaining firms once a cartel has been formed, this sequential cartel formation embodies a high degree of firms commitment. It is demonstrated that, In case of a Cournot market with homogeneous goods, in the unique equilibrium of the sequential cartel formation game, the first (n-k*) firms remain independent while the last k* firms form a cartel, k* being larger than 80% of the firms in the industry.

Network of Market Sharing Agreements

Pairs of firms refrain from competing on each other's territory. At industry level, the collection of such bilateral market-sharing agreements constitutes a collusive structure, or collusive network. A collusive network is stable if no pair of firms finds profitable to sign a new market-sharing agreement, and no firm has an incentive to renege on an existing market-sharing agreement. There are two conflicting effects at work when concluding a new agreement: (1) firm *i* benefits from the reduction of competition on its own market; (2) firm *i* foregoes access to market of firm *j* and the profit it was making there. It is demonstrated that a market-sharing agreement can only be concluded among two firms with the same number of competitors on their home markets. The only non-empty stable network is the complete network, where all pairs of firms sign market-sharing agreements, resulting in full collusion, with every firm a monopolist on its own market.

¹²⁸ Suppose that a cartel of k firms, with $1 \le k \le n$, is formed. The Cournot game is thus played among (n-k) independent firms and the cartel is made of the other k firms. As all (n-k-1) players are symmetric (the same marginal cost c and the same demand) each player gets the Cournot equilibrium profit. We can here distinguish from the profit of firms inside the cartel and of those ones outside: $\pi_i^{in}(k) = \frac{(a-e)^2}{k(n-k+2)^2}$ and $\pi_i^{out}(k) = \frac{(a-e)^2}{(n-k+2)^2}$. So, if we assume that $\pi_i^{in}(k) > \pi_i^{out}(k-1)$, it follows that $(n-k+3)^2 \ge k(n-k+2)^2$ and consequently $(1-k)(n-k)^2 + (6-4k)(n-k) + (9-4k) \ge 0$: so, for $k \ge 3$, which supposes $n \ge 3$, all the terms of the above inequality are negative. If n=2 the only possible cartel comprises the both firms (Belleflamme & Peitz, 2010).

profits each firm obtains when they all remain independent, $\pi^{out}(1)$. Firms prefer to form a cartel when $\pi^{in}(k) \ge \pi^{out}(1)$, leading to $k > \frac{1}{4}(2n+3-\sqrt{4n+5})$. Let K* denote the first integer following $\frac{1}{4}(2n+3-\sqrt{4n+5})$, then the first $n-k^*$ firms prefer to remain independent (Belleflamme & Peitz, 2010).

¹³⁰ Å network is represented by a graph g on the set of N firms. A graph is a set of pairwise links between firms i and j, denoted ij. Here, the link ij is formed if firms I and j sign a market-sharing agreement. We assume that the inverse demand is given by $\mathbf{p} = \mathbf{a} - \mathbf{q}$ and all firms have the same marginal production cost. For a given collusive network g, let ni(g) denote the number of firms active on market i. the total profit of firm I can then be written as π_i (g) = $\frac{(\mathbf{a}-\mathbf{c})^2}{(\pi_i(\mathbf{g})+1)^2} + \sum_{j \text{ with } ij\neq \mathbf{g}} \frac{(\mathbf{a}-\mathbf{c})^2}{(\pi_j(\mathbf{g})+1)^2}$ (Belleflamme & Peitz, 2010)

¹³¹ In the Cournot model, competition is based upon quantity. We consider the simple case of an oligopoly with n firms facing a linear demand for a homogeneous product and producing at constant marginal costs. Firm i sets quantity qi and the total output is $q = q_1 + \dots + q_n$. Suppose also that cost functions are linear: $C_i(q_i) = c_i q_i$. In this competitive context the equilibrium profit will be $\pi_i^* = \frac{(a - n c_i + C_{-i})^2}{b(n+1)^2}$ and the equilibrium quantity is $q_i^* = \frac{a - n c_i + C_{-i}}{b(n+1)^2}$. We observe that π_i^* decreases with c_i and increases with C_{-i} (cost structure of rivals). So, in the linear Cournot model with homogeneous products, a firm's equilibrium profits increase when the firm becomes relatively more efficient than its rivals (all other things being equal). (Belleflamme & Peitz, 2010)

2.1.3.1.1.2. Tacit Collusion

In these cases, all that is needed is a "meeting of the minds" between colluding firms, as well as a common understanding that deviation from the collusive tacit agreement will be met by some forms of punishment (Belleflamme & Peitz, 2010). If we assume that firms compete more than once in the market place (and it is closer to reality, actually), their strategies are made of a list of actions (a contingent plan) telling the firms what to choose in each period as a function of past prices or quantities (the history of the game). It is demonstrated¹³² that tacit collusion is not possible when competition is repeated over a finite number of periods: there is a known end of the game, and so, we can use backward induction to solve the game for its subgame perfect equilibria. Thus, if competition is repeated over a finite number of periods, firms play according to the (unique) Nash equilibrium of the static game in each period and tacit collusion cannot emerge. Instead, situation chances if we consider an infinite horizon, interpreted as "there is no known end date to the game": at each period there is a probability that firms will compete one more time. The unique Nash equilibrium of static game where collusion cannot emerge is still an equilibrium, but not the only one. In particular, tacit collusion can emerge, under the Grim Trigger Strategy: firm *i* starts by choosing the action maximizing total profits, as long as both firms has done in the previous periods. This is the cooperation phase. However, if one firm deviates, this deviation "triggers" the start of the punishment phase: from the next period on and forever after, both firms choose the action corresponding to the Nash equilibrium of the static game. So, it is demonstrated¹³³ that when completion is repeated over an infinite horizon, tacit collusion can be sustained by the Grim Trigger Strategy as long as the probability of meeting again (the discount factor δ) is large

¹³² Indeed, if we consider a time horizon T, we know that firms only care about their current profits' maximization and Nash equilibrium is thus the one of the static game, where each firm earn π^{n} . If we move to T-I, firms do the same. So, whatever action they choose in period T-I, this will not affect the profits they obtain in the subsequent period, and the Nash equilibrium in T-I is thus again the Nash equilibrium of the static game (Belleflamme & Peitz, 2010).

¹³³ In this case, when $T = \infty$ the stati game could be repeated for an infinite number of time by avoiding the emergence of tacit collusion. However, it is not the only equilibrium since tacit collusion can emerge at the subgame perfect equilibrium of the (infinitely) repeated game, particularly if we consider the so-called Grim Trigger Strategy. According to this strategy firm *i* choses the action maximizing its own profits and will repeat the choice until both firms do that at the previous period, in the so-called cooperation phase. Otherwise punishment is assured. Give π^{e} the profit under cooperation and π^{m} the pre-period monopoly profit, $\pi^{e} = \frac{\pi^{m}}{2}$ if both cooperate; if one cooperates and the other deviates, then the deviating firms obtain π^{d} , and we have naturally $\pi^{d} > \pi^{e} > \pi^{m}$. However, if in the cooperative phase firm 1 follows the Grim Trigger Strategy it will obtain as a discounted value $V^{c} = \pi^{e} + \delta \pi^{e} + \delta^{2} \pi^{e} + \dots = \frac{\pi^{e}}{2\pi^{e}}$ and the present value $V^{p} = \pi^{d} + \delta \pi^{n} + \delta^{2} \pi^{n} + \dots = \pi^{d} + \frac{\delta \pi^{n}}{2\pi^{e}}$. Hence, Firm 1 prefers to follow the Grim Trigger Strategy if $V^{c} \ge V^{p}$, and - by developing the relation – only if $\delta \frac{2\pi^{d} - \pi^{e}}{\pi^{d} - \pi^{e}} \equiv \delta_{min}$, where δ_{min} lies strictly between 0 and 1 (Belleflamme & Peitz, 2010).

enough. In particular, $\delta \ge \frac{\pi^d - \pi^c}{\pi^d - \pi^n}$, where π^d is the benefit for the deviating firm, π^c is the mutual benefit for both firms after cooperation, and π^n is the benefit obtained by a firm in a Nash equilibrium of static game, and we assume that $\pi^d > \pi^c > \pi^n$.

The reason is that firms must put sufficient weight on future losses to offset the temptation of securing an immediate gain by deviating; the minimum weight is lower when deviation pays less and punishment hurts more. We can also be in a Folk theorem situation: in the infinitely repeated game, provided players are sufficiently patient, there is a Nash equilibrium such that both players cooperate on the equilibrium path.

To find the optimal punishment for the deviating firms, Belleflamme and Peitz consider the following stick-and-carrot strategy:

- 1. Start the game by playing the collusive output/price as prescribed by the collusive agreement;
- Cooperate as long as the collusive output/price has been observed in all preceding periods;
- 3. If one of the players deviates from the collusive agreement at period *t*, trigger the punishment phase at period t+1 and return to the collusive agreement at period t+2;
- 4. If one of the player choose a different quantity/price during the punishment phase, start the punishment phase again at the following period.

Thanks to this strategy, the discount factor increases¹³⁴, so as the probability to have a tacit collusion (see Figure 27). Moreover, it is demonstrated that firms find it harder to sustain collusion when they interact less frequently or when price



Figure 27 - Stick-and-Carrot Strategy in the linear Cournot Duopoly (Belleflamme & Peitz, 2010)

¹³⁴ If n firms operate in the market, deviation profits remain unchanged but total collusive profits have to be shared among n firm $\pi^{e} = \frac{\pi^{n}}{n}$ and therefore the condition to deviate is that $V^{e} \ge V^{o}$ and thus that $\delta \ge 1 - \frac{1}{n} \equiv \delta_{\min}^{sear}(n)$, where $\delta_{\min}^{sear}(n)$ is the critical discount factor which is increasing in *n* and collusion become more difficult to sustain (Belleflamme & Peitz, 2010).

adjustments are less frequent¹³⁵. It is also demonstrated that with multimarket contact on different markets, collusion may become sustainable in several markets, even though deviations would be profitable if firms were active only in one of the markets¹³⁶.

2.1.3.1.1.3. Horizontal Mergers

Horizontal mergers are mergers between direct competitors. By starting with the simplest models, we now consider mergers between Cournot competitors. To analyze correctly the incentive to merge, we need to compare profits at the post-merger and pre-merger equilibria. In case of duopoly, firm 1 can make a take-it-or-leave-it offer for acquiring firm 2. Thus, the latter accepts an offer at least as high as its profit in duopoly: $\pi^m = \pi(1)$ should be greater than industry profit in duopoly $2\pi(2)$. In general, a merger has the effect that not only the equilibrium profit of each firm decreases with the number of firms – so that $\pi_i(n) < \pi_i(n-1)$ – but that industry profits decline with the number of competitors, so that $n\pi$ (n) < π (n - 1) π (n - 1). The other firms in the industry will always gain from the merger. The merging firms internalize their previous rivalry once they are placed under common control: this drives them to reduce output, which increases the market price and benefits the firms outside the merger, with a positive externality. As a response to the merger, the other firms increase output, which is detrimental to the merging firm's profit. It is demonstrated that under Cournot competition, mergers of two firms are unlikely to be profitable if the market is fragmented but they are more likely to be profitable if the market is concentrated¹³⁷. This is demonstrated under six restrictive assumptions: (1) duopoly; (2) no increasing marginal cost of production and no capacity constraints; (3) no effect on

¹³⁵ Suppose that *n* firms compete every *k* periods and the present discounted value is thus $V_1^{c} = (\pi^m/n) + \delta^k (\pi^m/n) + \delta^{2k} (\pi^m/n) + \dots = \frac{(\pi^m/n)}{(1-\delta^k)}$ and $V^{\sigma} = \pi^m$. Firms interact in each period and have fixed prices. In this case

 $V_1^c \ge V_1^b$ and $V_2^c \ge V_2^b$. It follows that the fully collusive outcome is sustainable if and only if $\delta \ge \left(1 - \frac{1}{n}\right)^{1/k}$ which increases with *n* and so also with *k*. Hence, collusion is easier to sustain in fast-moving markets than in markets where transactions are irregular (Belleflamme & Peitz, 2010).

¹³⁶ The idea is to induce firm C to collude by leaving a large portion of the market 2 to A and B, while using the interaction in market 1 as a disciplining device. Firm C does not deviate as long as $\frac{s\pi^{m}}{1-\delta} \ge \pi^{m}$ or $s \ge 1-\delta$. By considering that firms A and B will leave the share $1-\delta$ to firm C and keep share $\delta/2$, they would not deviate until $\frac{1}{1-\delta} \left[\frac{\pi^{m}}{2} + \frac{\delta\pi^{m}}{2}\right] \ge 2\pi^{m}$, by following that it would not deviate until $\delta \ge 3/5$ (Belleflamme & Peitz, 2010).

¹³⁷ If we are in a duopoly market with linear demand P(q) = a - q and constant marginal cost *c*, we obtain that Cournot equilibrium profits are $\pi(n) = \pi_i(n) = \frac{(a-e)^2}{(n+1)^2}$. By developing the expression, we find that the merger is profitable only if $2\frac{(a-e)^2}{(n+1)^2} \le \frac{(a-e)^2}{n^2}$, which is satisfied only if n=2 but not for any n higher than 3.

production efficiency; (4) only a single merger is feasible; (5) no additional firms can enter; (6) Cournot competition.

If we relax the first assumption, by assuming to merge several firms, it is demonstrated that they are profitable for Cournot competitors only if a highly concentrated market results¹³⁸. Indeed, the profitability of a merger depends on two opposite forces: quantity reduction and thus price increase; quantity increase from outside firms and resulting decrease in price. To have the first effect dominating the second one, the number of outside firms must be small enough.

If we relax also the second and the third assumption, we can have mergers able to increase firms' efficiency. Belleflamme and Peitz modeled two different types of efficiency gains: scale economies¹³⁹ and synergies¹⁴⁰. See Figure 28.

¹³⁸ In fact, in this case, we have k firms which merge together in an industry with n firms. In this case, equilibrium profits would be $\pi_t = \pi_{\sigma} = \left(\frac{a-\sigma}{n-k+2}\right)^2$, where π_t is the profits of merger's insiders and π_{σ} is the profits of outsiders. In this case, a merger is profitable if $k > \frac{1}{4}(2n+3-\sqrt{4n+5}) \equiv \vec{k}$, that is to say if it involves a sufficiently large number of firms. \vec{k} is higher than 80% (Belleflamme & Peitz, 2010).

¹³⁹ In the same context, we assume that the firm I's cost function is given by $C(q_i, K) = cq_i + \frac{k}{2\pi}q_i^2$, marginal cost is $c + (\frac{k}{\kappa})q_i$, where we define $\frac{h}{\kappa} = k$. Profits for the merged entity is $\pi_z = \frac{(k+4)(k+1)^2(n-c)^2}{(k^2+(n+2)k+2n)^2}$, and the merger is profitable if $k^2 - 2(n-5)k^2 + (2n-3n^2+17)k - 4(n^2-2n-1) \ge 0$. If we set constant marginal cost with h=0, also k=0, the inequality is satisfied with n=2, meaning that two firms merging together are not profitable as soon as there are more than two firms in the industry. With h>o, it is satisfied for large value of n if k is large enough, so that merged entity is substantially "larger" than the merging partners (Belleflamme & Peitz, 2010).

¹⁴⁰ In the same context, the merged entity choses the quantity q_i maximizing the profit $\pi_i = [(a - q_i - q_{-1}) - (c - x)]q_i$. We also assume that $\varphi \equiv \frac{\pi}{2} < 1$, where φ is the measure of the cost reduction. With these conditions, the merger would be profitable if $\frac{(n-k+2)\sqrt{k-(n+1)}}{(n-k+2)\sqrt{k-(n+1)}} \equiv \varphi_{\mathbb{P}}(k,n), \text{ that is to say that the synergies (expressed as a fraction of the market,$ *a-c*) must be larger than some

 $[\]varphi > \frac{1}{(n-k+1)(n+1)} = \varphi_p(k,n)$, that is to say the threshold $\varphi_p(k,n)$ (Belleflamme & Peitz, 2010).

| EFFICIENCY GAINS FROM MERGERS | | |
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| In this we entity own the firm's than eithe rival firms horizontal | nake the assumption that (i) each firm owns a certain amount of capital; (ii) when some firms merge, the merged s their combined capital stock; (iii) each firm's marginal cost increases linearly with that firm's output; (iv) the larger capital stock, the lower the slope of marginal cost curve. Thus, the merged entity has a lower marginal cost curve of the constituent firms. In addition, since the marginal cost of each rival firm rises with its output, the ability of to expand in response to the merger is not as great as in the prior model with constant marginal cost. as a result, mergers are much more likely to be profitable under these alternative assumptions. | |
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| In this cas merged fi | e, efficiency gains are modeled by assuming that the merger reduces the constant marginal cost of production of the m, say from c to c-x. For the outside firms the cost remain c. So, mergers can make it possible to exploit the synergies nong merging firms, by allowing the merged entity to produce in a more efficient way. It is demonstrated that | |
| existing a mergers b sufficientl | etween Cournot competitors that do not result in a highly concentrated market are profitable only if they entai I large synergies. Two opposite forces can affect profitability: positive effect stemming from the internalization of | |

Figure 28 - Mergers: Efficiency Gains (Belleflamme & Peitz, 2010)

If we relax the fourth assumption, we allow the formation of more than one merger in the same industry: this implies also that firms have to anticipate that future mergers may occur, which may make an initially unprofitable merger eventually profitable, as well as that an industry may show no signs of merger activity, due to the miscoordination among firms. If the industry exhibits a series of mergers it is called Merger Wave: the first mergers may not be profitable under the previous assumptions, but now that other mergers may occur they could be. So, there is an incentive for these firms to initiate and convince other firms that consolidation is in the interest of all firms.

If we relax the fifth assumption, we allow the presence of new entry. It is demonstrated that if the entry threat is immediate, there does not exist any rationale for a merger¹⁴¹. This reasoning shows that entry barriers are at the hearth of the competitive effects of mergers. So,

¹⁴¹ If we consider an infinitely repeated Cournot game with a merger stage at the beginning, where firm 1 can make a take-it-or-leave-it offer to firm 2, who can accept or reject. If it accepts, a potential entrant decides whether to enter. If no merger takes place, each firm's discounted profits are $V(2) = \frac{1}{1-\delta} (\pi(2) - f)$. Since entry into the market is profitable, a potential entrant would enter after Δt periods. If $\Delta t = \infty$ entry is impossible so we consider the opposite situation when $\Delta t = 0$. Then, firm 1 will encounter a new competitor in the market so that its expected profit will be also V(2), gross of the payment made for the takeover. Therefore, its profit will be 0, which is less than the discounted duopoly payoff (Belleflamme & Peitz, 2010).

if a merger only temporarily leads to a smaller number of firms because there is subsequent entry, a merger in a Cournot model is not profitable when firms are sufficiently patient.

Finally, if we relax the sixth assumption, we allow also price competition and not only quantity competition: if firms set prices in a differentiated product market, there are much stronger incentives to merge. Indeed, in price competition, firms compete less aggressively after merger, while outsider set higher prices. Thus, with price competition, it is demonstrated that there is a rationale for mergers even in a non-concentrated industry¹⁴². Moreover, since the competitors of the merged firm set higher prices than before the merger, profits of the merged firm increase even if there are no efficiency gains from merger.

There is another consequence from mergers: it may affect the degree of asymmetry among the remaining firms. Asymmetries among firms have several implications on the sustainability of tacit collusion: (1) it might be more difficult to define the common collusive price as, for instance, more efficient firms will prefer lower prices than less efficient ones; (2) the allocation of production quotas is also harder to agree upon as equal sharing would typically be inefficient when some firms are more efficient than others; (3) low-cost firms have more incentives to renege on a collusive agreement because deviation pays more and punishment hurts less for them.

Hence, we can conclude that a merger may exert two conflicting effects on sustainability of collusion: a positive effect through the reduction on the number of firms and a negative effect if it increases the asymmetry among firms, and it is demonstrated¹⁴³. However, even Bellaflamme and Peitz admit that estimating the impact in practice seems to be very difficult: quantitative and econometric methods may be of some help to evaluate ex-post the likelihood of collusion in some industries, but what is needed here is an ex-ante evaluation of how a

¹⁴² We assume that demand for product *i* is $Q_i(p_p \dots, p_n) = a - p_i + d\bar{p}_{-i}$, where $d\bar{p}_{-i}$ is the average price charged for all products other than *i*. firms face 0 marginal costs, and the equilibrium profits is equal to $\pi_1 = 2p_i\left(a - p_i + d\frac{1}{n-1}\left(p_i + (n-2)p_p\right)\right)$, where p_p is the best response. The two product firm internalizes the positive effect of a price change for one of its products on the demand for the other product. Since the two product firm prices less aggressively than the competing one-product firms, we must have $p_i^* > p_{po}^* > p_{po}^*$ (Belleflamme & Peitz, 2010).

¹⁴³ From the previous analysis, in fact, we can say that, on the one hand, a merger decreases the number of firms in the market, which makes tacit collusion easier to sustain. On the other hand, a merger may affect the degree of symmetry among the remaining firms. Asymmetries among firms have a lot of implications on the sustainability of collusion, including: more difficulty in defining the common collusive price; the allocation of production quotas is also harder to agree upon as equal sharing would typically be inefficient when some firms are more efficient than others; low cost firms have more incentives to renege on a collusive agreement because deviation pays more and punishment hurts less for them (Belleflamme & Peitz, 2010).

merger could affect this likelihood and no good methods have been proposed so far to tackle this challenging issue.

2.1.3.2. THE THREAT OF NEW ENTRANTS

When we talk about the threat of new entrants in the market, we usually do not think about cooperation: it is more common to have in mind strategies to increase barriers of entry, to defense the our own position in the market or to reinforce it to the detriment of the new incoming firms.

However, cooperation can have something to do with this strategic threat: it can foster collaboration with direct competitors to avoid new entrance, and it can shed light on the opportunity to collaborate with incoming firms to seek a "complementary innovation".

However, first of all, it is interesting to see how is the traditional way to fight new entrants, through entry Accommodation or Deterrence, to pass right afterwards to investigate the cooperative ways.

In the attempt to anticipate the possibility of entry, incumbents commit to a certain investment, whose amount depends on its strategic effect and on the type of product market competition. Belleflamme and Peitz, in their discussion, assume a two-stage game between one incumbent (firm 1) and one potential entrant (firm 2):

- First stage: incumbent chooses the level of some irreversible investment K₁;
- Second stage: after observing K₁, the entrant decides whether or not to enter:
 - If it decides to enter: both firms make their decisions on price and/or quantity simultaneously, and we will call it σ₁ and σ₂. Profits are given by π₁ and π₂ and the latter include also entry costs. It is assumed that profit functions are such that a unique and stable Nash equilibrium exists in stage 2 for any K₁, denoted as {σ₁^{*}(K₁), σ₂^{*}(K₁)};
 - If it decides to not enter: it makes zero profit, while the incumbent obtains $\pi_1^m(K_1, \sigma_1^m(K_1))$ where $\sigma_1^m(K_1)$ is the monopoly choice in stage 2, as a function of the first-stage investment.

A strategic incumbent chooses its first-stage investment either to deter entry or to accommodate it in the least harmful way.

2.1.3.2.1. Entry Deterrence

In case of entry deterrence, incumbent chooses its investment level so as to make entry unprofitable. We assume that the monopoly choice of K1 is sufficient to deter entry. However, there are also situations where incumbent has to distort its investment choice, but this distortion is costly. The incumbent, thus, will choose the level which is sufficient to deter entry, such that $\pi_2(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)) = 0$.

There are two channels through which incumbent's investment can affect the entrant's profit: (1) Direct effect, to wit the profit-maximizing effect that exist even if K_1 has no effect on firm 2; (2) Strategic Effect, that is to say the influence of K_1 on firm 2's second-stage behaviour which affect firm 1's profits. The investment makes the incumbent tough if the total effect on entrant's profit is negative. If the total effect is positive, then the investment makes the incumbent soft. As the objective of entry deterrence is to reduce the entrant's profits to zero, incumbent wants to look aggressive. So, if the investment makes it tough the incumbent has an incentive to overinvest ("top dog strategy"): be strong or big to look aggressive; otherwise incumbent must underinvest ("lean and hungry look"): be weak or small to look aggressive.

Belleflamme and Peitz investigate different ways to deter entry, involving strategies affecting cost variables (Investment in capacity¹⁴⁴ and Raising rival's cost¹⁴⁵) and affecting demand

¹⁴⁴ Consider an incumbent firm and a potential entrant. Incumbent sets capacity $\bar{q_1}$ and the entrant decides to enter or not. If the latter enters, the incumbent set additional capacity $\overline{\Delta q_2}$, and $q_1 = \bar{q_1} + \Delta q_1$ and the entrant sets $\overline{\Delta q_2}$ and $q_2 \leq \Delta q_2$. We have homogenous products and linear demand, such that the incumbent profit function is equal to $\pi_1 = (1 - q_1 - q_2 - c)q_1 - k\Delta \bar{q_2}$. By finding the incumbent's best response, we find that there are two possible curves: the upper curve becomes the reaction function if there is spare capacity, and the lower curve if capacity has to be extended. Instead, the entrant's profit function is given by $\pi_2 = (1 - q_1 - q_2 - c)q_2 - k\Delta \bar{q_2} - \epsilon$. We can thus find that the firm 2's best response to firm 1's quantity is $q_2(q_1) = \frac{1}{2}(1-q_1 - c - k)$, as long as it generates non-negative profits. To conclude, in an entry model with capacity commitment, the incumbent's conduct depends on the cost of entry, e. for small entry costs ($e < e^*$), the incumbent prefers to accommodate entry and behave as a Stackelberg leader. For intermediate entry costs ($e^* <= e <= e^+$), the incumbent chooses to deter entry by expanding its capacity. For large entry costs ($e > e^+$), the incumbent can behave as an unconstrained monopolist as entry is blockaded (Belleflamme & Peitz, 2010).

¹⁴⁵ Consider a two-stage game, and that at stage 1, firm 1 chooses the level of some "investments", K1, with the effect to raise its own constant marginal cost, as well as the constant marginal cost of the entrant, c1 and c2, which are increasing functions of K1. At stage 2, firm 2 decides to enter and equilibrium profits are represented by $\pi_i^* = (c_1(K_1), c_j(K_1))$. Whatever the nature of second-stage competition, firm i's equilibrium profit increases with its rival's marginal cost and decreases with its own marginal cost. In this conditions, the equilibrium profit will turn to be simply the square of the equilibrium quantity (Belleflamme & Peitz, 2010).

variables (Brand proliferation¹⁴⁶, Bundling and leveraging market power¹⁴⁷, Switching costs¹⁴⁸, Price reduction¹⁴⁹).

They are summarized in Figure 29 and Figure 30.



Figure 29 - Strategies affecting Cost Variables (Belleflamme & Peitz)

¹⁴⁶ We consider a three stage game, where: (1) stage 1: firm 1 decides to offer the base product or both product; (2) Stage 2: a competitor may enter the market and offer a product which directly compete with the second modified product. If competitor enters pay the entry cost e; (3) Stage 3: firms simultaneously set prices. If entry takes place, at stage 3 equilibrium profits will be $\pi_i^{d}(k)$, where k is the number of products offered by the incumbent. In case of two products entry is not profitable. Such deterrence is profitable if $\pi = (2) > \pi_1^{d}(1)$ (Belleflamme & Peitz, 2010).

¹⁴⁷ Assumed that firm 1 decides to sell products A and B as a bundle at price p_{ab} . Consumers who decide to buy product B alone are such that (i) $\alpha_b - p_z \ge \alpha_a + \alpha_b - p_{ab}$, that is to say $\alpha_a \le p_{ab} - p_z$; (ii) $\alpha_b - p_z \ge 0$, that is to say $\alpha_b \ge p_z$. Hence, firm2's demand is $(1 - p_z)(p_{ab} - p_z)$. Solving the system, we observe that entering with a bundle is profitable for firm 1 independently of the possibility of exit of firm 2 if f<0.119. In the full game, entry with a bundle can induce exit of firm 2 for an intermediate range of fixed costs (Belleflamme & Peitz, 2010).

¹⁴⁸ First consider the context: consumers of mass 1 are uniformly distributed on the interval [0, 1]]. In the first period, only the incumbent, firm 1, is active, located at 0 and produces good 1 at zero marginal cost. Firm 2 has the possibility to enter in period 2. If it enters, its location is exogenously fixed at the other extreme of the interval; its marginal cost of production is also equal to zero. A consumer of type x incurs a disutility of -x if he/she purchases a unit of product 1 and -(1-x) if he/she purchases a unit of product 2. A consumer buying from the incumbent in period 1 incurs a switching cost of z if then buys from the entrant in period 2. Finally, to guarantee full participation, we assume the reservation price r to be sufficiently high. In period 1, a portion $0 < K_1 \leq 1$ have bought from the incumbent in period 1. A consumer located at x in period 2 and who has not bought from firm 1 decides to buy from 1 in period 2 as long as $p_1 + x \leq p_2 + (1-x)$. Instead, if the consumers bought from firm 1, he is more inclined to continue to do so in period 2, if $p_1 + x \leq p_2 + (1-x) + z$. We should distinguish between Small and Large switching costs (Belleflamme & Peitz, 2010).

¹⁴⁹ Consider the strategy where, in period 1, the incumbent sets $q_1^{\prime}(c) = 1/2$, which is the single-period monopoly output of the low-cost incumbent. The potential entrant's entry strategy is $\varepsilon(p^1) = 1$ if $p^1 > \frac{1}{2}$ and $\varepsilon(p^1) = 0$ if $p^1 \le \frac{1}{2}$. The entrant believes that an incumbent with $q_1^2 \ge 1/2$ has high costs with probability μ . Given its belief, the entrant should not enter. It remains to be checked that a high-cost incumbent does not have an incentive to deviate from $q_1^{\prime} = 1/2$. Along the proposed equilibrium path, the incumbent makes first-period profit $(1 - 2C_n)/4$ and second period profit $(1 - C_n)^2/4$. Alternatively, the incumbent can set $q_1^{\prime} = (1 - C_n)/2$, which triggers entry in period 2. Hence, the deviation profit is first-period monopoly profit $(1 - C_n)^2/4$ plus second period duopoly profit $(1 - 2C_n)^2/9$. Hence a deviation is not profitable if $\frac{1-2c_n}{4} \ge \frac{(1-2c_n)^2}{9}$. So, the high cost incumbent deliberately lowers its first-period price below its one-shot monopoly price to avoid entry in the second period (Belleflamme & Peitz, 2010).

Figure 30 - Strategies affecting Demand Variables (Belleflamme & Peitz)

Brand proliferation

The incumbent may decide to enlarge its product range with the aim to keep competitors outside the market for a certain range of products. Consider the following 3-stage game: (1) firm 1 decides to enlarge or not; (2) new competitor for the new products, by paying a cost of entry; (3) firms simultaneously set prices. If the entrant competes against a two-product firm its profit woul be zero, as it competes head on with the second of the incumbent products. Thus, an incumbent may use brand proliferation to deter entry. However, it can create a form of cannibalization for the incumbent. So, it is demonstrated that if it can withdraw its product at sufficiently low cost from a segment in which it faces a direct competitor, brand proliferation is not a credible strategy for entry deterrence.

Bundling and Leveraging market power

Bundling consist in selling two or more products in a single package: it is an effective tool for sorting consumers and price discriminate between them. Consider that an incumbent is a monopolist in the market of product A but faces potential competition in the market of product B. It is demonstrated that by bundling products A and B, the incumbent may reduce the demand addressed to a rival firm producing only product B and thereby, make entry unprofitable or induce exit from the industry. In other words, a firm with market power in one market may be able to use pure bundling to leverage its market power into another second market and induce exit by firms operating in this second market.

STRATEGIES AFFECTING DEMAND VARIABLES

Switching costs

Consider an incumbent selling a product exhibiting switching costs and facing potential entry of a competing firm. Switching costs deter two opposite forces on entry: (1) it is more costly for the entrant to attract consumers; (2) small-scale entry may be more profitable if incumbent do not discriminate. Results changes even according to the importance of switching costs. In case of small switching costs, increasing incumbent's installed base is profitable for entry accommodation and deterrence. For large switching costs, the entrant's reaction is not affected by the size of the incumbent's installed base. In this case, the second effect dominate and the incumbent should overinvest to accommodate but underinvest to deter entry.

Price reduction

Some incumbents can decide to set low prices to avoid or delay entry (also in case of switching costs for example, by lowering the pre-entry price to increase the installed base). Since the marginal cost of the incumbent determines its behaviours, the entrant may be in a situation that entry is profitable if the incumbent has high costs, and not profitable in case of low costs. So, it is demonstrated that if the entrant is uncertain about the incumbent's costs, a highcost incumbent can mimic the low-cost incumbent in the monopoly period and thus avoid entry thereafter. Such a strategy is the equilibrium strategy of the incumbent for particular beliefs held by the entrant and an intermediate level of entry costs.

2.1.3.2.2. Entry Accommodation

In case of entry accommodation – usually when deterrence is too costly for the incumbent – firm 1 takes entry as given and shift its focus from the entrant's profit towards its own profit. So, the aim is to choose a K₁ that maximizes π_1 , not to make π_2 negative. The total effect can

be split again into two effects¹⁵⁰: (1) Direct Effect; (2) Strategic Effect. In the present case, the incumbent should overinvest¹⁵¹ if the strategic effect is positive and underinvest¹⁵² otherwise.

The impact of the strategic effect in case of accommodation (SEA) depends on the sign of the strategic effect in the entry deterrence case (SED) and on the strategic substitutability or complementarity of the firms' second-stage choices:

$sign(SEA) = sign(SED) \times sign(slope of firm 2's reaction curve)$

If in the entry deterrence case the direct effect is negligible (or zero), this investment makes firm 1 tough (soft) if SED is negative (positive). If second choices are strategic substitutes, the reaction curve would be downward sloping: it is demonstrated that entry accommodation and entry deterrence call for the same conduct¹⁵³. If they are strategic complements, instead, it is demonstrated that when deterrence calls for overinvestment, accommodation calls for underinvestment ("puppy dog strategy"): being weak or small to look inoffensive. By the same token, when deterrence calls for underinvestment, accommodation calls for overinvestment ("fat cat strategy"): being big to look inoffensive. This is due to the fact that under complementarity the commitment to be aggressive reduces the incumbent's profits as the entrant reacts in an aggressive way; therefore, the incumbent wants to look inoffensive, so as to trigger a favorable response from the entrant.

¹⁵⁰ Indeed, the total effect is $\frac{d\pi_a}{dx_a}$, and it is the sum of the Direct effect and the Strategic Effect (SEA). The Direct effect is equal to $\frac{\partial\pi_a}{\partial\pi_a}$. The Strategic effect is equal to $\frac{\partial\pi_a}{\partial\pi_a}\frac{d\pi_a^*(\pi_a)}{d\pi_a}$ (Belleflamme & Peitz, 2010). ¹⁵¹ We talk of overinvestment if strategic level exceeds the non-strategic level. The strategic level is the investment level at the sub-game

¹⁵¹ We talk of overinvestment if strategic level exceeds the non-strategic level. The strategic level is the investment level at the sub-game perfect equilibrium of the two stage game; the non-strategic level is the choice made by a "myopic" incumbent that does not internalize the effects of its investment on the entrant's second-stage decisions, or either if its investment was not observable by the entrant (Belleflamme & Peitz, 2010).

¹⁵² We talk of underinvestment if strategic level is below the non-strategic level (Belleflamme & Peitz, 2010).

¹⁵³ If we consider second-stage choices as strategic substitutes, reaction curves are downward sloping, as it happens in quantity competition. From the expression mentioned above, the SEA has the reverse sign of SED and the following relationships exist: (1) investment makes firm 1 tough, thus SED<0, SEA<0 and we should overinvest; (2) investment makes firm 1 soft, thus SED>0, SEA<0 and we should underinvest (Belleflamme & Peitz, 2010).

2.1.3.2.2. Incumbents Cooperation for Entry Deterrence

After having analyzing the situations where a monopolist try to avoid the entrance of a potential entrant, we can move to more realistic scenario: several incumbents and/or potential entrants characterize the market. If we take into account several incumbents, they can try to successfully deter the entrance by cooperating together. In this case, also outside incumbents freely benefit from the other firms' investments. Hence, investment in entry deterrence acquire the nature of a public good and underinvestment may result: incumbents, acting in a non-cooperative way may invest less in entry deterrence than they would do if they could coordinate their actions.

To analyze the situation, Belleflamme and Peitz consider a homogeneous product Cournotshaped industry with two incumbents (firm 1 and firm 2) and distinguish between two different situations: (a) there is a single potential entrant (firm 3); (b) there are two potential entrants (firm 3 and firm 4). Consider a three-stage game:

- 1. The two incumbents choose their capacities, q_1 and q_2 ;
- 2. The entrant(s), after observing q_1 and q_2 , decide whether to enter or not; if they enter, they also choose their capacity level;
- 3. The active firms played a capacity-constrained Cournot game: firms have a constant marginal cost of production and are unable to produce more than the capacity level chosen; we assume inverse demand function P(q) = a q.

To simplify the analysis suppose that only two capacity levels can be chosen, q_H and q_L (with $q_H > q_L$), with associated fixed costs f_H and f_L (with $f_H > f_L$). We are interested in situations where entry deterrence requires the joint effort of the two incumbents, so we assume they

both need to start we a capacity q_H . Indeed, if only or none one choose capacity q_H , if there is a single entrant, it always can enter, and, if there are more entrants, they always enter if both incumbents chose q_L and only one enters if one incumbent chose q_H . The payoffs of the nongame are summarized in Figure 31.

| | Investment makes the incumbent | | |
|-------------|--------------------------------|---------------------|--|
| | tough | soft | |
| Strategic | (D and A) | (D and A) | |
| substitutes | Top Dog | Lean and Hungry | |
| Strategic | (D) Top Dog | (D) Lean and Hungry | |
| complements | (A) Puppy Dog | (A) Fat cat | |

Figure 31 - Optimal business strategies for entry deterrence D and entry accommodation A - (Belleflamme & Peitz, 2010)

It is demonstrated that underinvestment is not possible when there is a single potential entrant¹⁵⁴, but it may occur when there are two potential entrants¹⁵⁵. To be simple, the reason is that if one incumbent were to install a large capacity, this by itself would deter one entrant; then, the other incumbent would have an incentive to install a small capacity and not deter the other entrant. Nevertheless, this would decrease the profit of the first incumbent below what it can gain by installing a small capacity. As a consequence, the two incumbents end up installing a small capacity and entry takes place.

So, we need a general requirement for a model of non-cooperative entry deterrence to exhibit a free-rider problem: the total return to investing in entry deterrence need not occur at a single critical point, never met in case of a single entrant but possible in case of more entrants. So, Belleflamme and Peitz conclude that multiple incumbents may not be able to deter entry if they do not coordinate their investment decisions, by colluding in their choices of investments in entry deterrence.

2.1.3.2.3. Incumbents and New Entrants Cooperation: Complementary Innovation

Another more particular case of cooperation is that one between incumbents and new entrants to give rise to a sort of "creative cooperation".

Saives, Desmarteau and Holford examined this case in their 2013-article, by finding that this practice has started to become very important in the era of knowledge-based economy. Particular evidences have been found within the biopharmaceutical sector, where it has been empirically proven that creative responses have been put forth to face the major technological changes and increasing complexities which the life sciences have introduced within the drug discovery process. Thus, many biotech firms – even small ones – have become partners in "creative symbiosis" with large pharmaceutical companies, often by mean of an initial "research workshop".

Therefore, it seems that cooperation between incumbents and new entrants is not really contemplated if we consider new entrants which could become direct competitors of existing

¹⁵⁴ Indeed, assume that firm 1 and 2 both choose \bar{q}_{π} , and enters otherwise. We must have that $\pi_{L\pi} > \pi_{LL}$, that is to say that an incumbent choosing \bar{q}_{L} is better off when the other incumbent chooses \bar{q}_{π} rather than \bar{q}_{L} . It follows that $\bar{q}_{2}(\bar{q}_{L},\bar{q}_{L}) - \bar{q}_{2}(\bar{q}_{L},\bar{q}_{\pi}) > \bar{q}_{\pi} - \bar{q}_{L}$. This inequality can never be satisfied. It follows that underinvestment is not possible when there is a single potential entrant (Belleflamme & Peitz, 2010).

¹⁵⁵ Indeed, in this case, we assume that entrants choose to install the small capacity. Here, the inequality $\pi_{LR} > \pi_{LL}$ may well be satisfied as two firms enter in the case LL but only one in the case LH. The inequality can be indeed be rewritten as $\left[\propto -\bar{q}_{L} - \bar{q}_{R} - \bar{q}_{L} \right] \bar{q}_{L} - f_{L} > \left[\propto -2\bar{q}_{L} - 2\bar{q}_{L} \right] \bar{q}_{L} - f_{L}$, that is to say $\overline{2q}_{L} > \bar{q}_{R}$. (Belleflamme & Peitz, 2010)

companies, and maybe also for substitutes. It seems that it is reasonable and advantageous to think about cooperation in case new entrants' activities are focused on complementary products with respect to incumbent firms. In this case, Saives, Desmarteau and Holford argue, that a "creative innovation" in the reference industry can be introduced to create "complementary innovation" by changing the reference industry collaborating firms are operating in. They define "creative innovation" as "the use of extensive cooperation between incumbents and new entrants initiated ('created') by an innovation that leads to a search for mutually complementary assets", such as marketing, manufacturing and after-sale service. In the more particular case we are interested in, even if "complementary innovation" has the power to destroy the existing industrial structure of the market, it does not mean that this happens by destroying incumbents, as Schumpeter taught us with the opposite term "creative destruction". The result is an industry structure of extensive cooperation between incumbents and new entrants, allowing for a symbiotic coexistence in a newly defined industry.

Moreover, the authors state that "creative cooperation" for "complementary innovation" occurs when the ultimate aim of the cooperative process is the successful commercialization of an innovation by both the collaborating firms, motivated by the complementary assets and resources they can reciprocally share with each other. Thus, they found that inter-firm cooperation, in this case, represents the preferred reconfiguration mechanism in response to a changing context¹⁵⁶, but it has to be supported by: (1) a "Creative Strategy (and Governance)", by putting into question the existing business models to transform knowledge into assets; (2) a "Creative Organization which implies organizational innovation toward new partnership forms".

2.1.3.3. BUYERS AND SUPPLIERS: VERTICALLY RELATED MARKETS

Other strategic players in the market, able to affect a firm strategic choice result, are both suppliers and, of course, buyers. They have market power, actually, and a company has to take it into account when making choices.

Vertically related markets face inefficiencies due to the so-called "double-marginalization problem": when in a market there are firms operating only at one level of the vertical supply

¹⁵⁶ Changing context involves dealing with uncertainties and risks, creating new capabilities for integrating the tacit knowledge of scientific experts, forging long-term learning capacities through long-term partnerships (Van Wijk, Stam, Elfring, Zietsma, & Den Hond, 2013).

chain, retail prices are higher than in market whit vertical integration, because of the margin applied by the retailer including even the margin of the upstream firm. Indeed, it is demonstrated that in a vertically related industry with an upstream and a downstream monopolist in which each firm maintains the price-setting power of its product, the retail price is above the monopoly price set by a vertically integrated firm¹⁵⁷. However, the basic insight remains relevant eben under imperfect competition: if we have an oligopoly, these downstream firms will also apply a margin as the upstream ones. The double-marginalization problem is now lower because one layer of the market loses its market power, but it still exists.

Belleflamme and Peitz argue that the double-marginalization problem can be alleviated or avoided through the use of more sophisticated contracts different from linear contracts: they are talking about strategic agreements such as that ones fostering resale-price maintenance, exclusive territories and exclusive dealing. Also Vertical Mergers may be efficiency increasing, as they can avoid double-marginalization problem as well, and they are able to internalize externalities with respect to investment activities between upstream and downstream firms.

2.1.3.3.1. Strategic Agreements

2.1.3.3.1.1. Resale-Price Maintenance

Resale-Price Maintenance (RPM) is considered as a way to enforce optimal prices from the viewpoint of upstream firms: it involves mandating prices downstream, to allow a positive margin for the retailer by ensuring that the downstream firm remain active. Thus, it potentially eliminates competition between retailers, since manufacturer will have power over price. However, manufacturer competition can become so strong to keep retail prices too low. Thus, in many markets another alternative is more often contemplated, that is the reduction of transaction costs: indeed, retailers engage in a costly service provision and manufacturers are aware that their pricing strategy should not destroy retailer's investment

¹⁵⁷ We assume that the market has linear demand function Q(p) = a - bp and constant marginal cost c < a/b. The retailer maximizes its profits, $\max_{v}(p-w)(a-bp)$ and for a given wholesale price w the retailer sets $p(w) = \frac{a+bw}{zb}$. Retailer profits will be $\frac{(a+bw)^2}{4b}$. The manufacturer takes the profits maximization behavior of the retailer into account, and his profits maximization will be $\max_{v}(w-c)(\frac{a}{z}-\frac{bw}{z})$. The corresponding retail price is $p^* = \frac{z}{4b} + \frac{z}{4}$. A vertically integrated firm would solve $\max_{v}(p-w)(a-bp)$ and thus sets its price equal to $p^m = \frac{a}{zb} + \frac{z}{4}$, where c < a/b and thus $p^m < p^*$. This shows that vertical merger is welfare increasing, since the retailer ignores that a higher price-cost margin downstream also reduces profits upstream (Belleflamme & Peitz, 2010).

strategy. To investigate the situation, Belleflamme and Peitz assume a market with a single manufacturer (upstream) and two competing Hotelling-linear-differentiated retailers, 1 and 2 (downstream). They compete in price (unless RPM works) and service. Consumers are heterogeneous with respect to their horizontal location and service dimension, which can be interpreted as an opportunity cost of time: consumers located far from the product have a high opportunity cost of time and do not purchase any product. This implies that an increase in services by the retailer is less effective in stealing business from the competitor than a reduction in price. Hence, in this particular model retailers are biased towards price competition and the manufacturer can improve by setting a price floor that is binding in equilibrium. If the manufacturer can use two-part tariffs, it can obtain the full profit of the vertical integrated solution. By developing the model, they demonstrate that the use of RPM by a manufacturer leads to higher retail prices and more retail services if consumers are more sensitive to price competition than to service competition. Conversely, this leads to lower prices and fewer retail services if consumers are less sensitive to price competition than to service competition¹⁵⁸. This demonstrate RPM to implement the vertically integrated solution.

However, there is also another issue: RPM can affect the sustainability of a cartel in the upstream market. Indeed, when a RPM does not exist, cartels are expected to become less stable as wholesale prices cannot be observed by other cartel's members, and it becomes difficult to distinguish between retail price changes due to cost changes in the downstream market, and those due to individual deviations by cartel's members. Therefore, RPM makes price deviations by cartel members easier to detect and facilitate collusion between them.

2.1.3.3.1.2. Exclusive Territories

It is a strategic agreement granting the manufacturer to distribute its product in the territory of certain downstream firm, exclusively. Downstream firms could be interested because they

¹⁵⁸ Denote the retail price by p_i and the service level by s_i , and demand is a function of both price and service level of both retail and manufacturer. Each retailer makes profits equal to $\pi_i(p_1, p_2, s_1, s_2) = (p_i - w)Q_1(p_1, p_2, s_1, s_2) - K(s_i)$, where $K(s_i)$ is the cost of providing service level s_i . Manufacturer's profits is $(w-c)(q_1 + q_2)$. With RPM, given PS the producer surplus, total industry profits are maximized only if $\frac{\partial p_2}{\partial s_1} = 0$ and $\frac{\partial p_2}{\partial s_4} = 0$. Suppose that the manufacturer can possibly set w such that the two externalities exactly offset each

other. For this to hold, using symmetry and rearranging, we must have $\frac{\frac{\sigma u_i}{\sigma p_i}}{\frac{\sigma q_i}{\sigma p_i} + \frac{\sigma p_i}{\sigma q_i}} = \frac{\frac{\sigma u_i}{\sigma q_i}}{\frac{\sigma q_i}{\sigma q_i}}$ If this does not hold with equality, because

retailers are either more sensitive to price competition or to retail service competition, RPM affects retail prices and services (Belleflamme & Peitz, 2010).

can increase their investments in services, as the agreement protects part of the rents generated through the investment; otherwise, competitors may free-ride on the "public good" that is provided by the retailer. They can be also beneficial for upstream firms, since it makes upstream demand less elastic and thus reduces competition upstream. Belleflamme and Peitz developed the idea in a two-product and two-region competition model with identical linear market demand in each region. There is one retailer for each product in each region, not facing any transport costs selling in the other region. So, apart from exclusive territories, there is pure Bertrand competition between retailers of the same product, and retailer in region $k \in \{a, b\}$ selling product $i \in \{1,2\}$ sells product at its unit cost, equal to the wholesale price w_i plus the unit of retailing cost which for simplicity is taken as equal to zero. We thus have $p_{ia} = p_{ib} = w_i$. Suppose that manufacturers grant exclusive territories to each of their retailers, which can obtain strictly positive profits: so, they are willing to sign contracts that give them exclusivity in their region under the condition that they do not sell in the other region. The two-stage game is like that:

- 1. Manufacturers set their wholesale price;
- 2. After learning the wholesale price, retailers set their prices simultaneously, trying to maximize their profits;

It is demonstrated that manufacturers may make higher profits if they sell through exclusive territories than if they do not, and retailers are also better off. However consumers suffer and total surplus is reduced¹⁵⁹. Thus, it is demonstrated that even if retailers obtain a positive share of producer rents, offering exclusive territories can be profitable for manufactures as well, because demand at the upstream level becomes less sensitive to price, by making manufacturers less aggressive.

¹⁵⁹ If manufacturers grant exclusive territories to each of their retailers, the retailers, after learning the wholesale price of their own supplier, set their retail price simultaneously. Thus, in the region k of size \propto_k , the retailer of product *i* maximizes $\propto_k (p_{ik} - w_i)(1 - p_{ik} + dp_{jk})$. As retailer *i* does not observe the competing retailer *j*'s input price, it has to form an expectation about this price, and this is the same for retailer *j* about price of retailer *i*. each retailer believes that the competitor within the same region faces the symmetric equilibrium wholesale price ω^* , and resolving for each retailer, the retail prices are $p_{ik}(\omega_i, \omega^*) = \frac{z}{4-d^2} \left[1 + d\frac{1+\omega^*}{z} + \omega_i\right]$. Due to the double marginalization, $p^* > p^*$. Manufacturer's equilibrium profits are $\pi^* = \frac{z+d}{z-d} \frac{z}{(4-d-d^2)^2}$. That is to say that the equilibrium profits with exclusive territories is larger than the profit without exclusive territories as long as *d* is large enough (0.78 < *d* < 1). So, upstream firms are better off with exclusive territories if the two products are close enough substitutes, meaning that the competition between retailers within the same region is strong (Belleflamme & Peitz, 2010).

2.1.3.3.1.3. Exclusive Dealing

Exclusive dealing clauses included in a contract between upstream and downstream parts force a firm to make deals only with the other firm. They have been always seen as anticompetitive to the antitrust doctrine. Belleflamme and Peitz created a model based on a market with two sellers (an incumbent and an entrant), who offer purchasing contracts for a homogenous product, and a buyer, who can be interpreted as a retailer operating as a monopolist in its markets and able to extract all the surplus from the final consumers. It is assumed to have demand Q(p). The incumbent faces constant marginal production cost c_I an

the entrant faces c_E , assuming that $c_E > c_I$, and an entry cost e. Assume that entry occurs if no exclusive dealing clause is signed by making it efficient, that is to say if $(c_I - c_E)Q(p) > e$.

The four-stage game is shaped like that:

- 1. The incumbent offers the buyer a payment m in return for signing a legally binding exclusive dealing contract;
- 2. The buyer decides if to accept the contract or not;
- 3. After observing if the exclusive dealing will prevail, a potential entrant decides to enter or not;
- 4. The incumbent observes if entry occurred:
 - a. If the potential entrant did not enter, the incumbent would set the monopoly price p^m and obtain monopoly profit π^m ;
 - b. If the potential entrant entered, firms in the market set prices simultaneously, like in a Bertrand competition, so as the price is equal to c_I . The incumbent make zero sales and the entrant make profits $(c_I c_E)Q(c_I)$. Hence, for obtaining exclusivity, the incumbent is willing to pay up to π^m to the buyer upfront. However the buyer suffers a loss from accepting exclusivity because he has to pay the price p^m instead of c_I . The buyer's loss from confronting the incumbent as a monopolist instead of competition between incumbent and entrant is $\Delta CS = \int_{c_I}^{p^m} Q(p) dp$. Since it is higher than π^m , the buyer cannot

accept at these conditions. Hence, it is not profitable for the incumbent to induce the buyer to accept exclusive dealing.

Thus, actually, in this setting, exclusive dealing cannot be anticompetitive and it will not be observed at equilibrium.

However, in other setting it could be. Indeed, it is demonstrated that under imperfect competition, with uncertain costs of the entrant seller, exclusive dealing contract between the incumbent and the buyer including liquidating damages, before the entrance, can take place and can thus constitute a barrier of entry¹⁶⁰. This implies also that, due to imperfect competition and a contract design including liquidating damages, an incumbent firm can exclude a more efficient rival.

However, this exclusion is not always possible. Indeed, if an entrant enjoys increasing returns so that its average cost is decreasing, if a sufficiently large number of buyers sign up an exclusive contract with the incumbent, the entrant cannot offer attractive terms to the buyers; otherwise, it can. Effectively, by signing up with the incumbent, buyers exert a negative externality on other buyers; the incumbent thus avoids entry if it manages to convince a sufficiently large number of buyers to sign the exclusive dealing contract. It is demonstrated that, due to buyer miscoordination, an incumbent firm can possibly make buyers sign exclusive dealing clauses. Here, the incumbent firm is better off with these clauses in place and the more efficient rival firm is excluded from the market¹⁶¹. However, there exist another equilibrium where the buyers can coordinate their decisions. In this case we are back to the original settings and the exclusive dealing clauses are not anticompetitive.

¹⁶⁰ It is demonstrated that entry does not take place if $C_{z} > 1/2$. In this case, the incumbent's monopoly position allows him to extract the full surplus. This implies that the expected price paid by the buyer is $Prob\left(C_{z} \le \frac{1}{2}\right) \times \frac{1}{2} + Prob\left(C_{z} \ge \frac{1}{2}\right) \times 1 = \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times 1 = \frac{1}{4}$. This is the same expected price if it signs the contract. Therefore the buyer has no incentive to reject the contract proposed by the incumbent. Incumbent is better off with long-term con tract as it gains $(p - c_{z})Prob\left(CE \ge \frac{1}{4}\right) + penalty \times Prob\left(CE < \frac{1}{4}\right) = \frac{1}{4}$. Otherwise, without contract, it would be $\int_{\frac{1}{4}}^{\frac{1}{4}} \left(C_{z} - \frac{1}{2}\right) dC_{z} = \frac{1}{4} \le \frac{1}{4}$. Thus, in the model with uncertain costs of the entrant seller, the incumbent seller offers an exclusive contract before entry takes place that will be signed by the buyer. This contract implements the allocation under vertical integration and therefore constitutes a barrier of entry (Belleflamme & Peitz, 2010).

¹⁶¹ Suppose that in absence of exclusive dealing contract with one buyer, entry by the more efficient firm takes place $(2(C_t - C_z)Q(C_t) > f)$. However, an entrant who sells to one buyer only cannot recover its entry costs at price C_t , as $(2(C_t - C_z)Q(C_t) < f)$. Hence, if the incumbent can sign the exclusive dealing contract with one buyer, entry is not viable. The incumbent is willing to pay up to π^{-1} to each buyer, so that buyer 2 signs. Entry will not take place and the incumbent sets the monopoly price p^{-1} independent of the fact the buyer 1 will sign or not. Therefore, buyer 1 has an incentive to sign, and there is an equilibrium where the incumbent offers a positive payment to both buyers for obtaining exclusivity, both buyers sign and entry by the efficient firm does not take place, such a sub-game perfect equilibrium has the feature that buyers suffer a coordination failure (Belleflamme & Peitz, 2010).

There is also the possibility that the incumbent propose discriminatory contracts (the socalled "divide-and-conquer strategy"): it may offer buyer 1 a contract it finds impossible to resist, more convenient than for the other buyers. It is demonstrated that, by offering discriminatory contracts, an incumbent firm can induce a subset of buyers to strictly prefer exclusive dealing and thus monopolize other buyers without paying them for signing exclusive dealing contracts. The rival firm is then effectively excluded from the market¹⁶². To implement discriminatory offers, the incumbent may condition its offers on observable characteristic of buyers, or it may limit the total number of buyers to which such an offer applies, by taking a closer look at the possibility that it can sequentially make contract proposals to buyers.

Hence, to say in other words, exclusive dealing can be anticompetitive in markets in which incumbents enjoy a high degree of market power.

2.1.3.3.2. Vertical Mergers

Vertical mergers (upstream and/or downstream mergers) can have efficiency-enhancing effects, by solving the double-marginalization problem, but also anticompetitive nature.

In their model, Belleflamme and Peitz focus on input foreclosure: vertical integration may lead to higher input (or wholesale) prices for competitors. So, a vertical merger can be used to raise rivals' costs. The model is based on a Cournot competition and we assume that upstream and downstream markets are homogeneous oligopolies. Suppose that upstream and then downstream firms simultaneously set quantities. In this market, n^u firms compete upstream and n^d firms compete downstream, inverse demand is P(Q) = a - bq. Consider vertical mergers by k upstream and k downstream firms, there remain n^u -k nonintegrated upstream firms and n^d -k nonintegrated downstream firms. Vertically integrated firms are assumed to not be able to commit to quantity in the upstream market but they can adjust production in downstream market. While the marginal cost for a vertically integrated firm is c, downstream firms face an input price of w per unit determined by the market. In this

¹⁶² Assume that incumbent offers buyer 1 a contract which is impossible to resist, so that it is sure of obtaining monopoly rents from buyer

^{2.} The offer to buyer 1 is equal to $\Delta CS = \int_{c_1}^{p^m} Q(p) dp$ plus a very small amount for signing an exclusive dealing contract, while not making any contractual offer to buyer 2. The incumbent is better off making such offer rather than not making any offer if $2\pi^m - \Delta CS > 0$, that is to say if demand is linear. Such "divide-and-conquer" strategy is more costly for the incumbent than relying on buyer miscoordination but has the advantage for the incumbent that the entrant is excluded in any equilibrium following this contract offer (Belleflamme & Peitz, 2010).

setting the profit maximizing choice of a vertically integrated firm depends on its conjectures about the response of total quality upstream and downstream to its activity on the input market. Belleflamme and Peitz assume that if a vertically integrated firm sells an extra unit of the input, it presumes that all other upstream manufacturers do not change their quantity; if a vertically integrated firm buys one unit of input from some other upstream firms, it presumes that the total quantity of inputs increase by one units. It is better for the firm to produce this unit by itself. Hence, it follows that the cost-advantage of a vertically integrated firm depends on the degree of market power of upstream manufacturers. Moreover, it is demonstrated that vertical integration may raise the costs of non-integrated downstream rivals and that a higher wholesale price may or may not lead to higher retail prices.

It is also demonstrated that downstream vertical integration reduces the number of outlets through which upstream rivals can sell and thus reduces profits if deviating from a collusive outcome: vertical integration may then facilitate collusion.

2.1.3.4. A STEP TOWARD INNOVATION: R&D COOPERATION

R&D investments result immediately and for sure into an innovation, as it is the underlying reason they are sustained. So we can think of R&D as a strategic tool to use to increase a firm's competitive advantage through innovation, and this is very interesting when R&D cooperation is involved. Belleflamme and Peitz investigated this topic.

R&D is like any form of investment preceding the production stage, and they take into account the strategic commitment that inevitably arises in considering R&D decisions. In their model, Belleflamme and Peitz place the firms in a symmetric position, by allowing them all to invest in R&D. R&D also exhibits many of the attributes of a public good, and they introduce this assumption in the model by assuming the fact that R&D by one firm typically leads to spillovers benefiting other firms. Moreover, the model incorporates the possibility for firms to cooperate on R&D decisions and to internalize spillovers. Such form of cooperation is supposed to be widespread and also in the reality is widely allowed, if not encouraged, by public authorities. Finally, the context is an industry of two symmetric firms competing in a two-stage game:

- Firms simultaneously conduct process R&D and choose R&D expenditures r(x_i) to reduce their marginal costs by x₁ and x₂. The assumption is that R&D activities exhibit decreasing return on scale: c_i(x_i, x_j) = c − x_i − βx_j, where β ∈ [0,1] is the spillover effect measuring the extent to which firm *i* benefits from R&D undertaken by firm *j*: when β is equal to zero R&D is a private good, if it is equal to 1 R&D is a public good.
- 2. Upon observing x_1 and x_2 , firms compete in the product market with substitute products. Each firm's profit is equal to $\tilde{\pi}_i = \pi_i [c_i(x_i, x_j), \sigma_i, \sigma_j] r(x_i)$. σ is the firm's strategic choice in the second stage about quantity or price competition.

It is demonstrated that under quantity competition quantities are strategic substitutes $(\pi^{ij} < 0)$, whereas under price competition prices are strategic complements $(\pi^{ij} > 0)$, a crucial difference for assessing the effect of strategic behavior and of R&D cooperation.

As far as the effect of strategic behavior is concerned, they assume that investments are strategic in the sense that they are carried out with a view to affect the environment in which the second-stage game is played. It is demonstrated that, in the absence of strategic behavior and of R&D cooperation, the marginal private return to R&D per unit of output is simply the reduction in the firm's own unit costs¹⁶³. However, when firm *i* is strategic, it also anticipates the effect of its R&D choice on the subsequent product market equilibrium, and there are two potential effects to take into account: (1) the effect on π_i due to a change on firm *i*'s own

second-stage action, but it is nil so it can be ignored; (2) the strategic effect resulting from the combined influence of firm *i*'s investment on firm *j*'s second-stage action and of firm *j*'s action on firm *i*'s profit. It is demonstrated that the strategic effect of an increase in the R&D of one firm on its own profit is¹⁶⁴:

¹⁶³ When firm *i* asses the effect of increasing its R&D intensity, it first considers the direct or "cost-minimizing effect" $\begin{pmatrix} \frac{\partial \pi_i}{\partial \pi_i} & \frac{\partial \pi_i}{\partial \pi_i} \\ \frac{\partial \pi_i}{\partial \pi_i} & \frac{\partial \pi_i}{\partial \pi_i} \end{pmatrix}$ a further cost reduction will have on its profits. From the production costs, the direct effect is simply equal to the equilibrium second-stage quantity q^* . If firm *i* were non-strategic, that is the only effect that would matter for its choice (Belleflamme & Peitz, 2010).

¹⁶⁴ Indeed, in absence of spillover ($\beta = 0$), firm j's reaction function does not move and the new equilibrium is such that firm j produces a lower quantity as a result of the increase in x_i . However, for $\beta > 0$, firm i's R&D investment also reduces firm j's marginal cost, which shifts firm j's reaction function to the right. If firm j's reaction function moves sufficiently outward, the new equilibrium is such that a firm j

- Positive for small spillovers ($\beta < \overline{\beta}$) under quantity competition, where $\overline{\beta}$ is the threshold value of the spillover parameter around which the sign of the strategic effect changes;
- Negative for large spillovers $(\beta > \overline{\beta})$ under quantity competition;
- Always negative under price competition.

This is because an increase in its R&D expenditure makes the firm a tougher competitor, and thus it is worth investing more from a strategic point of view only if tough behavior meets a soft response of the rival firm. This is the case under quantity competition, provided that spillovers are small enough (because otherwise, the other firm also becomes a tougher competitor), and is never the case under price competition.

As far as the effect of R&D cooperation is concerned, Belleflamme and Peitz assume that cooperation does not affect the value of the spillover parameter. We can distinguish between R&D Cartel and Cartelized Research Joint Venture (RJV).

In case of **R&D Cartel**, it is demonstrated that R&D activities in the presence of spillovers create two types of externalities: (1) influence on the whole industry profits and increase in the level of spillovers, ignored when firms choose R&D separately and internalized when they choose it together to maximize their joint profits; (2) influence on the firm's competitive advantage, to become more efficient than their rivals, that exist when R&D is chosen independently by firms but it is fully internalized when they act cooperatively. If spillovers are large enough, the competitive advantage motivation for investing in R&D is weak, whereas the temptation to free-ride on the other firm's effort is high; as a result, cooperation leads to larger investments in R&D, implying further reductions in unit costs and a larger output.

In case of **Cartelized Research Joint Venture (RJV)**, firms not only coordinate their R&D decisions but also share their information completely so as to eliminate duplication of effort. As a consequence, the final spillover parameter β is internally set to unity: this naturally tends to make cooperation more attractive from a welfare point of view. Indeed, it turns out

produces a larger quantity than before. Thus, there exists a threshold value of the spillover parameter around which the sign of the strategic effect changes, and we denote it as $\vec{\beta}$ (Belleflamme & Peitz, 2010).

that a cartelized RJV yields a superior performance compared to non-cooperative R&D in all criteria of interest: propensity for R&D, firms' profits, consumer surplus, and thus social welfare. That leads to unambiguous antitrust implications: public authorities should permit simultaneous R&D sharing and coordination of R&D decisions among firms competing in a product market.

2.2. Concluding Remarks

Chapter Two of our thesis contains a screening of the main Models of Collaboration between firms developed so far within different economic fields of study. We have considered three different perspectives: Managerial, Financial and Industrial.

From a managerial perspective, we saw that firms should seek the Cooperative Equilibrium (Ring & van de Ven), by adhering to both the explicit and implicit guidelines, to let the partnership continue with repetitive sequences of interactions. The starting conditions to manage, in order to find a Cooperative Equilibrium, have been identified as uncertainties, efficiency and equity criteria for assessing a cooperative interaction, the need for internal resolution of disputes, and the importance of role relationships. We have also seen that the development of a cooperative inter-firm relationship passes through three main steps, namely Negotiation Stage, Commitments Stage and Executions Stage. It is possible that, due to the occurrence of "disruptive events", the process is forced into a renegotiation to preserve the ongoing relationship. By analyzing the interactions between partners, Lui & Ngo found that certain Action Types (Acquiescing, Compromising, Avoiding, Defying, Manipulating), by combining together, drive the creation of specific Action Patterns (Action Acquiescence, Action Simplicity, Action Reciprocity). The development of one action pattern, rather than another, is also strongly influenced by partnership characteristics, which are represented by inter-organizational trust, asymmetric dependence and firms' similarity. The influence produced by these features, however, is mitigated by the effect of asset specificity and partners' reputation, which act as transaction costs variables. In international interorganizational partnerships, cultural differences have to be recognized, weighted and duly managed. To do that, many cultural frameworks have been developed, each of them showing different pools of factors, which could be used to "describe" a certain culture and put it in comparison with another one. These factors have the same utility as the Axelrod's factors in his cultural model exploring how cultural differences can evolve during an ongoing interaction among people. Thus, these frameworks can integrate, in a certain way, the Axelrod's model on cultural dissemination.

From a financial perspective, we have investigated the current models available to understand if a M&A operation could increase or destroy value. Indeed, we investigated both drivers of value creation – mainly Synergies and how to duly manage the inevitable transaction costs – and causes of value destruction – mainly Agency costs, Managerial Entrenchment and Managerial Hubris. We also discuss a method whose aim is to help in answering the question "How can firms successfully choose a compatible companion?". Indeed, it compares a series of "compatibility" attributes through a mathematical model, to identify the ideal profile of a possible partnering firm. The results depend both on firms' sets of characteristics and on the degree of symbiosis between these two sets. We also specifically investigated R&D Joint Ventures, by relying on the Aloysius's Joint Venture Game, which tries to help firms in considering both advantages and disadvantages of engaging in such types of collaborations. He found that symmetric firms always have an incentive to cooperate, and that the introduction of asymmetry can seriously endangered cooperation, and he tries to formulate the "necessary conditions" for cooperation. He concludes that, even if cooperation by firms may be theoretically optimal, negotiations and bargaining are necessary to provide an acceptable outcome to all parties involved.

Finally, from an industrial point of view, we have analyzed how cooperation influences industrial dynamics by having as a surrounding background the evergreen Porter's Model of the five industrial strategic competitive forces, and by relying on a micro-economic approach. As for Direct Competitors and Substitutes, cooperation can arise through Collusion (Tacit or Explicit) and Horizontal Mergers. We saw that explicit collusion could take the form of Simultaneous Cartel, Sequential Cartel or Networks of Market Sharing Agreements. Instead, tacit collusion comes from a "meeting of minds" between colluding firms, but it can emerge only when competition is repeated over an infinite horizon, as - at the end of each period - there is a probability for firms to meet at least one more time. Horizontal mergers are more likely to be profitable if the market is concentrated. Moreover, they can increase firms' efficiency, by producing Synergies and Scale Economies. Also, in case of new entry, it is

demonstrated that a merger is not profitable when firms are sufficiently patient. By talking about new entrants, we saw that cooperation can arise between incumbents (for entry deterrence) or between incumbents and new entrants (for complementary innovation). In the first case, the danger of free riding is particularly high; while in the second case we are talking about a practice which has started to spread very quickly, mainly in the pharmaceutical industry. In the latter case, cooperation is not really contemplated when entrants could become direct competitors of the existing company, but just with complementary products providers. Finally, as for Buyers and Suppliers, we are talking about Vertical integration, where the main issue is the so-called "double-marginalization problem". Vertical integration can originate through Strategic agreements (i.e. resale price maintenance, exclusive territories, exclusive dealing) and Vertical mergers. We also eventually discussed the case of R&D cooperation and we found that R&D expenditure makes the firm a tougher competitor, and thus it is worth investing more form a strategic point of view only if tough behavior is met by a soft response of the rival firm.

Thus, we can conclude that managerial, financial and industrial organizational models are very different from each other. Nevertheless, we cannot underestimate the similarities. Indeed, we can say that every perspective here analyzed is a complement of each other. Each of them are fundamental to comprehend the real impact of cooperation and what is produced through it in terms of managerial, financial and industrial dynamics. We will see that each of them will be useful to come up with the appropriate insights to build our desired Mid-range theory.

However, to be closer to our solution, we have also to investigate cooperation as a "process", as a flux of ongoing interactions, according to the work methodology determined in the Introduction. We will discover that our curiosity will bring about further deepness to our discussion and a fundamental contribution to the achievement of our comprehensive solution.

3. CHAPTER THREE – COOPERATION AND KNOWLEDGE MANAGEMENT: THE "GAME"

The previous two Chapters have been related to the *entitative dimension* of Cooperation. We discussed several models according to which cooperation evolves according to various fields of study. The majority of them seem to be correlated, and present many conceptual similarities.

Chapter Three will focus on the opposite dimension of the cooperative process, by exploring it as a *flux of interactions* between human beings, as continuous exchanges in behaviors and knowledge, in a constant evolution that is possible if we are together. We will see the possible implications of this approach in terms of cooperation and knowledge creation, by departing from the single individual to relationship among organizations.

The first part of the Chapter relies mainly on the conclusions of one of the most important contribution in cooperation studies: a 2012-book of **Richard Sennett**, *Together*, *the Rituals*, *Pleasures & Politics of Cooperation*.

The second part is dedicated to the way cooperation can lead to knowledge creation and the methods through which it could be managed in a cooperative manner. We will ground on **Nonaka and Takeuchi's** school of thought. We will follow with a discussion on the more recent tendency in Knowledge Management to emphasize the so-called "**Communities of Practice**", in their traditional and hybrid virtual dimensions. Finally, we will conclude by proposing a new driver for knowledge creation and cooperation, which has recently started to be studied as a new strategic tool for firms: the **Game**, and why and how our companies, schools, business alliances and the whole society need it.

3.1. Collaboration as Flux of Interactions

After having considered cooperation as a set of steps and modeled it according to different theories, the effort is to find some literature about cooperation as an ongoing process and a flux. It brings us to explore some works not belonging to the economic sphere (not directly, we mean), but to philosophy and mainly sociology. One of the most recent contribution in the field is the recent Sennett's book, *Together*.

Richard Sennett¹⁶⁵ has explored how individuals and groups make social and cultural sense of material facts, including the way they are used to work¹⁶⁶. As a social analyst, Sennett continues the pragmatist tradition begun by William James¹⁶⁷ and John Dewey¹⁶⁸. Before the last book of our interest, he studied how personal identity takes form in the modern city (*The Uses of Disorder, 1970*), how working-class identities are shaped in modern society (*The Hidden Injuries of Class, 1972*), cities as public realms (*The Fall of Public Man, 1977*) and the philosophical implications of this perspective (*Authority ,1980*), urban design (*The Conscience of the Eye, 1990*), and even how bodily experience has been shaped by the evolution of cities (*Flesh and Stone, 1992*)¹⁶⁹. In the middle of 1990s, as the work-world of modern capitalism began to alter quickly and radically, Sennett began a project charting its personal consequences for workers, leading to some interesting works dealing with ethnographic account of how middle-level employees make sense of the "new economy" (*The Corrosion of Character, 1998*), the effects of new ways of working on the welfare state (*Respect in a World of Inequality, 2002*) and an overview of the changes in the current capitalistic environment (*The Culture of the New Capitalism, 2006*).

At the end of 2000s, he has explored more positive aspects of labor which are very linked to our discussion, with: *The Craftsman* (2008) and *Together* (2012). This is expected to be a

¹⁶⁵ R. Sennett was founder director of the New York institute for the Humanities, and is now University Professor at New York University. He has previously won the Amalfi and Ebert prizes for sociology and in 2010 was awarded the Spinoza Prize for outstanding contributions to public debate on ethics and morality (Sennett, 2012).

¹⁶⁶ To be precise, but also to not exclude anything, he studied how people can become interpreters of their own experience, even if society continuously obstacles them in doing so. His research entails ethnography, history, and social theory (Richard Sennett WebSite, 2014).

¹⁶⁷ William James (1895 – 1920) was an original thinker in and between the disciplines of physiology, psychology and philosophy. His personal reflection has given us such ideas as "the stream of thought" and the baby's impression of the world "as one great blooming, buzzing confusion" (Stanford Encyclopedia of Philosophy, 2013).

¹⁶⁸ John Dewey (1859-1952) was an American philosopher, associated with pragmatism. Over a long working life, Dewey was influential not only in philosophy, but as an educational thinker and political commentator and activist. Some have read him as a precursor of recent concerns about the relationship between liberal individualism and the social setting in which the individual is embedded. He has been seen as a source of inspiration for notions of participatory or deliberative democracy, by considering autonomy and talk-centred conception of democracy as mutually sustaining ideals for modern societies (Stanford Encyclopedia of Philosophy, 2013).

¹⁶⁹ He is also the author of three novels: *The Frog who Dared to Croak* (1982), *An Evening of Brahms* (1984) and *Palais Royal* (1987). (Richard Sennett WebSite, 2014)
trilogy, whose third volume (*The Open City*), will be published in 2016. This trilogy represents his three-book project on "Homo Faber", focusing on the skills human beings possess to make a life together.

Since a deep study on Sennett would require a separate dedicated work, we decide to discuss only one of his contributions, belonging to the **"Homo Faber" trilogy**, more linked to our purpose, and it is *Together (2012)*. The main conclusions of the book will be discussed in the following sections.

3.1.1. Cooperation, according to Sennett

Sennett defines cooperation as "an exchange in which the participants benefit from the encounter" (Sennett, 2012)¹⁷⁰. Thus, it is perfectly in line with our approach to cooperation as a flux and a process of interactions.

Cooperative exchanges can have many forms; they can even combine with competition. Cooperation can be formal as well as informal. Sennett, in *Together*, wants to focus on a small corner of what might be done about destructive cooperation of the us-against-you sort, or about cooperation degraded into collusion. The good alternative is a demanding and difficult kind of cooperation, which tries to join people who have separate or conflicting interests, who do not feel good about each other, who are unequal or who simply don't understand one another. The challenge is to respond to others on their own terms. This is the challenge of all conflict management techniques.

According to Sennett, "the most important fact about hard cooperation is that it requires skills", and mainly social skills. The most serious one of this sort are the capacity of listening well, behaving tactfully, finding points of agreement and managing disagreement, or avoiding frustration in a difficult discussion. These specific skills are commonly known as "Dialogic Skills".

Unfortunately, it seems that modern society is "de-skilling"¹⁷¹ people in practicing cooperation. Indeed, as we will discuss later in more depth, modern society has weakened

¹⁷⁰ This behavior is instantly recognizable in chimpanzees grooming one another, children building a sandcastle, or men and women laying sandbags against an impeding flood. Instantly recognizable, because mutual support is built into genes of all social animals: they cooperate to accomplish what they cannot do alone (Sennett, 2012).

¹⁷¹ The term "de-skilling" derives from the replacement of men by machines in industrial production, as complex machines replaced skilledcraft labour. In the 19th century, this replacement occurred with robotics, whose aim is to replace expensive human labour in providing

cooperation in distinctive ways, including inequality and change in modern labour. The Gini co-efficient, a widely used social statistical tool, measures that inequality has increased dramatically in the last generation, both in developing and developed societies¹⁷². Economic inequalities translate in everyday experience as social distance. Distances of this sort quite rightly make ordinary people angry: us-against-them thinking and behavior is a rational result. On the other hand, changes in modern labour have weakened both the desire and the capacity to cooperate with those who differ.

In principle, everyday modern organizations are in favor of cooperation, but, in practice, their structures inhibit it¹⁷³. Moreover, modern labour is increasingly short term in character, and social relations become short-term as well, so that employees cannot feel to be attached to each other: they become involved in superficial social relations, because if people do not stay long in an institution, both their knowledge of and commitment to the organization weaken. People keep to themselves, do not get involved in problems which are not of their immediate business, particularly with those in the institution who do something different. Moreover, cultural forces today work against the practice of demanding cooperation: the desire to neutralize difference, to domesticate it, arises from an anxiety about it, which intersects with the economics of global consumer culture. One result is to weaken the impulse to cooperate with others. Thus, we are losing the skills of cooperation needed to make a complex society work.

3.1.1.1. DIALOGICS

Dialogics names attention and responsiveness to other people. Usually when we speak about communication skills we focus on how to make a clear presentation. But, listening well requires a different set of skills, closely attending to and interpreting what others mean before responding, making sense of their gestures and silences as well as declarations. The result of a better understanding will be a richer exchange in the conversation, which will be more cooperative and dialogic. Actually, listening carefully produces conversations of two sorts: the dialetic and the dialogic. In the dialetic, the verbal play of opposites should gradually

services as well as in making things. It happens in the social realm in equal measure: people are losing the skills to deal with intractable differences as material inequality isolates them and short term labour makes their social contacts more superficial and activates anxiety about the others (Sennett, 2012).

¹⁷² (The World Bank, 2014)

¹⁷³ In managerial discussion it is recognized as the "silo effect": isolation of individuals and departments in different units, where people and groups share little and hoard information valuable to others. Changes in time which people spend working together increase this isolation (Sennett, 2012).

build up to a synthesis and the aim is to come eventually at a common understanding. Skills in practicing dialetic lies in detecting what might establish that common ground. Misunderstandings and cross purposes come into play, doubt is put on the table, and people have to listen harder to one another. Dialogic names a discussion which does not resolve itself by finding common ground. Although, through the process of exchange people may become more aware of their own views and expand their understanding of one another. But it can also happen that misunderstandings can eventually clarify mutual understanding. However, a dialogic conversation can be ruined by too much identification with the other person.

Both sympathy and empathy convey recognition, and both forge a bond and are necessary at different times and in different ways to practice cooperation. Sympathy means identification with the others and overcome differences through imaginative acts of identification. Empathy is the sentiment of curiosity about who other people are in themselves. It is more a demanding exercise, as the listener has to get outside him or herself. As a philosophical matter, sympathy can be understood as one emotional reward for the thesis-antithesis-synthesis play of dialetic. Empathy is more linked to dialogic exchange: even though curiosity sustains the exchange we don't experience the same satisfaction of closure, but it contains its own emotional reward as well.

By practicing indirection, speaking to one another in a subjective mood, we can experience a certain kind of sociable pleasure: being with other people, focusing on and learning about them, without forcing ourselves to appear like them.

Thus, conversation is like a rehearsal in which listening skills come to the fore, to interpret well by focusing on the specifics of what one hears. Dialetic and dialogic offer two ways of practicing a conversation, the one by a play of contraries leading to an agreement, the other by bouncing off views and experiences in an open-ended way. In listening well, we can feel either sympathy or empathy, both cooperative impulses. Anyway, modern society is much better at organizing the first sort of exchange than the second, by fostering a dialetic communication rather than a dialogic discussion. It appears also in the field of technological frontier of cooperation.

3.1.1.2. COOPERATION ONLINE

Conducting a written conversation online seems to be less painful, compared with speaking to someone on the phone or face to face. So, less physical communication and a sort of "cooperation in the flash" are the resulting outcome. New communication technologies have, however, irreversibly transformed the landscape of communication.

E-mail, mobile phone texting, blogs, Facebook, Wikipedia, Twitter, wikis, social networking software, and others technology-based communities has arisen during the last ten years, so that Andrew McAfee¹⁷⁴ coined the term Enterprise 2.0 to describe how these same technologies could be used on organizations' intranets and extranets, and to convey the impact they would have on business (McAfee, 2009). He states that the new tools of collaboration and interaction provide benefits to close colleagues, professional strangers and every level of tie strength in between. But not everyone agrees.

For instance, Sennett considers the example of Facebook in his 2012-book, as a tool constantly replacing face to face relationship. According to him, it makes people (youngsters mainly) machine dependent for friendship. Moreover, in social networking sites social transactions are less demanding, more superficial than face to face. However, it could be up to the person how to use these tools, so that to improve links among people. According to Sennett, social networking sites make the easy assumption that "inclusion" is the same as "cooperation". But, it is not the same, and, paradoxically, the pursuit of hundreds of friends, whose number is explicitly displayed, privileges competitive display.

Sennett discusses also about an interesting example, Google Wave, which should have been a new innovative online cooperative tools but which eventually ended up to be a failure. Google claimed it was an efficient way to cooperate, since irrelevancies fall to the wayside, but the program proved too simple. Its dialectical linear structure failed to account for the complexities which develop through cooperation. If someone found something unexpected, by obliging them to think "outside of the box", it would become impossible to continue a dialogic type of conversation. Indeed, side-screening has a huge social consequence within an online group: if dialogic conversation is eliminated step by step, the contributors of stray

¹⁷⁴ Andrew McAfee is a principal scientist at MIT's Center for Digital Business. He coined the term Enterprise 2.0 in a groundbreaking Sloan Management Review article. He has been named one of the 100 Most Influential People in IT (McAfee, 2009).

thoughts can feel left out as the project becomes increasingly defined. Because complex layers of meaning did not seem to build up, dealing with either our social nor technical issues, enthusiasm in the group begin to wane in following the dialectical narrative envisaged by the program. Sennett and his group were forced to meet face-to-face to practice more effective lateral thinking. Hence, one large reason for failure might have been that the program mistook information-sharing for communication. Information sharing is an exercise in definition and precision, while communication is as much about what is left unsaid as said.

Thus, the divide between information and communication affects the institutional practice of cooperation.

3.1.2. Competition and Cooperation: the Fragile Balance

If we think of the many situations where we have been in contact with other people, we can agree that cooperation and competition sometimes can combine. Both aggression and anger, and the impulse of goodwill are intrinsically embodied in human nature. Thus, what is needed is a balance between these two opposite feelings that can live together, and we can succeed in finding it through experience.

Sennett argues that striking a balance between the two means considering our nature as social animals. After an analysis of different cooperative and competitive behaviors in nature, he concludes that natural cooperation begins with the fact that we cannot survive alone and he makes a passage from nature to culture. There is a difference because, according to Hobbes, no equilibrium rules the life of the natural man, and hence the human capacity for peaceful cooperation is scant. Indeed, cooperation is certainly imprinted in our genes, occurring what the already studied R. Axelrod argues, that is to say that it happens also "without friendship or foresight". But cooperation cannot be stable because the environment itself is never fixed. It changes continuously. We are more complex than animals or insects, and, as Sennett points out:

"The genetic social knowledge of these insects is quite incomplete, no single leader or top ant possess it, there is no overseer or "brain caste" who carries such a master plan in its head, and no single bee carries an entire master plan of bee society in its brain. If individual incompleteness grounds the lives of social insects, still environmental domination by ants and other social insects is the result of cooperative group behavior. How can the incomplete brain and social control be reconciled?"

And also,

"Individually insufficient creatures compensate through the division of labour, each executing small, separate tasks, the group becoming thereby potent. But here again there is an unexpected twist. Social insects, for instance, possess enough genetic code to take over, when sickness or misadventure requires, some of the specialized tasks performed by other members of the nest or hive; the division of labour is flexible, and social insects can switch roles temporarily. This is surprising, because we usually think of a hive as efficient the way a factory is, where the division of labour is locked into fixed tasks. In the nest or hive, though, efficiency and rigidity do not equate; cooperation is more supple."

Within humans, striking a balance between competition and cooperation is needed. There are different levels of relationship between the two and they depends on the types of exchanges occurring between individuals: because cooperation is a flux of exchanges.

3.1.2.1. THE SPECTRUM OF EXCHANGE

Exchange represents the "experience of give and take among all animals", arising as a result of the life's basic rhythm of stimulus and response. Sennett divides the spectrum of exchange into five segments: (1) Altruism; (2) Win-Win; (3) Differentiating Exchange; (4) Zero-Sum; (5) Winner-Takes-All.



Cooperation and competition are most balanced in the middle of the spectrum of exchange.

The **win-win exchange** occurs on both nature and culture, but in both the balance is fragile. Here competition can produce mutual benefits, as in the market exchanges imagined by Adam Smith¹⁷⁵. The main human example of win-win is the business deal where all parties gain: they may have competed to arrive at this shared result, but eventually something for everyone emerges. However, the balance between competition and cooperation does not happen naturally in business dealings or in other situations, without a will to do that. Negotiating skills are fundamental to the balance achievement, and these skills constitute a craft of their own. Win-win exchanges are more often open-ended processes than a net list of gains and losses that people can come up against when they begin negotiating. In the very middle of the spectrum, we have **Differentiating exchange**, which is the "province of dialogics". Dialogic exchanges differentiating individuals, and groups can balance cooperation and competition, by means of ritualized moments celebrating the differences between members of a community, affirming the distinctive value of each person¹⁷⁶, with the power to reduce the "acid of invidious comparison" and foster cooperation. At one extreme of the spectrum, **Altruism** is an involuntary force in natural communities and an experience which is internalized among humans. Altruism focuses on gift-giving, and cooperation with other people here is not the point; the altruist is motivated by an internalized dialog with an inner companion, whose result is that altruistic behavior shapes our sense of personal agency. In **Zero-sum exchange**, one individual's or group's gain becomes another's loss¹⁷⁷. Here,

¹⁷⁵ Adam Smith was not a naturalist working out in the field, but he subscribed to the belief of Linnaeus and others that nature balances competition and a live-and-let-alive sort of companionable order. He accepted a social version of the 18th century's celestial machine. This is clear in his famous *invisible hand* ensuring a market competition through which everyone can receive something at the end (Sennett, 2012).

¹⁷⁶ Establishing territory through marking out borders and boundaries is fundamental in nature, but becomes more specialized and subtle in humans (Sennett, 2012).

¹⁷⁷ According to Sennett, two little lies about zero-sum exchange are frequently believed as true: (1) "I didn't want to hurt you, I'm sorry you are losing out, but in life that's the way the cards fall out", and so on. It is not true that the winner is sorry for the other's loss, as the winner often takes pleasure in the loser's fate; (2) "I really don't care" on the loser's part. (Sennett, 2012).

competition prevails but it requires cooperation to begin, actually. Indeed, zero-sum exchanges require cooperation among individuals on the same side at least. Anyway, even between opponents it entails a certain kind of cooperation, since they have to set the rules of the game together. Another sort of connection between opponents is the fact that the winner will always give something to the loser, if competition is to continue; otherwise, total selfishness will abort new games. At the other extreme, **Winner-takes-all** cases see all connections between the two cut away. In business, winner-takes-all exchange is the logic of monopoly: the idea is to eliminate all competitors.

To conclude, Sennett argues that rituals are one way of structuring symbolic exchanges, as they can establish powerful social bonds, and have proved tools which most human societies use to balance cooperation and competition. In general, rituals are established as a consequence of the historical background and sometimes we do not remember why we are continuing doing a certain action as a habit. But, Sennett recognizes three ways rituals can try to be established to balance competition and cooperation:

- 1. **Rituals depend on repetition** for their intensity. We usually equate repetition with routine, going over something again and again, as a rehearsal process. Nevertheless, repetition has to follow a certain course to stay fresh, and refreshment incurs by ingraining a habit;
- 2. **Rituals transform objects**, bodily movements or bland words into symbols, and sorts them with the help of practice and practice, and also in this case we can ingrain a habit;
- 3. **Rituals are also connected to expressions**. We linked some rituals with feelings and emotions and we know how it is suitable to behave or not. So it becomes a habit to behave in a certain way during the connected rituals.

Another point is that rituals have to be accessible and easy-to-learn, so that everyone can participate. In the business world, these rituals are usually small events (i.e. coffee break).

3.1.2.2. REFORMATION OF COOPERATION: THE "ARTISANAL" WORKSHOP

From the first book of the "Homo Faber" trilogy, Sennett discusses and believes in the power of the "craftsman" and "artisanal" workshop approach.

The workshop is one of the oldest institution of human society, and one reason for this grounds on how artisanal works is done: it is a shared practice with others, rooted to one place. Moreover, it has to practice efficient internal coordination if they were to provide for more than local need, and it was mainly a matter of organizing men's time.

The idea that laboratories have distinctive rituals has become by now a commonplace, and an entire branch of sociology is devoted to studying these codes of deference and assertion, cooperation and competition in the lab. And, also, innovation changed the meaning of cooperation within it. Cooperation had to make sense of accidents of work, the accidental discovery of something new or different. The laboratory-workshop thus brought dialogic communication to the fore. Experiments make one kind of win-win exchange particularly important: the mutual benefit coming from lateral thinking. This experimental process, emphasizing what we would call interdisciplinary thinking, made the workshop itself a place for dialogic communication and informal association. However, this type of "scientific" cooperation can establish only if conducted in a civilized way.

These argumentations given, Sennett states that the modern society needs a "Reformation" in the social arrangements for cooperation, and that

"Modern capitalism has unbalanced competition and cooperation, and so made cooperation itself less open, less dialogic."

3.1.3. Cooperation Weakened

Sennett recognizes two forces which are weakening cooperation: structural inequality and new forms of labour. These two are due to the model of capitalism currently dominating our economic framework and have psychological consequences on people, by leading to the rise of the "uncooperative self".

3.1.3.1. INEQUALITY

Today, inequality has increased, since the gap between the rich and the middle classes grows continuously¹⁷⁸. This is a sign of the zero-sum competition, which is even veering toward the winner-takes-all extreme, with the capitalist as the winner. Thus, it is clear that, in capitalism, social cohesion is inherently weak.

It could be useful to compare our culture to foreign ones, to see what are the main differences in dealing with social capital and cooperation. One example is the modern China: the country is now aggressively capital, yet it has a strong code for social cohesion, named *Guanxi*. Guanxi refers to the "concept of drawing on connections or networks to secure favors in personal or business relations" (Luo & Chen, 1997). People who share a Guanxi relationship are committed to one another by an unspoken code of reciprocity and equity, based on the *Renging*, that is to say humanized obligation as a form of social capital providing leverage in interpersonal exchanges¹⁷⁹. When Chinese people weave their Guanxi network, they also create a web of Renging obligations, and, while enjoying the benefits of a connections' network, they also take on a reciprocal obligation which must be repaid in the future. Guanxi seems to be the lifeblood of Chinese business community, as well as politics and society at large. Also Western marketing and management literature believes in the role of networks, but there is a difference with the Chinese Guanxi. The former has increasingly viewed the management of networks as an important aspect of strategic behavior and viewed the networking paradigm as a means of understanding the totality of relationships connected to the firm. Networking can enhance a firm's competitive advantage by providing access to resources of other network members. Guanxi recognizes all these benefits and in the same way emphasizes the fact that networks are not discrete events in time but continuous relationships. However, Guanxi mainly relates to personal, not corporate, relations, and exchanges that take place amongst members of the network are not solely commercial, but also social.

¹⁷⁸ In USA, the wealth share of the middle class has increased 18% in real dollars during the last 50 years, while the wealth share of the top 5% has increased 293%. The odds of a student in the middle class making as much income as the parents are 2-5, while the odds of the top class becoming wealthy as the parents are over 90% (Sennett, 2012).

¹⁷⁹ It is also linked to the broader cultural belief that there is nothing in the universe that can survive without its interconnection with other things: everything is conditioned and reciprocally influenced (Liu & Boutin, 2008).

In 2012, Yadong Luo¹⁸⁰ performed a research on fifty-three empirical studies on the linkage between Guanxi and organizational performance. His result confirms that Guanxi enhances organizational performance and suggests that business ties continue to play a prominent role in facilitating organizational performance. The importance of government ties, however, has been steadily declining on account of the improvement in the institutional environment and a gradually established rule of law in China during the last decade. The continuing importance of business ties in business transactions reflects the deep rooted cultural characteristics of personal relationships in social and economic life in Chinese society (Luo, et al., 2012).

Guanxi is thus an example of how a social bond can shape economic life, based on informal cohesion fostering dialogic exchanges. According to Sennett there are two reasons why we might want to think like the Chinese society about cooperation:

- 1. If informal, the Guanxi network is also meant to be sustainable: Guanxi is a relationship meant to endure from generation to generation, and it is a question for us of holding people accountable in the future for their actions in the present;
- 2. People in a Guanxi network are not ashamed of dependency: modern family life and business practice has extended the idea of self-containment, by considering dependency on others as a sign of weakness, a failure of character. However, a fear of social embeddedness dominates the life of who does not ask for help.

When cooperation is higher, inequality is lower (Sennett, 2012).

3.1.3.2. THE SOCIAL TRIANGLE

By looking at labour conditions, we see that manual labour forged informal bonds at work, consisting of three elements composing a "social triangle", according to Sennett: (1) workers extended grudging respect to decent bosses, who returned equally grudging respect to reliable employees; (2) workers talked freely about significant mutual problems, and also covered in the shop for co-workers in trouble; (3) people were really involved, by doing extra hours or other people's jobs when something went temporarily and drastically wrong.

So, the "social triangle" is composed by Earned Authority, Leap-of-faith Trust, and Cooperation.

¹⁸⁰ Yadong Luo is the Emery M. Findley distinguished chair and professor of management at the University of Miami. He is also an elected fellow of the Academy of International Business and a distinguished honorary professor at Sun Yat-Sen Business School, China.

Earned authority manages the everyday experience of inequality by moderating humiliation in the relation of command and obedience and informal discussions can become binding rituals.

Trust is necessarily linked to a lead of faith: we have to decide to believe that someone could genuinely be helping out. Mutual trust can be built on such a conviction, and proves a stronger bond than trust based on lower levels of risk.

Earned Authority

Cooperation

Leap-of-faith

Trust

Figure 33 - The Social Triangle (Source: Sennett, 2012)

3.1.3.3. THE UNCOOPERATIVE SELF

Inequality and new forms of labour have psychological consequences on people in society, since a distinctive character type is emerging: the person who cannot manage demanding, complex forms of social engagement, and so decides to withdraw, by losing the desire to cooperate with others. This person is called by Sennett the "uncooperative self".

The Uncooperative Self is characterized by anxiety, like every person. But, the way it is managed is very different. People react to feel less anxious. The uncooperative self's reaction is the isolation from the others by bringing about the withdrawal. Sennett argues that, when the purpose is just to relieve anxiety in dealings with others, these withdrawals produce a kind of blindness, and there are two psychological ingredients of this blindness: (1) narcissism; (2) complacency.

Narcissism is seen as something more complex than selfishness, related to sympathy and the fact to be in a "mirror state" where the person sees only him/herself reflected when dealing with others. These people are going to feel anxiety when reality intrudes, by feeling a threatened loss of self rather than an enrichment of self. In these cases, anxiety is reduced by restoring feelings of being in control: when this inner psychological transaction occurs, social consequences follow, and the main one is that cooperation diminishes.

Complacency is something different from being secure. Being secure leads to the willingness to experiment, to unleash curiosity. Complacency is not outward-looking, because it expects experience to conform to a pattern already familiar to oneself, so that experiences seem to repeat routinely rather than evolve. The formation of complacency turns on individualism, and cooperation withers.

3.1.4. Cooperation Strengthened

However, the weakening of cooperation is not fatal, as it can be repaired, by strengthening some skills which are fundamental to manage complex cooperation, according to Sennett.

The dialogic conversation, connected to the way artisans share labour in a workshop, how people can diplomatically manage conflicts with others who they do not know really, and their aptitude in the broader context of community, can be analyzed and shaped to promote the Reformation of cooperation.

3.1.4.1. THE CRAFTSMAN

Let us come back to the image of the "artisanal workshop" and try to understand better how work is organized inside.

The workshop is characterized by people with technical skills, which can have two basic forms: making and repairing things. Making are usually considered as the more creative activity and repairing is seen as something happening after-the-fact work, but they are not so different, actually.

"Craftsmen who are good at making things develop physical skills which apply to social life. The process happens in the craftsmen's body; social-science jargon makes this link between the physical and the social by using the ugly word 'embodiment'."

Sennett analyzes three of these "embodiments":

- 1. How the rhythm of physical labour becomes embodied in ritual;
- 2. How physical gestures give life to informal social relations;
- 3. How the artisan's work with physical resistance illuminates the challenge of dealing with social resistances and differences.

According to him, the process of Reformation should be based on applying experiences inside the workshop to society.

Rhythm and RitualThere is a rhythm governing the development of human skills, composed by some
stages: (1) Ingraining a habit through repetition; (2) Skills expands by questioning the
established habit, through conscious experiments; (3) the new "skill" has to become re-
inscribed as a habit, by developing a full quiver of techniques enabling mastery of
complex problems. The rhythm of skills development becomes a ritual if practiced
again and again. Rituals are embraced if people feel they are adapting, expanding and
improving their behavior.

- *Informal Gestures* Gestures might seem just a built-in involuntary reflex. However, anthropological studies reveal that culture makes a big difference in shaping those gestures. Some scientists or evolutionists (i.e. Charles Darwin) believed to be involuntary. We can have control of them, since visual thinking is even thinking, despite it cannot be translated into words. This sort of mental-visual work allows us to learn from the displays other people make to us when gesturing. Moreover, gestures can inflect the rhythm of making, suspending and remaking habits in time, and they are also the means by which we experience the sensation of informality. The informal social triangle is a social relationship we make; gesturing is one way to enact the relationship and "the better we get at gesture, the more visceral and expressive informality becomes".
- *Working with Resistance* "The artisan knows one big thing about dealing with resistance: not to fight against it, as though making war on knots in wood or heavy stone; the more effective way is to employ minimum force". In fighting against resistance it is probable to become more focused on getting rid of the problem rather than understanding the reason why it is. By working with resistance we can succeed in stopping frustration at being blocked and in engaging with the problem on its own right. Applying minimum force seems to be the most effective way to work with resistance: it is also a basic rule in engineering¹⁸¹, and it matters particularly in dialogic social behavior. Only through behaving with minimum self-assertiveness we can open up to others.

Figure 34 - Embodiments in Workshop (Source: Sennett, 2012)

These are three modes of making things full of social implications: the rhythm of developing a physical skill can embody ritual, gestures can embody the informal social triangle, using minimum force can embody response to those who resist or differ.

¹⁸¹ Machines conserve Energy by using the fewest moving parts and making the least possible moves, to get rid of friction (Sennett, 2012).

What is important now is to focus on repairing, not just on making. Sennett distinguishes three ways to perform it:

- 1. **Restoration**: making a damaged object seem just like new, governed by the object's original state;
- 2. **Remediation**: improving the operation of the object, by substituting better parts or materials while preserving the old form;
- 3. **Reconfiguration**: altering the object altogether, by re-imaging the form and use of the object in the course of fixing it. Improvisation is the key for radical repairs of this sort.

Indeed,

"Cooperation is not like a hermetic object, once damaged beyond recovery; (...) its sources – both genetic and in early human development –are instead enduring; they admit repair."

Reconfiguration is more experimental in outlook and more informal in procedure: repairing broken social relations can become open-ended, especially if pursued informally. So, within the three methods, reconfiguration seems to be the most socially engaging and it has proven to be the most effective in renewing cooperation.

3.1.4.2. EVERYDAY DIPLOMACY

Everyday diplomacy is one way people deal with people they do not understand, cannot relate to or are in conflict with. To succeed in this issues people continuously behave in society in the same way to repairing and making things in a workshop¹⁸². Everyday diplomacy has the power to put dialogic conversation to work practically, and one result is skilled conflict management.

Conflict management can occur with mediators or without mediators. In the former case, the mediator must manifest high cooperative listening skills, in terms of understanding and responding emphatically to what the other person is saying. However, the most difficult case is the latter one. There is no practice of reconciliation, while actors come to a better

¹⁸² The point of the repair is staying socially connected to others, requiring lowering the emotional temperature. This is the reason why these repairs can be attempted by indirect cooperation (Sennett, 2012).

understanding of each other. They begin with mutual accusation declarations and demands, and it takes a long time for the exchanges to reach some "compromise". Sometimes cooperation on the small issues moves forward to symbolize that something can be done, instead large, irreconcilable issues are deferred, even permanently. Without mediators conflict relationship can be managed if the two group are mutually dependent. This is the reason why we talk about "everyday diplomacy".

Anyway, cooperation is linked to active participation, not to passive presence, and people can be encouraged by making it worth people's time. This can be done by acting on the way meeting are organized, and people have to negotiate the borderline between formality and informality. The virtue of formal meetings is that they can avoid the bad habit of appeasement, by accounting for official transparency, and, if the meeting does wind up with a compromise, the participants can still feel that they have not been personally compromised. Formality allows for inclusion, if all participants follow the same code of speaking. Yet, a formally fixed agenda inhibits evolution of a problem from within: there is an overall goal but getting to the end can take different routes. While formality favours authority and seeks to prevent surprise, the open-meeting, in principle, seeks more equality and more surprise.

Everyday democracy is a crafting of expressive social distance.

3.2. Knowledge Management in Cooperation

After discussing the more sociological aspects of cooperation, to have a main understand on how it works between two people, we can say that it is valuable also between companies. Indeed, we know, from Chapter One, that cooperation between individuals behaves theoretically in the same way for individuals and teams, as well as between organizations. Thus, cooperation within and between companies can be considered as a continuous flux of interaction between people belonging to the same company or to other companies connected to it.

But, what is eventually created through cooperation?

These interactions have to be managed to create something, to allow the sharing of something. We are talking about **knowledge**, which can be shared among people in order to find something new and foster innovation, by giving the firm(s) a competitive advantage.

Knowledge management theories have been mainly inspired by the fundamental contribution of Ikujiro Nonaka¹⁸³ and Hirotaka Takeuchi¹⁸⁴, whose main book "The Knowledge-Creating Company: how Japanese companies create the Dynamics of innovation" (1995), is still of present-day importance.

3.2.1. Nonaka and Takeuchi: a source of inspiration

Nonaka and Takeuchi, in this book, wants to understand and make clear how Japanese companies have become world leaders in the automotive and electronics industries, among others, and to show the secret of their success. They are the first ones to tie superior Japanese performance to their ability to create new knowledge and use it to produce successful products and technologies.

Actually, their path started in 1986, with the article "The New New Product Development Game", where they use for the first time the "**Rugby**" **metaphor** to describe the speed and flexibility with which Japanese companies developed new products, in contrast with the traditional sequential or "relay race" approach. While in the latter the project went sequentially from phase to phase and functions were specialized and segmented, in the former, the product development process emerges from the constant interaction of a hand-picked, multidisciplinary team whose members work together from start to finish. The shift from a linear to an integrated approach encourages trial and error and challenges the status quo, by stimulating new kinds of learning and thinking within the organization at different levels and functions¹⁸⁵. They distinguish six characteristics in managing their new product development processes: (1) Built-in instability¹⁸⁶; (2) Self-organizing project teams¹⁸⁷; (3)

¹⁸³ Ikujiro Nonaka is a Japanese organizational theorist and Professor Emeritus at the Graduate School of International Corporate Strategy of the Hitotsubashi University in Tokyo, best known for his study of knowledge management. In 2008, the Wall Street Journal listed him as one of the most influential persons on business thinking.

¹⁸⁴ Hirotaka Takeuchi is a Harvard Business School professor and former dean of the Graduate School of International Corporate Strategy at Hitotsubashi University in Tokyo. He was selected as an AIB (Academy of International Business) Fellow in 2013 in recognition of contributions to the scholarly development of the field of international business, and he won the 2012 Apgar Award for Innovation in Teaching for his role in developing the Harvard Business School IXP (Immersion Experience Program) Course in Japan.

¹⁸⁵ Just as important, this strategy for product development can act as an agent of change for the larger organization. The energy, motivation and effort can spread throughout the big company and begin to break down some of the rigidities that have set in over time (Nonaka & Takeuchi, 1986).

¹⁸⁶ Top management creates an element of tension in the project team by giving it great freedom to carry out a project of strategic importance to the company and by setting very challenging requirements (Nonaka & Takeuchi, 1986).

¹⁸⁷ A group possesses a self-organizing capability when it exhibits three conditions: autonomy, self-transcendence, and cross-fertilization. By Self-transcendence we mean that the project teams appear to be absorbed in a never-ending quest for "the limit." By Cross-fertilization we mean that a project team consisting of members with varying functional specializations, thought processes, and behaviour patterns carries out new product development (Nonaka & Takeuchi, 1986).

Overlapping development phases¹⁸⁸; (4) Multilearning¹⁸⁹; (5) Subtle control¹⁹⁰; (6) Organizational transfer of learning¹⁹¹.

To understand the rugby analogy we have to focus our attention on the "ball": the ball, being passed back and forth around in the team, contains a shared understanding of what the company stands for, its mission and its vision, including high subjective insights, intuitions and hunches, ideals, values and emotions. The ball is not passed in very defined and structured manner: ball movement is born out of the team members' interplay on the field, determined on the spot by basing on direct experience, trial and error, by requiring an intensive and laborious interaction among members of the team. This interactive process is analogous to how knowledge is created organizationally within Japanese companies: it is linked to bodily experience and trial and error as it is about mental modeling and learning from others.

They also recognize, however, some limitations of the "rugby" approach, as it requires extraordinary effort on the part of all project members throughout the span of the development process and it may not apply to breakthrough projects that require a revolutionary innovation. Moreover, it may not apply neither to mammoth projects like those in the aerospace business, where the sheer project scale limits extensive face-to-face discussions, nor to organizations where product development is masterminded by a genius who makes the invention and hands down a well defined set of specifications for people below to follow.

In their famous 1995-book, they treat organizational knowledge creation, understood as the capability of a company as a whole to create new knowledge, disseminate it throughout the organization, and embody it in products, services and systems (Nonaka & Takeuchi, 1995).

¹⁸⁸ Under the holistic or rugby approach, the phases overlap considerably, which enables the group to absorb the vibration or "noise" generated throughout the development process (Nonaka & Takeuchi, 1986). ¹⁸⁹ We have multilearning (multilevel and multifunctional) because members of the project team stay in close touch with outside sources of

information, they can respond quickly to changing market conditions (Nonaka & Takeuchi, 1986).

¹⁹⁰ Management establishes enough checkpoints to prevent instability, ambiguity, and tension from turning into chaos. It is exercised in seven ways: (1) Selecting the right people for the project team while monitoring shifts in group dynamics and adding or dropping members when necessary; (2) Creating an open work environment; (3) Encouraging engineers to go out into the field and listen to what customers and dealers have to say; (4) Establishing an evaluation and reward system based on group performance; (5) Managing the differences in rhythm throughout the development process; (6) Tolerating and anticipating mistakes; (7) Encouraging suppliers to become self organizing. Involving them early during design is a step in the right direction. (Nonaka & Takeuchi, 1986)

¹⁹¹ Transfer of learning to subsequent new product development projects or to other divisions in the organization takes place regularly (Nonaka & Takeuchi, 1986).

3.2.1.1. THE KNOWLEDGE-CREATING COMPANY

In this book, they make the well-known classification between two types of knowledge¹⁹²:

- 1. **Explicit Knowledge**: it can be articulated in formal language (grammatical statements, mathematical expressions, specifications, manuals, etc.) and can thus be transmitted across individuals formally and easily. This is the dominant mode of knowledge in Western philosophical tradition;
- Tacit Knowledge: it is hard to articulate with formal language, as it is personal knowledge embedded in individual experience and involves intangible factors (personal belief, perspective, values, etc.). it is an important source of Japanese companies' competitiveness¹⁹³.

| TACIT KNOWLEDGE | EXPLICIT KNOWLEDGE |
|---------------------------------------|---------------------------------------|
| Knowledge of Experience (Body) | Knowledge of Rationality (Mind) |
| Simultaneous Knowledge (Here and now) | Sequential Knowledge (there and then) |
| Analog Knowledge (Practice) | Digital Knowledge (Theory) |

 Table 2 - The two types of Knowledge (Source: Nonaka and Takeuchi, 1995)

Even though according to Western philosophy, the individual is the principal agent who possesses and processes knowledge, Nonaka and Takeuchi argue that knowledge creation takes place at three levels: **individuals**, **group** and **organizational** levels.

This is mainly connected to the way Japanese companies look at knowledge.

Japanese companies recognize that knowledge is primarily tacit, which makes it difficult to communicate or to share with others. It can be segmented into two dimensions: (1) technical dimension; (2) cognitive dimension.

The technical dimension encompasses the kind of informal and hard-to-pin-down skills captured in the term "know-how". The cognitive dimension consists of schemata, mental

¹⁹² Actually, it was Michael Polanyi to introduce the distinction between tacit and explicit knowledge. Polanyi argued that human beings create knowledge by involving themselves with objects, that is self-involvement or commitment. Scientific objectivity is not the only source of knowledge. He develop the theory in a more philosophical context, while Nonaka and Takeuchi tried to extend it to a more practical one (Nonaka & Takeuchi, 1995).

¹⁹³ It is rooted on the historical background. Indeed, times of uncertainties have often forced companies to seek knowledge held by those outside the organization. Japanese companies have continuously turned to their suppliers, customers, distributors, government agencies and even competitors for any new insights or clues they may have to offer (Nonaka & Takeuchi, 1995).

models, beliefs and perceptions so ingrained in us that we take them for granted, by reflecting our image of reality.

Nonaka and Takeuchi suggest three main characteristics of knowledge creation, that relate to how tacit can be made explicit, and they are shown in the table below.

CHARACTERISTICS OF KNOWLEDGE CREATION

| Metaphor and Analogy | By means of metaphor, people put together what they know in new ways and begin to express what they know but cannot yet say. An analogy is much more structured than a metaphor in making a distinction between two ideas or objects. In this respect, analogy is an intermediate step between pure imagination and logical thinking. |
|---|--|
| From Personal to Organizational Knowledge | Knowledge always starts with an individual's personal knowledge which is then transformed into organizational knowledge valuable to the company as a whole, through the interactions taking place within the group. |
| Ambiguity and Redundancy | Ambiguity can prove useful at times not only as a source of a new sense of direction, but also as a source of alternate meanings and a fresh way of thinking about things. As for redundancy, for Western managers it represents unnecessary duplication and waste. Actually, redundancy plays an important role in management and knowledge-creation process, because it encourages frequent dialog and communication, to create a "common cognitive ground" and to induce to look at a project from a variety of perspectives. |

 Table 3 - The Three Characteristics of Knowledge Creation (Source: Nonaka and Takeuchi, 1995)
 1995)

These are the first issues to take into account to build a knowledge-creating company.

3.2.1.2. KNOWLEDGE AND MANAGEMENT

Nonaka and Takeuchi, after having discussed in details the various theory about knowledge among different cultures and time (from Plato and Aristotle to Decartes and Locke, from Kant, Hegel and Marx to the Cartesian split; in Japanese intellectual tradition, they talk about Buddhism, Confucianism, "emotional naturalism" of Yujiro Nakamura), they also trait knowledge in economic and management theories.

Here is a synthesis of the major thinkers on knowledge in economic and management theories, before Nonaka and Takeuchi (1995).

KNOWLEDGE IN ECONOMIC THEORIES

| F. von Hayek (1945) | He classified knowledge into scientific knowledge (knowledge of general rules), and knowledge of the particular circumstances of time and place, arguing that changing circumstances continually redefine the relative advantage of knowledge held by different individuals. However, he ended up with a static interpretation arguing for simply the efficient utilization of existing knowledge (Hayek, 1945). |
|---|---|
| E. P. Penrose (1959) | She focused on the growth of individual firms and she argued that it is never resources themselves that are the inputs of the process of production, but the services that resources can provide. Services are a function of the experience and knowledge accumulated within the firm, so that firm is viewed as a repository of knowledge (Penrose, 1959). |
| J. A. Schumpeter (1961) | He developed a dynamic theory of the economic change, with the principal aim to discuss the unfolding nature of the capitalist economy, by arguing that the fundamental impulse of capitalism development is "new combinations". Thus, he emphasized the necessity to combine explicit knowledge, as he believed that the emergence of new products, production methods, organizations resulted from new combinations of knowledge (Schumpeter, 1961). |
| A. Marshall (1965) | He was among the first to state explicitly the importance of knowledge in economic affairs. According to him, capital consist in great part of knowledge and organization and that knowledge is the most powerful engine of production. (Marshall, 1965) |
| R. R. Nelson and S. G. Winter (1988) | They viewed the firm as a repository of knowledge by developing their evolutionary theory of economic and technological change. They argued that knowledge is stored as behavioral patterns of the business firm, routines and that innovation is an inherently unpredictable mutation of routines. They also recognized that the essence of technology is knowledge, but they did not explicitly link the creation of technological knowledge to broader organizational processes (Nonaka & Takeuchi, 1995). |

KNOWLEDGE IN MANAGEMENT AND ORGANIZATION THEORIES

| F. W. Taylor (1911) G. E. Mayo (1933) | He founded the scientific management, in the attempt to eliminate the "soldiering" of workers and replace the "rule of thumb" with science, to increase efficiency in production. The Scientific management was an attempt to formalize experiences and tacit skills into objective and scientific knowledge, but he did not perceived them as a source of new knowledge (Taylor, 1911). Through experiments, he and his group demonstrated that morale, "sense of belonging" to a work group, interpersonal skills to understand human behavior improved productivity. He developed, together with F. J. Roethlisberger, a new managerial theory of "human relations": human beings are social animals who should be understood and treated in the context of the social group, by developing social human skills to facilitate interpersonal communication within formal and informal are specified. |
|---|---|
| C. I. Barnard (1938) | He attempted to synthesize the two previous management theories at the organizational level. According to him, knowledge consists not only of logical, linguistic content, but also of behavioral and nonlinguistic content. He also argued that leaders create values, beliefs and ideas in order to maintain the soundness of knowledge system within the organization as well as to manage the organization as a cooperative system. He emphasized the importance of "behavioral knowledge", to be organized together with the scientific knowledge (Barnard, 1938). |
| H. Simon (1958-73) | He investigated the nature of human problem solving and decision making by developing a view of organization as an "information-processing machine", based on the assumption that human cognitive capacity is inherently limited. Using the concept of "bounded rationality", Simon built a computer model of human thought process as a form of information processing. It is knowledge that selects a limited number of consequences correlated with each strategy from all possible consequences. He argued that an organization facing a complex environment should design itself in a way minimizing the need for information distribution among the units, to reduce information load on them (Nonaka & Takeuchi, 1995). |
| M. D. Cohen, J. G. March and J. P. Olsen (1972) | They emphasized the irrational nature of human problem solving and decision making. In their model, selection opportunities are equated with "garbage", and problems, solutions and decision makers with "garbage can". They perceived the organization as a system of perceptions that assigns meaning to what happened retrospectively, rather than as a system of planning and deductive decision making (Cohen, et al., 1972). |

| E.H. Schein (1985) | He argued that there should be enough shared experience to end up to a shared |
|---------------------------|---|
| | view, which must have worked for long enough to have come to be taken for |
| | granted and to have dropped out of awareness. He considered culture as a learned |
| | product of group experience, and organization as a system of shared meanings and |
| | beliefs, where a critical administrative activity involves the construction and |
| | maintenance of belief systems assuring continuous compliance, commitment and |
| | positive effect to participants (Schein, 1985). |
| | |
| | |
| P. Drucker (1991) | He coined the terms "knowledge work", the most important type of work in the |
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Nonaka and Takeuchi made a great step forward to understand how organizations create new products, new methods and new organizational forms, by developing a method that is still valid.

3.2.2. Organizational Knowledge Creation: from the Individual...to the Firm...and to the Network

3.2.2.1. THEORY OF (INTER)ORGANIZATIONAL KNOWLEDGE CREATION

Nonaka and Takeuchi developed a new theory of knowledge creation, which integrates traditional and nontraditional views of knowledge.

Their framework contains two dimensions: (1) **Epistemological dimension**; (2) **Ontological dimension**.

As for the ontological dimension¹⁹⁴, organizational knowledge creation is understood as a process that amplifies the knowledge created by individuals organizationally, and crystallizes it as a part of the knowledge network of the organization. This process takes place thank to an expanding community of interactions, at intra- and inter-organizational levels. As for the epistemological dimension, we distinguish between tacit and explicit dimensions.

¹⁹⁴ "Ontology" is concerned with the levels of knowledge-creating entities (individual, group, organizational, and inter-organizational). (Nonaka & Takeuchi, 1995)

Tacit and explicit knowledge interact with and interchange into each other in the creative activities of human beings. The Nonaka and Takeuchi's model of knowledge creation is based on the critical assumption that human knowledge is created and expanded through social interaction between tacit and explicit knowledge: this interaction is called "knowledge conversion"¹⁹⁵, which is a social process between individuals and not confined within an individual.

According to this view they distinguish four different modes of knowledge conversion:

- 1. Socialization: from Tacit to Tacit
- 2. Externalization: from Tacit to Explicit
- 3. Combination: from Explicit to Explicit
- 4. Internalization: from Explicit to Tacit

Socialization is a process of sharing experiences and creating tacit knowledge such as shared mental models and technical skills. The key element is experience, since the mere transfer of information would not make sense, if it is abstracted from emotions and specific contexts where shared experiences are embedded. It can be considered as "Sympathized knowledge". **Externalization** is a process of articulating tacit knowledge into explicit concepts, by taking the shapes of metaphors, analogies, concepts, hypotheses, or models. It is triggered by dialogue or collective reflection: a frequently used method to develop concepts is to combine deduction and induction; the use of metaphors is an important tool to create a network of new concepts. It can be considered "Conceptual Knowledge". Combination is a process of systemizing concepts into a knowledge system, involving combining different bodies of explicit knowledge through media (documents, meetings, telephone conversations, or computerized communication networks) and by sorting, adding, combining and categorizing. Creative uses of computerized communication networks and large-scale databases facilitate this mode of knowledge conversion. It can be called also "Systemic Knowledge". **Internalization** is a process of embodying explicit knowledge into tacit knowledge, closely related to the "learning-by-doing" and the internalization of experiences (gained through

¹⁹⁵ The idea of "knowledge conversion" is partially consonant with the ACT model developed in cognitive psychology, which emphasizes that for cognitive skills to develop, all declarative knowledge (explicit) has to be transformed into procedural knowledge (tacit) used in such activities. It was developed by Anderson and Singley in 1983-9 and they found one limitation of the model: it views the transformation as a special case and it considers knowledge transformation as mainly unidirectional from declarative to procedural. Nonaka and Takeuchi argue that the transformation is interactive and spiral (Nonaka & Takeuchi, 1995).

socialization, externalization combination) and allows knowledge to become а valuable asset. Documentation helps individuals internalize what experienced, they thus enriching their tacit knowledge. It can be called "Operational Knowledge".



Figure 35 - The Knowledge Spiral (Source: Nonaka and Takeuchi, 1995)

These four modes interact together, in what Nonaka and Takeuchi define the "Knowledge Spiral", as shown by Figure 35.

The spiral works as follow: socialization usually starts with building a "field" of interaction, facilitating the sharing of members' experiences and mental models; Externalization is triggered by meaningful dialog or collective reflection, where using appropriate metaphor or analogy helps team members to articulate hidden tacit knowledge, usually hard to communicate; Combination is triggered by networking new and existing knowledge by crystallizing it into new products, service or managerial systems; eventually, learning-by-doing triggers internalization. And the process can re-start again through socialization and so on.

What follows, as a reflection, is that tacit knowledge is fundamental for organizational knowledge creation, and firms have to mobilize that one created and accumulated at individual level, which should be "organizationally" amplified through the four modes of knowledge conversion. This triggers the "Spiral of Organizational Knowledge Creation", starting at the individual level and moving up through expanding communities of interaction, which crosses sectional, departmental, divisional and organizational boundaries.



Figure 36 - The Spiral of Organizational knowledge Creation (Source: Nonaka and Takeuchi, 1995)

What is required, to pass from one ontological level to the next one, is another process at higher level to maintain the integrity of the whole, by leading to another cycle of knowledge creation in a larger context. Thus, the role of the organization in this process is to provide the proper context for facilitating group activities and the creation-accumulation of knowledge at individual level. Nonaka and Takeuchi discuss five conditions required at the organizational level to facilitate the process: (1) intention¹⁹⁶; (2) Autonomy¹⁹⁷; (3) Fluctuation and Creative Chaos¹⁹⁸; (4) Redundancy¹⁹⁹; (5) Requisite Variety²⁰⁰.

¹⁹⁶ Organizational intention drives the knowledge spiral. It is the organization's aspiration to its goals, and the efforts to achieve it usually take the form of strategy, whose essence lies in developing the organizational capability to acquire, create, accumulate and exploit knowledge. The most difficult task is to conceptualize a vision about what kind of knowledge should be developed and to operationalize it into a management system for its implementation (Nonaka & Takeuchi, 1995).

¹⁹⁷ At individual level, each employee should be allowed to act autonomously as far as the circumstances permit, so that the organization can increase the chance of introducing unexpected opportunities. It also increases the possibility for self-motivation to create new knowledge. Moreover, the autonomous team can perform many functions, thereby applying and sublimating individual perspectives to higher levels (Nonaka & Takeuchi, 1995).

¹⁹⁸ Fluctuation and creative chaos stimulate the interaction between the organization and the external environment. Fluctuation is characterized by "order without recursiveness", whose pattern is hard to predict at the beginning. If organizations adopt an open attitude toward environmental signals, they can understand how to exploit their ambiguity, redundancy or noise, in order to improve their own knowledge system. When fluctuations are introduced, we face a breakdown of routines, habits, cognitive frameworks, and we have the opportunity to reconsider our fundamental thinking and perspective. Chaos is generated naturally when the organization faces a real crisis, but it can also be generated intentionally when the leaders try to evoke a "sense of crisis" by proposing challenging goals. This intentional chaos, so-called "creative chaos", increases tensions and focuses the attention on defining the problem and resolving the crisis situation. But, it only works when employees are able to reflect on their own actions, otherwise it turns out to be "destructive chaos" (Nonaka & Takeuchi, 1995).

¹⁹⁹ Redundancy, in this context, is intended as the existence of information that go beyond the immediate operational requirements of organizational members, as it refers to the intentional overlapping of information about business activities, management responsibilities, and the company as a whole. It is particularly important in the concept development stage, when it is critical to articulate images rooted in tacit

To conclude, in other words, the knowledge creation process can be modeled in five stages: (1) Sharing tacit knowledge; (2) creating concepts; (3) Justifying concepts; (4) Building an archetype; (5) Cross-leveling knowledge. The five steps are summarized in Figure 37.

Nonaka and Takeuchi argued that the transformation process characterizing the two spirals which we have seen above, is the jey to understand the theory: the knowledge spiral at the epistemological level (Figure 35) rises upward, while the knowledge spiral at the ontological level (Figure 36) moves from left to right and back again to the left in a cyclical motion. Innovation emerges out of these spirals. As for the organizational structure, Nonaka and Takeuchi thought that both the top-down²⁰¹ and the bottom-up²⁰² Management are not suitable to deal with these spirals. According to them, the so-called "middle-up-down" management is preferable, as applied in many Japanese companies.



Figure 37 - The Five-phase model of the organizational knowledge-creation process (Source: Nonaka and Takeuchi, 1995)

knowledge. Thus, redundancy of information brings about "learning by intrusion" into each individual's sphere of perception (Nonaka & Takeuchi, 1995).

²⁰⁰ Requisite variety stands for the organization's internal diversity which matches the variety and complexity of the external challenging environment. It can be enhanced by combining information differently, flexibly and quickly, and by providing technical equal access to the broadest variety of necessary information. Developing a flat and flexible organizational structure where different units are interlinked with an information network is one way to deal with the complexity of the environment (Nonaka & Takeuchi, 1995).

²⁰¹ A top-down organization is shaped like a pyramid, under the assumption that only top managers are able and allowed to create knowledge (Nonaka & Takeuchi, 1995).

²⁰² Bottom-up management is a mirror of the top-down organization. Instead of hierarchy and division of labor, there is authonomy, and knowledge is created and, to a large extent, controlled by the bottom. A bottom-up organization has a flat and horizontal shape. Autonomy, not interaction, is the key principle (Nonaka & Takeuchi, 1995).

3.2.2.2. MIDDLE-UP-DOWN MANAGEMENT PROCESS FOR KNOWLEDGE CREATION

The middle-up-down management puts middle managers at the very center of knowledge management, positioning them at the very intersection of the vertical and horizontal flows of information within the company. The model see the middle managers as the leading protagonists, playing a key role in facilitating the process of organizational knowledge creation: they serve as a link between top management and front-line workers, as "knowledge engineers"²⁰³ of the knowledge creating company. Instead, top managers take the role of "knowledge officers"²⁰⁴, and front line employees and line managers are the "knowledge practitioners"²⁰⁵.

In practice, the middle-up-down management works like that: top management creates a vision, while middle management develops more concrete concepts that front-line employees can easily understand and implement, by trying to solve the contradiction between what top management hopes to create and what actually exists in the real world. Thus, top management role is to create a grand theory, while middle management tries to create a mid-range theory able to test empirically within the company with the help of front-line employees.

²⁰³ Knowledge engineers are responsible for converting tacit knowledge into explicit, and vice versa, thereby facilitating the four modes of knowledge conversion. They play also two other key roles, both involving the creation of a knowledge spiral: facilitating a knowledge spiral along the epistemological dimension, across the different modes of conversion; facilitating another spiral along the ontological dimension, across the different modes of conversion; facilitating another spiral along the ontological dimension, across different organization levels. They should have the following qualifications: top-notch capabilities of project coordination and management, skilled with coming up with hypotheses in order to create new concepts, ability to integrate various methodologies for knowledge creation, communication skills to encourage dialogue among team members, proficient at employing metaphors to generate and articulate imagination, able to engender trust among team members, able to envision the future course of action based on an understanding of the past (Nonaka & Takeuchi, 1995).

²⁰⁴ Knowledge officers are responsible for managing the total organizational knowledge creation process at corporate level. They give a company's knowledge creating activities a sense of direction by articulating grand concepts on what the company ought to be, by establishing a knowledge vision in the form of a corporate vision or policy statement, and by setting the standards for justifying the value of knowledge that has been created. They should have some qualifications: able to articulate a knowledge vision and a sense of direction, able to communicate it as well as the corporate culture, able to justify the quality of the knowledge created, talent for selecting the right project leader, willing to create chaos within the project team, able to interact with team members on a hands-on basis and solicit commitment, able to direct and manage the total process of organizational process creation (Nonaka & Takeuchi, 1995).

 $^{^{205}}$ Knowledge practitioners are responsible for accumulating and generating both tacit and explicit knowledge, as "knowledge operators" – interfacing with tacit knowledge the most part – or "knowledge specialists" – interfacing primarily with explicit knowledge. Knowledge practitioners should have some qualifications: high intellectual standards, strong sense of commitment, wide variety of experiences inside and outside the company, skilled in carrying out a dialog with customers and colleagues, open to discussions and debate with others (Nonaka & Takeuchi, 1995).

For middle managers to works effectively, they need an organizational structure supporting the management process, as Nonaka and Takeuchi argue. Thus, they introduced the so-called **"hypertext"**²⁰⁶

organization, enabling the creation of knowledge

efficiently and continuously 207 . Like an hypertext document, an hypertext organization is made up of interconnected layers or contexts: the business system, the project team, the knowledge base. The **business system** is the central layer, where routine operations are carried out. Since a bureaucratic structure



Figure 39 - Middle-up-down knowledge creation process (Source: Nonaka and Takeuchi, 1995)



Figure 38 - An Hypertext organization (Source: Nonaka and Takeuchi, 1995)

is suitable for conducting routine work efficiently, this layer is shaped like a hierarchical pyramid. The **project team** is the top layer, where multiple project teams engage in knowledge-creating activities (e.g. new product development). The team members are brought together from a number of different business units and are assigned exclusively to a project team until the project is completed. At the bottom is the **knowledge base** layer, where

²⁰⁶ A hypertext consists of multiple layers of texts, while a conventional text basically has only one layer (the test itself). Under a hypertext each text is usually stored separately in a different file, and, when it is needed, an operator can key in a command that pulls out all the texts on the computer screens at one time in a connected and logical way. This allows anyone looking into the computer screen not only to "read through" the text, but to go down "into" it for further degrees of detail or background source material. (Nonaka & Takeuchi, 1995)

²⁰⁷ It should not be confused with a matrix structure, which is used to achieve two or more different types of tasks in a conventional hierarchical organization (Nonaka & Takeuchi, 1995).

organizational knowledge generated by the two other layers is re-categorized and recontextualized. This layer does not exist as an actual organization entity, but is embedded in corporate vision, organizational culture or technology. Members of the project team on the top layer, who are selected from different functions and departments across the business system layer, engage in knowledge creating activities.

Thus, three totally different layers (or contexts) coexist within the same organization. The process of organizational knowledge creation is conceptualized as a dynamic cycle of knowledge moving easily across the three contexts.

Moreover, Nonaka and Takeuchi assert that a hypertext organization has the organizational capability to convert knowledge from outside the organization, too, as it is an open system featuring continuous and dynamic knowledge interaction with customers and companies outside the organization. The key characteristics is the ability of members to shift contexts, to move easily in and out of one context into another.

Thus, finally, Nonaka and Takeuchi conclude that, in order to implement an organizational knowledge creation program within a company, we have to follow seven guidelines, as a result of what we have said in this section (Nonaka & Takeuchi, 1995):

- 1. Create a knowledge vision
- 2. Develop a knowledge crew
- 3. Build a high-density field of interaction at the front line
- 4. Piggyback on the new product development process
- 5. Adopt middle-up-down management
- 6. Switch to a hypertext organization
- 7. Construct a knowledge network with the outside world.

3.2.3. Collaborative Knowledge and Communities of Practice

In the era of knowledge economy²⁰⁸ – that is to say the use of knowledge to generate tangible and intangible assets -, knowledge has become a key to success. Another - but related – strategic area to manage knowledge as an asset is represented by the **communities of practice's cultivation** (Wenger, et al., 2002). Indeed, in knowledge economy firms are

²⁰⁸ The knowledge based Economy is "an economy in which knowledge and human cognition take a central role in the production process" (Saives at al, 2013).

restructuring many relationships internally²⁰⁹ and externally²¹⁰ to respond to the demands of shifting market, knowledge markets are globalizing rapidly and the success depends on communities sharing knowledge across the globe, and, in addition, companies are not only competing for market share but also for talents²¹¹. All three trends of global economy point to the critical role that communities of practice are destined to play, to develop a "knowledge strategy" along with a business strategy.

Communities of practice are defined as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, et al., 2002). It is not necessary that these people work together every day, but when they need they meet since they find value in the interactions. Even if they accumulate knowledge through interaction the become also informally bound by the value that they find in learning together, which increase their personal satisfaction of knowing colleagues who understand each other's perspectives, as well as of belonging to an interesting group of people. In this way, they not only come up with new tools, standards, designs, manuals, ideas, insights, but also develop personal relationships and established ways of interacting, and even a common sense of identity²¹².

Some communities of practice grow spontaneously while others may require careful seeding. Organizations can do a lot to create an environment where they can prosper: valuing the learning they achieve, making time and other sources available for workers, fostering participation, removing obstacles. This creates a context integrating communities of practice into the organization. Otherwise, communities of practice can still exist but they probably will not achieve their full potential. What is important, also, in communities of practice is that they create value by connecting personal development and professional identities of practitioners to the strategy of the organization. This ability is crucial in knowledge economy, where companies succeed by fully engaging the creativity of their employees.

²⁰⁹ Internally companies are disaggregating into smaller units focused on well-defined market opportunities (Wenger, et al., 2002).

²¹⁰ Externally, companies are increasingly partnering with other organizations in the context of their extended expertise (Wenger, et al., 2002).

²¹¹ Finding and keeping the right people can make a big difference in a company's ability to become a market leader and to gain access to venture capital (Wenger, et al., 2002).

²¹² They are not a new ideas because we can see them in the past, with primitives meeting around the fire to agree on how to feed each other by hunting, in ancient Rome with "corporations" of metalworkers, potters, masons and other craftsmen, in Middle Ages with similar artisanal associations, during the Industrial Revolution and so on. They are also everywhere, and sometimes they do not have a name but we belong to them already. What is stressed by the book is that we have to consciously cultivate communities of practice in companies (Wenger, et al., 2002).

The organization should then "double-knit" create a structure, where practitioners themselves has a dual role as both community practitioners and operational team members, and help link the capabilities of communities of practice to the knowledge requirements of teams and business units. This multi-membership creates а learning loop, as shown by



Figure 40 - Communities of practice: The multimembership learning cycle (Source: Wenger et all, 2002)

Figure 40. As a member of teams and workgroups, people are accountable for performing tasks and when they face similar problems, they apply and refine their skills. When, instead, they face new problems, they invent new solutions. However, the same people are also community members, and as such they are accountable for developing a practice. Thus, they bring their team the experience to their communities and receive help with their problems: they discuss the solutions, generalize or document them and integrate them in the community's practice. Afterwards, they can return to their projects by taking advantage of the expanded capabilities which face in this way the application to real problems.

More recently, communities of practices born in a wider context, beyond geographical boundaries, have been studied. In particular, we found interesting the 2014-article by Grabher and Ibert, "Distance as asset? Knowledge collaboration in hybrid virtual communities".

It is widely accepted and demonstrated that physical proximity co-produces relational proximity, and that relational proximity in turn promotes learning as it cultivates mutual understanding. Even Sennett, as we saw in the first section of this chapter, is in favor of face-to-face, direct contact, to engender a dialogical conversation. However, Grabher and Ibert point out that these standard lines of reasoning have increasingly been confronted with critical perspectives. Collaborative knowledge production, they argue, is not contingent on

permanent physical co-presence, as it is also produced under conditions of temporary physical co-presence through, for example, collaboration on a temporary web site, meetings and so on (Grabher & Ibert, 2012). Moreover, the respective work posits that physically distanciated relations and knowledge flows through inter-organizational "pipelines" providing critical paths for processes of knowledge production by supplementing and completing local buzz.

They focus on virtual communities. According to them, Virtual communities are "communities within which interaction is mainly mediated by communication tools provided by the Internet, and in publicly accessible online environments". On the other hand, "hybrid" communities denote a community which "encompasses on the one hand the sphere of professional expertise, and the mundane world of ordinary users, lay-persons, enthusiast and hobbyists, on the other".

Grabher and Ibert distinguish hybrid virtual communities in three types²¹³:

- 1. Firm-Hosted Communities: they are started and maintained by professional and commercial producers, by setting up the online forum of exchange, employing the community moderators, defining the norms of interaction and soliciting feedback from participants;
- **2. Firm-related Communities**: they are launched by community members who create and enforce the rules of interaction in a self-organized process²¹⁴;
- **3. Independent Communities**: they emerge and evolve without the impulse or assistance of professional or commercial organizations, since interaction dynamics are driven by the motivations and aspirations of community members alone.

Through their experiments and screening on existing virtual communities, with a netnographic approach²¹⁵, they confirm the widely shared view that communities generate knowledge that is potentially commercially useful and able to be exploited by firms whose

²¹³ This is actually a static classification, as in the constantly shifting field of online environment and social media, virtual communities are inherently dynamic (Grabher & Ibert, 2012).

²¹⁴ However, they are not independent from the professional producers, since the object of common interest is associated with a distinct brand or even a specific product. Knowledge collaboration emerge through question and practice emerging from daily utilization (Grabher & Ibert, 2012).

²¹⁵ Netnography is a term, developed by Robert V. Kozinets, naming an online marketing research technique for providing consumer insight. In other words, it is ethnography adapted to the study of online communities, faster, simpler, and less expensive than the traditional one. It provides information on the symbolism, meanings, and consumption patterns of online consumer groups (Kozinets, 2002).

products or larger markets are subjects matter of communities. These can have a positive impact on innovative performance, particularly in highly turbulent environments. They also identify even three advantages of "not being here" during the interaction: (1) low multiplexity and quasi-anonymity²¹⁶; (2) cumulative learning, selection and memory²¹⁷; (3) asynchronicity and reflective reframing²¹⁸.

3.2.4. A step forward: "the Game" as a New Driver

During the last decade, we have also faced a growing interest in concepts like "gamification", "serious play", "business game", "play at work".

This literature seems to be not so structured yet, and it has been mainly based on understanding how a wider use of games and video games could improve learning in modern education environments. More recently, the "gaming" approach has started to be studied also within the entrepreneurial and business environment (See Bajdor & Dragolea – 2011; Witt, et al., 2011; Fauquet-Alekhine, 2011; Mavré Lisaa, 2011; Hinthorne & Schneider, 2012; Groh, 2012; Nicholson, 2012; Hamari & Koivisto, 2013; Blohm & Lelmelster, 2013; Oprescu, et al., 2014).

Even if "gaming" have not been studied yet within the knowledge management's field, we believe that it can be considered as a **new emerging form of knowledge-creating tool fostering cooperation**. Thus, here we will encompass its different meanings, to understand what exactly we are talking about, and what happens when people "are playing together".

3.2.4.1. GAMIFICATION, SERIOUS GAMES AND SIMULATION

²¹⁶ Since members in hybrid virtual communities are quasi-anonymous, online interaction is characterized by low degrees of multiplexity: in this sense, hybrid virtual communities can economize on ambiguity and indirectness, since people feel freer to express their opinion without too much limitations (Grabher & Ibert, 2012).

²¹⁷ Virtual hybrid communities are "hypertextual", encouraging writely and active reading rather than passive consumption of what has been produced by conventional authorial author. It is common practice in virtual communities to explicitly refer to previous statements, so memory is stored and put always and again into question (Grabher & Ibert, 2012).

²¹⁸ In contrast to face-to-face meetings, the long term engagement of intrinsically motivated participants implies that debates on particular issues might delve into the subject matter for a considerable period of time. This allows interactive processes of "reflective reframing" that are not available in the most intensive face-to-face encounters (Grabher & Ibert, 2012).

As remembered by Deterding, the term "gamification" is quite recent, rooting in the digital media industry, where it started to spread from 2008. However, only in 2010 the concept became quite popular in the field. Instead, the word should not be limited to digital technologies, as it can be applied to multiple settings. The exact meaning of the word was very controversial²¹⁹, but since 2011 the majority of authors have agreed on the definition proposed by Deterding: "Gamification is the use of game design elements in non-game contexts" (Deterding, et al., 2011).

Deterding (2011) and Groh (2012) try also to different of distinguish between kinds entertainment activities. The main distinction is between "Game" and "Play". "Play" describes behaviours which are freer. expressive, improvisational. "Game" is a subset of "playing" but it is characterized by rules and well-established goals.



They also distinguish between "Serious games" and "Gamification". Indeed, they are connected, but they are not synonymous. "Serious games" are full-fledged games, that is to say 'completely developed games', and they arise for non-entertainment purposes: usually, the major goals are solving a problem, to train, investigate or promote the users. Thus, Deterding defines serious gaming as "the (educational) utilization of the broader ecology of technologies and practices of games". Contrarily, "Gamifying" has to be considered as more related to the design of the process, activity or non-game-base technology, by creating the necessary "game elements". We can distinguish between Liberal Game Elements, which can be found in any game, and Constrained Game Elements, which are unique to that game. Deterding identifies five levels of game elements: (a) Interface design patterns²²⁰; (b) Game

²¹⁹ Definitions were mainly linked to two main background ideas: (1) the increasing societal utilization of video games and their influence on our daily life; (2) video games were thought to be designed for entertainment and not for utility, as they can produce "states of desirable experience" and encourage users to remain engaged in it for a long time with high intensity (Deterding, et al., 2011). ²²⁰ such as badges, levels, or leaderboards (Deterding, et al., 2011).

design patterns, or game mechanics; (c) Design principles or heuristics²²¹; (d) Conceptual models of game design units²²²; (e) Game design methods²²³.

Deterding also separates – as shown by Figure 41– not anly gamification from serious games, but also the concept of playful interaction, by taking into account two dimensions: (1) Playing or Gaming; (2) Parts or Whole. The latter dimension separates serious games and gamification, respectively. The former differentiates between Games and Toys, where we are in the situation of just Playful interaction. Groh also recalls a graph based on Deterding's thought which places the term gamification into the broader schema of ludification of culture (see Figure 42).

Lisaa (2011) also makes a distinction between Serious Games and Simulations. According to him, a simulation provides "a mathematical model or at least an algorithm describing a sequence of events based on assumptions or pre-developed scenarios of actual incidents reproduced with a maximum commitment to realism". The aim of simulation is actually to leave the actor free to act and to experiment his strategic choices. However, valuation systems depends mainly on the instructor's knowledge, since automatic mechanisms are very difficult to implement. A serious game uses "mechanics and addictive systems of classic video games products" and give a real-time feedback, which is the basis for entertainment. Thus, it takes place in a more closed environment, where freedom of action is smaller and subjected to stricter rules.

There is a drowback in gaming, which is emphasized by Deterding and Schell, whose relevant contributions can be appreciated even on YouTube, within the Google Tech Talks (2011). They both criticize the way how gamification is widely understood and practically applied: just blueprints for putting point, badges, and leaderboards on everything, without taking into account pleasure but only external rewards, which people are playing for. It inevitably lead to less motivation not more, because people, after a while, feel that it does not worth the effort. Hence, they introduce three important principles to foster intrinsic motivation: Relatedness, Competence and Autonomy.

 ²²¹ guidelines for approaching a design problem or evaluating a design solution (Deterding, et al., 2011)
 ²²² such as the MDA framework, fantasy, and curiosity. MDA frameworks are tools used to analyse games by breaking them into three components: Mechanics, Dynamics and Aesthetics (Deterding, et al., 2011).

²²³ including play-testing, play-centric design and value conscious game design (Deterding, et al., 2011).
Relatedness refers to the human need to interact and communicate with others. This is why it is important to have in mind the user personal goals, because they are perfectly in line with their interests and passions. For the same reason, it is necessary to connect the user to "a meaningful community with the same interests". Indeed, it is true that we make achievements to show them to our friends and acquaintants, because in this way they become special. We have also to be able to create a meaningful story, to engage the user, and make them aware of social context meanings. **Competence** refers to the universal need "to be effective and master a problem in a given environment". This abilities can be categorized into "Have to do"²²⁴ and "Want to do"²²⁵. The latter is very difficult to perform, as we have to confront the user with more and more interesting and difficult challenges, where difficulty varies inside the flow region and where failures also are appreciated²²⁶. What is important, in addition, is to "give

juicy feedback"²²⁷, to give the player the possibility to get feedback at any given state of the game. We have also to pay attention in preventing unintended behaviors of players trying to avoid the challenge. Autonomy, finally, refers to the universal need to control one's own life. Since the majority of games are a voluntary activity and players choose to play on their own, it could be dangerous that extrinsic rewards (i.e. cash incentives) are used to force this natural willingness, especially in contexts of work; people would feel like loosing a peace of their autonomy and that is not desirable.



²²⁴ "Have to do" includes things like duty, work, slavery, and even efficiency (Groh, 2012).

²²⁵ "Want to do" involve fun, play, freedom, and especially pleasure (Groh, 2012).

²²⁶ In fact, they improve the experience of mastering the challenge thereafter, which, of course, should also vary to prevent doing the same thing all over (Groh, 2012).

²²⁷ The term "juicy" means that the feedback is "fresh" and encouraging as well as (Groh, 2012).

Nicholson (2012) argues that this problem of the external motivation substituting internal motivation can be addressed through the so-called "**meaningful gamification**": it means to design game elements in a way that they will be meaningful to the user through information. He grounds his opinion on different theories, such as Organismic Integration Theory²²⁸, which is a sub-theory of the Self-determination Theory²²⁹, Situational Rilevance²³⁰, Situated Motivational Affordance²³¹ and Universal Design for Learning²³². All of these theories have one thing in common: the user is at the center²³³. Thus, he introduces a definition of meaningful gamification, which is "the integration of user-centered game design elements into non-game contexts", and it can result in longer-term and deeper engagement between participants, non-game activities, and supporting organizations.

An example of this type of involvement is also connected to the concept of "idea competitions". Witt, Schneider and Robra-Bissantz (2011) define it as "an invitation of an organizer (like a company, university, museum or federal ministry) to submit ideas for a specific topic", after which contributions are evaluated and winners are announced. Also in this case, external rewards can be detrimental since people become very competitive with each other. The secret is once again to enhance participation due to interest, joy, self-expression and curiosity. Indeed, they argue that, when persons are intrinsically motivated, they are in a state of energized focus (the "flow"), involvement and enjoyment²³⁴.

²²⁸ Organismic Integration Theory focuses on the importance of creating a gamification system that is meaningful to the user, assuming that the goal of the system is to create long-term systemic change where the users feel positive about engaging in the non-game activity (Nicholson, 2012).

²²⁹ Self-Determination Theory focuses on what drives an individual to make choices without external influence. The idea is that, if too much external control exists on a certain activity, aspects of this control will be relaxed, if there is not so much control this activity will be self-regulated, by allowing users to self-identify goals and groups that are meaningful for them. In this way it is more likely to produce autonomous internalized behaviours (Nicholson, 2012).

 $^{^{230}}$ Situational Relevance is a concept referring to what is important to solve a particular problem within a specific context, for example with a relevant document solving that information need. But it is up to the user, so, the only way to know if something is relevant (or "meaningful") is to ask the user. It is important if we have to create goals in a game addressed to other users, where we need to involve him in the process, to create and customized the gamification system, by selecting himself meaningful game elements and goals (Nicholson, 2012).

²³¹ Situated Motivational Affordance is a related theory out of Human-Computer interaction, and it is very linked to the Situational relevance. It is more focused on the context of each of the elements of a gamification system. According to this theory, a user "is motivated by an aspect of a system only when there is a match between that aspect and the background of the user". Thus, not only involving the user is important, but also consider the organizational context into which the specific activity is placed (Nicholson, 2012).

²³² The theory of Universal Design for Learning lies within the theory on educational learning and tries to help user to create appropriate course content for a diverse group of learners. It involves three strategies: (1) to think about different ways to present the content of learning (the "what"); (2) to think about providing different activities for the learner to explore and demonstrate mastery of content (the "how"); (3) to give learners different paths to internalize content and become engaged and motivated (the "why"). S, he users can decide the most appropriate path to demonstrate their mastery, in the way which is more meaningful to them. (Nicholson, 2012).

²³³ The opposite of meaningful gamification would be meaningless gamification which is based on organization-centered design, relying upon points and levels leading to external rewards that are not related to the underlying activity are not concerned about the long-term benefits of the gamification on the user; they are focused on increasing the organization's bottom line in the short term (Nicholson, 2012).

²³⁴ From the questionnaire delivered by the authors, participants tend to agree that flow is fostered by the idea competition, and that they enjoyed the task they were immersed into (Witt, et al., 2011).

3.2.4.2. WHAT HAPPENS WHEN "PEOPLE ARE PLAYING"?

Many authors has also explored what happens during this "gaming" process. The aim is to understand what is produced in humans and between humans, to know if some kind of knowledge is created, if some kind of innovation is fostered.

Fauquet-Alekhine (2011) explored what happens in simulation and he asserts that what is important is to ensure full immersive conditions. It means that a simulator should be able to make trainees feel like they are living a non-simulated situation²³⁵. In order to do this, two points are important:

- 1. the "immersive distance" should be as short as possible, to wit the simulated situation should be very close to the non-simulated one;
- the simulator should be capable to let the trainee embody the work activity, because we know that knowledge usually acquired during the initial training period can only be transformed into skills by action in work situations, where the action is the application of the knowledge to perform a task.

Especially for the second condition, he argues that a direct physical contact with the real system is necessary, to "feel the system". Only in this way, the worker begins to feel something for the system he has to be involved with, also in a non-simulated environment, and this makes him more confident afterwards. Thus, according to Fauquet-Alekhine, "the main point is the gap between the simulated and non-simulated situations": if it is too large or not correctly managed, the trainees cannot be immerged inside the simulated situation and perceive it as the real working situation.

Also Barab and Dede (2007) already analysed players' immersion, within virtual educational learning environment. They also found that simulations – in their case, virtual learning experiences, specifically – can provide a strong sense of engagement, even students that were not so much engaged with traditional learning methods and that, for this reason, had the label of "academic loser".

²³⁵ A non-simulated situation refers to operating, piloting, intervening in a situation within a non-simulated context inducing real consequences on security, safety and production. This situation is widely called "real situation" or "real life" as opposed to "simulated situation", even if also a simulated situation is obviously part of the real life (Fauquet-Alekhine, 2011).

Cheng, Shet and Annetta (2013) change the focus from simulations to Serious Educational Games (SEGs). While previous literature on SEGs emphasizes the positive influence on learning outcome, they try to explore how players feel and what they experience through playing and how these subjective feelings influence learning outcomes: in other words, they were interested in the "Why". By exploring, they find useful to make a distinction between the "flow experience" and the "immersion": in the flow experience²³⁶ everything but the game itself is ignored, and it is fundamental for all learning because it is a high incentive to intrinsic motivation; immersion is a "suboptimal and non-extreme state" in the degree of involvement, which someone considers more appropriate for video game play experience, for example²³⁷. Thus, immersion seems to be the precondition of the flow experience. According to Chen, Shet and Annetta, immersion can actually be split into three stages of involvement: (1) Engagement, linked to Sensory Immersion; (2) Engrossment, linked to Challenge-based immersion; (3) Total Immersion, linked to Imaginary Immersion. See Figure 43.

ENGAGEMENT

To be "engaged" we have to overcome two barriers: (1) Access, which is relative to gamer's preference because they need to like the type or the style of the game; (2) Investment, because they have to decide to invest their time and effort into the game and focus their attention on it. If they outcome the barriers, and put more and more efforts and time, then they increase their engagement.

"Sensory Immersion"

ENGROSSMENT

The barrier to overcome to enter this stage are: (1) lowering of their perception of physical surroundings and needs; (2) their emotions are directly attached to the game, so that emotions are affected directly by the game. They will feel emotionally drained when they stop playing.

"Challenge-based Immersion"

TOTAL IMMERSION

Gamers experience the feeling of presence: they feel to be there. They have entirely lost their self-awareness, feel attached to the in-game characters and empathize with their situations.

"Imaginative Immersion"

Figure 43 - The Three Stages of Immersion (Source: Cheng at al)

However, we have also to prevent the consequence that students ignore learning materials because of becoming too immersed in the game, by appropriately integrating instructional strategies through the facilitation of teachers and provision of scaffoldings.

In addition to immersion and the involvement of participants to be intrinsically motivated, Hinthorne and Schneider (2012) state that serious games are also an "innovative, (often) lowtech approach to communication that is (perhaps surprisingly) suitable for research". They

²³⁶ The idea of flow was proposed by Csikszentmihalyi (1990) to describe a positive experience where individuals perceive a congruence of skills and challenges, a state where people are intensely involved in an activity and are experiencing a high level of enjoyment and fulfilment. Because of that, people are also willing to put forth effort to reach an sustain that state with little concern for theur surroundings or what they will be achieving by it (Cheng, et al., 2014).

²³⁷ Anyway, neuroscience provides some direct evidence to support the relationship between video game play and flow experience: mesocorticolimbic dopamine system is activated and is believed to provide a hedonic reward, pleasure and motivation reinforcing people to engage in activities (Cheng, et al., 2014).

link serious gaming with the so-called Participatory Development Communication (PDC), which is a leading framework for good communication in international development research and practice. What they wanted to explore – from their point of view – was how development researchers and practitioners can better succeed in engaging the communities they work with. What the try to demonstrate is also that PDC cannot emerge from hierarchical and top-down transmission of knowledge, but only from horizontal processes of knowledge exchange²³⁸. However, horizontal interaction requires the intention to create a space where all participants feels comfortable with and where he feels free to express his opinion. PDC could be able to prompt constructive conversation between an inclusive range of development stakeholders, including representatives of donor organizations, development practitioners, local government officials, traditional authority figures, and community members. Of course, PDC also requires a facilitator which is neutral while encouraging critical thinking and respectful dialogue. In this case, Hinthorne and Schneider explicitly recall the concept of "dialogic communication", by encouraging critical reflection on one's own experiences, in addition to an orientation to action²³⁹, because "through making things, and sharing them with others, we feel a greater connection with the world".

According to them, play allows participants to view or experience familiar problems in a new way and creates a safe space for experimenting with novel solutions. Thus, serious play activities are designed with the purpose to provide a structured space within which this kind of critical analysis can arise and evolve, by also creating opportunities to exchange knowledge. In doing this, serious play is very different from generic play, because: (a) it creates a safe space for practicing skills and experimenting with new ideas or identities; (b) it enhances imagination and creative thought; (c) its processes show the character to elicit tacit knowledge²⁴⁰; (d) it can enhance participation and interaction.

3.2.4.3. GAMIFICATION: WHY AND WHERE

Now we have a more conscious and detailed understanding of what we are talking about and of how "gaming" can influence human behaviours.

²³⁸ By Horizintal we mean that every voice counts. Indeed, all participants are made capable of meaningfully contributing to the discussion of development issues affecting their local community (Hinthorne & Schneider, 2012).

²³⁹ Active engagement distinguishes a participant from an observer and differentiates play from entertainment (Hinthorne & Schneider, 2012).

²⁴⁰ The physical or tactile nature of serious play activities (e.g., model building, games, theater) can bring intuitive or tacit knowledge to the surface by drawing on aesthetic and perceptual dimensions of experience (Hinthorne & Schneider, 2012).

At this point, it could be useful to see where gamification is now applied (or can be applied) and why. We have examples on how it could be integrated with enterprise processes and risk management techniques. But many authors emphasize that gamification can be useful also to the whole society.

Gamification has been used in conjunction with terms such as "motivation" and "management". In marketing, we have a lot of loyalty card systems and programmes, but as we already said, it is turn to be increasingly less effective, as they are just external factors of motivation.

Bajdor and Dragolea (2011) argue that implementation and realization of gamification can also increase the effectiveness of the Risk Management System, through different drivers: Pattern recognition²⁴¹; Collecting²⁴²; Surprise and unexpected delight²⁴³; Organizing and Creating order²⁴⁴; Gifting²⁴⁵; Flirtation and romance²⁴⁶; Recognition for achievement; Leading others²⁴⁷; Fame/getting attention²⁴⁸; Being the hero²⁴⁹; Nurturing/growing²⁵⁰.

Even if it is true that some elements already mentioned in the previous section are present in what Bajdor and Dragolea argue, it seems that the factor of "immersion" is still missing, as well as a well-structured "field of the game", in a "simulated" reality where players can identify themselves and become involved. What they depict is a gamification of an activity, but what we seek is the creation of a **serious game**, which has proven to be more appropriate to the notion of cooperation and knowledge management.

²⁴¹ to search for the optimal behaviour of employees when they are working, by asking them to examine themselves, like in a game (Bajdor & Dragolea, 2011).

²⁴² employees of a company may be further motivated to comply with newly implemented safety procedures, by awarding them points as accurately as possible the use of these procedures (Bajdor & Dragolea, 2011).

 $^{^{243}}$ the person who won the most points, once a month, can be awarded the title of the employee who most closely observe safety rules in the company (Bajdor & Dragolea, 2011).

²⁴⁴ it allows the creation of the whole procedure of the proceedings and a group of people that will be working on the issue, so that they feel like important elements in the implementation of Risk Management (Bajdor & Dragolea, 2011).

²⁴⁵ in Risk Management, the gift could be a "virtual cake" for an employee who faithfully fulfils all the procedures (Bajdor & Dragolea, 2011).

²⁴⁶ it may be in the form of casual conversation or a simple presentation of sympathy (Bajdor & Dragolea, 2011).

²⁴⁷ after presenting the problem of safety rules in the enterprise, employees derive a working group to resolve the issue (Bajdor & Dragolea, 2011).

²⁴⁸ a group of employees who will develop the best solution to the problem is somehow a reward for its winning message reaches all employees of the company (Bajdor & Dragolea, 2011).

²⁴⁹ by proposing new solutions for improving the safety at work or modify existing solutions (Bajdor & Dragolea, 2011).

²⁵⁰ control is carried out regularly, and even the slightest derogation from the rule are immediately reported to the person responsible for risk management (Bajdor & Dragolea, 2011).

The same comments would apply also to what Oprescu, Jones and Katsikitis (2014) state in their paper proposing ten principles (I PLAY AT WORK) that may support gamification efforts. The ten principles are depicted by Figure 44.

| ID | Principle | Description | Theoretical basis | Expected benefits |
|-----|---------------------------|---|---|--|
| 1. | I Orientation | Gamified processes place the user (employee) at the center of the experience | Operant conditioning, locus of control, self-efficacy | Increased engagement, sense o control and self-efficacy |
| 2. | Persuasive elements | Gamified processes include persuasive elements based on sound psychological and behavioral theories | Theory of planned behavior, stages of change theory, uncertainty management | Adoption of new initiatives Increased satisfaction with Internal communication |
| 3. | Learning orientation | Focus on knowledge acquisition, skill development, motivational outcomes or behavior change | Theory of planned behavior, self-efficacy, experiential learning | Development of personal and organizational capabilities and resources |
| £.: | Achievement based rewards | Focus on a justifiable and predictable return on investment | Theory of planned behavior, experiential learning | Increased personal satisfaction and employee retention |
| 5. | Y Generation adaptable | Generation Y is the fastest growing segment of the workforce and they are looking for work experiences that are supportive, fun and engaging | Hierarchy of needs, psychogenic needs | Employee acquisition and retention |
| 5.0 | Amusement factors | Inclusion of humor, play and fun elements as part of the work processes | Psychogenic needs, social learning theory | Increased personal satisfaction and enhanced wellbeing |
| Z | Transformative | Use of a balanced and attractive combination of competition and collaboration in order to transform existing work processes within an organization | Leadership theories, team building | Enhanced productivity |
| 8. | Wellbeing oriented | Focus on personal and organizational wellbeing | Organizational behavior, self-competence | Enhanced personal and organizational wellbeing |
| 9. | Research generating | Collaborative research efforts must be encouraged to justify future investments in the area | Organizational needs assessment and evaluation | Enhanced monitoring and decision making |
| 10. | Knowledge-based | Based on knowledge, either as an outcome or as feedback | Organizational training, adult learning | Development of personal and organizational capabilities and resources |

Figure 44 - The 10 principles I PLAY AT WORK (Source: Bajdor&Dragolea, 2014)

Anyway, Shell²⁵¹ (2011) argue that we cannot gamify everything. There is a lot of bad games because they are not anchored to the context or correctly shaped to be in line with it. Many times, when we offer reward to do something, it eventually results in obtaining what we actually *do not want*, becouse things are done worse, not better, with an emphasis on quantity

²⁵¹ Jesse Schell is an American video game designer, an acclaimed author and a Distinguished Professor of the Practice of Entertainment Technology at Carnegie Mellon University's Entertainment Technology Center, a joint master's program between the College of Fine Arts and School of Computer Science in Pittsburgh, Pennsylvania.

and not on quality. Indeed, he proposes to talk about a "pleasurifization" - not "gamification" – which has the aim to improve pleasure in what we have to do, and thus to improve motivational design to think of how we could continue to do it in a different way.

Implications of games to society as a whole has been studied by Jane McGonigal²⁵² (2010), who has examined the question of what games can offer to the society in particular. By following the fact that 3 million hours a week are spent at playing online games, and that cognitive science research found that an average young person now, in a coutry with a strong gamer culture, will have spent 10.000 of hours by playing online by the age of 21²⁵³, she was wondering of what skills this "gamers" (will) have developed. Indeed, scientific research states that when we work on something so hardly for a period so long, we become virtuous and good at it. But, she asked herself: *good at what, exactly?* Thus, from her study, she found that this "further evolution of human beings" has led the gamers to develop the following skills:

- Urgent Optimism: it is the desire to act immediately to tackle an obstacle, combined with the belief that we have possibilities to be successful and win;
- Social Fabric: actually, we like people after playing with them even if they beat us because playing commit trust, as the other player will spend time with you, will follow the same rules, will value the same goal, will remain with you until the game is over. In this way, stronger social relationships and cooperative behaviors result;
- **Blissful Productivity**: people know that they are happier working hard rather than relaxing or hanging out, as we feel optimized by doing hard but meaningful work;
- Epic Meaning: gamers are very committed to "save the world" with missions inside "human planetary-scale stories".

These four pattern behaviours that she recognises in gamers lead to a conclusion on what they can be defined: *"Super-empowered Hopeful Individuals"* (McGonigal, February 2010, TED Talks). They believe they are individuals capable of changing the world. Nevertheless, she points out the paradox: they are ready and want to change the "virtual world" and not the

²⁵² Jane McGonigal is an American game designer and author who advocates the use of mobile and digital technology to channel positive attitudes and collaboration in a real world context. She has taught game design and game studies at the San Francisco Art Institute and the University of California, Berkeley, and currently serves as the Director of Game Research & Development at Institute for the Future and Chief Creative Officer at SuperBetter Labs.

²⁵³ Data based on a research carried out by the Carnige Mellon University (McGonigal, February 2010).

"real world". This is the problem, coming from the fact that the real world, as it is now, cannot give them the same pleasure, the same feelings. They are playing to escape the real world, which makes them "suffer". Hence, that makes sense but, obviously, cannot be an optimal situation, and McGonigol argues that the world should become more like a game – like what was supposed to happen in the ancient $Lidya^{254}$ – and she is working in this direction²⁵⁵.

After all, it is also a belief of Gabe Zichermann²⁵⁶ – one of the most vocal advocates of "gamification" concept – that games are good for society, by sustaining that "games are the only force in the known universe that can get people to take actions against their self-interest, in a predictable way, without using force" (Zichermann, 2010, Google Tech Talks).

3.3. Concluding Remarks

Chapter Three has explored how cooperation evolves as a flux of interactions between individuals and organizations, to integrate the models of cooperation investigated so far. This interactive process of ongoing exchanges let us able to combine and create new knowledge and innovation. We have eventually identified a new way to foster cooperation and knowledge creation, which is the "Game", which could be considered as "the new frontier" in knowledge management theory.

Firstly, cooperation has been explored by grounding on Sennett's 2012 book *Together*, one of the most important contribution in cooperation studies, from a sociological point of view. We learnt to consider cooperation as "an exchange in which the participants benefit from the encounter", requiring "dialogic skills", making people aware of their own views and expand their understanding of one another, through sympathy but primarily empathy. Sennett argues that the current society is "de-skilling" people in practicing dialogic conversations and

²⁵⁴ Herodotus proposed the view that in ancient Lidya, there was a hard moment of famine. The former king of Lidya, thus, decided to do something crazy: making the famine survival like a game. Practically, it is said that he ordered to people to alter one day when they could eat, and two days where thay could only play. The great commitment created for playing was so relevant that they could do this for 18 days. Some historical findings seem to corroborate this story (McGonigal, February 2010).

²⁵⁵One of the main aspects from her book "Reality Is Broken: Why Games Make us Better and How they Can Change the World" is that for solving the world's problems it is important that people play more games and not less. She created two games that could be played with the purpose to commit people in social issue, such as global pollution and so on. Both games have the principle "Play it – before you live it". The first game is "World without Oil", where, the gamers have to image that they are living on earth without oil and find out how they can survive. The second one is "Superstruct" in which over 8000 people have tried to find super-structs to save mankind, by developing ideas to hold super-threats like ravenous, power struggle or outlaw planet (Groh, 2012).

²⁵⁶ Gabe Zichermann is an author, public speaker, and CEO of Gamification.com. He has worked as a proponent of leveraging game mechanics in business, education, and other non-entertainment platforms to increase user engagement in a process called gamification.

cooperation itself, mainly due to increasing inequality and the new labour structures. Sennett envisaged a sort of "reformation of cooperation" to strike an appropriate balance between competition and cooperation, where dialogic exchanges can differentiate individuals and affirm the distinctive value of each person, with the fundamental support of a dialogic discussion and the power of rituals. This Reformation could be possible, according to Sennett, by returning to what he defines the "artisanal workshop", where the Social Triangle (Earned Authority, Lead-of-faith trust, Cooperation) can be restored and avoid the ongoing spread of the "uncooperative self". The "uncooperative self" has been created by the modern capitalism, and names that person who cannot manage demanding, complex forms of social engagement, and so decides to withdraw, to fight anxiety for diversity through social isolation, thereby nurturing narcissism and complacency. However, Sennett proposes the optimistic solution to trigger a reformation in cooperation and to "repair" the social relationships damaged from the uncooperative society, through a "craftsman approach" and everyday diplomacy.

We have also seen that, once that people are allowed to cooperate together – either within an open-ended discussion or to achieve a common purpose – something is created through this interactive social exchange, and that is knowledge. As Nonaka & Takeuchi teach, to be effective and lead to innovation (and firms' competitive advantage), this knowledge should be properly managed, in a flexible and innovative way. They distinguish explicit knowledge and tacit knowledge, which has proven to be the fundamental starting point to trigger the "knowledge spiral", in a circular process of socialization, externalization, combination and internalization, taking place between individuals. However, firms have to manage the mobilization of the tacit knowledge created at individual level to make it amplify organizationally, through the four models of knowledge conversion. This triggers the "spiral of organizational knowledge creation", starting at the individual level and moving up through growing communities of interaction, from the group to external networks. Nonaka and Takeuchi argue that this process has to be sustained by an appropriate structure – which they identify in the Hypertext Organization – and must have middle managers as undiscussed protagonists. After the Knowledge-Creating Company, some advances have been done, and we briefly discussed the appearance of the Communities of practice within and between organizations.

Eventually, we introduced some insights produced by a non-structured literature on "gaming" and "gamification", as this spreading tool seems to have the right features to be considered as the modern frontier of knowledge management. We discussed the different meanings of "play", "game", "gamifying", "serious games" and "simulation", to come up with a major understanding of the phenomenon under consideration. We also tried to understand how people feel when they are playing and we found that, if the game is well-structured, meaningful, challenging and engaging, they go completely engaged, engrossed and finally totally immersed in the simulated reality. However, it is not sufficient to create whatever type of game to be successful, or to implement just factors of external motivation (like external rewards) to make people involved. They need to be primarily intrinsically motivated, by implementing a meaningful gamification by following the principles of Relatedness, Competence and Autonomy. Indeed, when people feel intrinsically motivated, it has been found that they are able to develop important skills by playing (urgent optimism, social fabric, blissful productivity, epic meaning), allowing them to become "Super-empowered hopeful individuals".

Thus, what we need, to foster cooperation and knowledge creation, is a "Game" as well as an appropriate structure to maintain cooperation and knowledge creation alive. However, we need a specific type of game and a specific type of organizational structure. We need a well-structured serious game, conceived to simulate a specific context governed by its own rules where players assume specific roles, by identifying themselves with the characters and being immersed in the simulated reality, which has to be connected and related to the non-simulated one. In fact, we purse to create a desired impact on the latter. On the other hand, we need an appropriate organizational structure created to maintain cooperation between people alive and allowing the continuous spirals of knowledge creation. Nonaka and Takeuchi have already suggested the hypertext organization, and we discussed the communities of practice. However, other recent methods are now available.

We will discuss these issues in the final chapter, when we will even discover unexpected links between the different insights from each chapter, and we will be able to form our comprehensive mid-range theory.

4. CHAPTER FOUR – THE "FUTURE GAME": CLOSING THE CIRCLE

In the previous chapter, we have seen that "the Game" can have a great impact on collaborative practices and knowledge creation, if well constructed and well managed, in order to make players involved and committed to the game's purpose. Indeed, it is well known and demonstrated that people like playing, and they spend a huge amount of time doing that. Thus, there is a chance to shift the gamers' attention from the simulated (or "virtual") reality to the non-simulated reality, by gamifying it and the way to find new solutions to existing problems. This might be done by society, private and non-private organizations, including firms and partnerships of firms.

Chapter Four has the aim to understand how games can practically be used and integrated in business practices, and whether they can be combined with other recent organizational forms created to encourage cooperation and knowledge sharing. We will also try to interpret this trend by taking into account the whole theoretical framework discussed in the previous chapters (knowledge management, Sennett's artisanal flux of interactions, different models of collaboration between firms), to end up with some insights on the "evolution of cooperation" with reference to the Prisoner's Dilemma Game. In particular, we will focus on the emerging "Future Game", which – among other serious games studied so far – seems explicitly to enlarge the "shadow of the future" and to have the perfect features to foster cooperation, innovation and knowledge creation.

Hence, we will eventually close the circle, open at the beginning of the paper with the Axelrod's solution to the uncooperative Prisoner's Dilemma Game.

4.1. Fostering Knowledge and Cooperation: New Organizational Choices

Before discussing in more details how games can practically be used, it is important to say that some new organizational choices have arisen during the last decade, which have the aim to foster cooperation and agile management to manage and create knowledge and innovation.

We would like to mention two of these new organizational structures which seem to be the most important for our purposes: the 2010-new Italian juridical form "*Contratto di rete*" (**Network Agreement**), and a new certified agile project management technique, the **Scrum**



Approach to Project Management.

4.1.1. Network Agreement (it. "Contratto di Rete")

In Italy, the Network Agreement – which is the literal English translation from the Italian juridical name "Contratto di Rete" – has been put formally into force in 2010, through the law n. $122/2010^{257}$. Law n. 221/2012 has introduced further modifications.

The Network agreement came from the necessity to give a new juridical instrument to regulate an already wide ongoing phenomenon in Italy: the birth of many enterprise networks, mainly

small and medium firms, which have the necessity to work together to increase their competitiveness in national and international markets²⁵⁸. Italian economic scenario is very particular in this sense, because it counts a large part of the firms being SMEs, and this derives from the historical economic conjunctions which have characterized the Country over the past 80 years²⁵⁹.

The Network Contract is an additional form to other kinds of networking solutions governed by law, such as consortiums, collective mandates, A.T.I.s, joint ventures, G.E.I.E.,

 ²⁵⁷ L. n.122/2010 followed the initial introduction with the legislative degree . 5/2006 (art.3 comma 4-ter and following), converted with l. n.33/2009 and then modified by n. 99/2009 and also reformulated by l. d. n. 78/2010 (Bernini, et al., 2012).
²⁵⁸ It has been found that networks are set up due to the following reasons: (1) to create leaner organizational structures of big integrated

²⁵⁸ It has been found that networks are set up due to the following reasons: (1) to create leaner organizational structures of big integrated organizations; (2) to increase economies of scale and specialization which would be impossible for the single firms alone; (3) globalization, since firms who whish to operate in foreign markets are trying to manage relationships' platforms of increasing complexity (Bernini, et al., 2012)

²⁵⁹ It depends on the "institutional shocks" characterizing the Italian history. In fact, in the early 1960s, large corporation began to have a crisis, because of tensions in the labour market, very quickly wages increase, drop in the share of self-financing, growing need of external capital. At that point the so-called "potential industrial districts" (already present in the 1950s) were ready to gather the skilled workers fired by the large firms. In this way, the micro-industry development was fueled. (Barca, et al., 1998).

franchising contracts, sub-supply contacts. Each of them – including the Network Agreement – are characterized by autonomy, interdependence, coordination, cooperation, stability and flexibility.

The Network Contract has, however, something more than those ones, because it allows to require juridical personality in order that the "network" can be treated by considering its "oneness" and without distinguishing among the different members. The Network thereby created could also have a head office and a "name", which represents its juridical name. The contract should also be registered at the Companies Registration Office²⁶⁰. The law does not limit the participation to Italian firms only, and it is widely interpreted that even foreign firms are allowed to join the network, also because this limitation would be in contrast with the European law.

The Network contract is very flexible, and the law indicates the essential and discretionary elements to introduce inside the contract, shown by Table 5.

| Essential Elements | | Discretionary Elements | |
|--------------------|---|------------------------|---|
| | | | |
| 1) | At least two Entrepreneurs joining together | 1) | Setting up of a "Common Capital Fund" and connected |
| 2) | Strategic Objectives declared, to innovate and rise the members' competitiveness, and methods to evaluate the effective achievement | | management rules ²⁶¹ |
| 2) | The "Network Programme", including rights and duties for participants and the action needed to fulfil the "Common Plan" | | Setting up a "Common Authority" for contact execution and monitoring, by specifying the representing powers and substitution rules ²⁶² |
| | | | |
| 3) | Contract duration | | |
| 4) | Joining modalities for other potential entrepreneurs | 3) | Clauses related to discretionary early termination of the |
| 4) | Decision-making rules | | contracts |
| | | | The second se |

Table 5 - Network Contracts: Essential and Discretionary Elements

What is very important to stress is the purpose of the contract, which should be strategic: to increase, individually or collectively, their own innovative capacity and competitiveness on the market. Thus, members commit themselves to collaborate according to the forms and fields established by the "Common Programme", in line with the normal business activities, or to exchange information and industrial, commercial, technical or technological services, or even to exercise one or more activities belonging to the firms' core business. Anyway, despite the great flexibility of the Network Contract, it does not make exceptionS for the

²⁶⁰ To do that, the contract should be composed by notary deed or certified private written work (Bernini, et al., 2012).

²⁶¹ The law envisages two ways to constitute the "Common capital Fund": (1) network fees from the member firms; (2) the provision of capital assets, if member firms are joint-stock company (Bernini, et al., 2012).

²⁶² The law does not state anything about organizational model to be applied. Thus, there is full freedom for the member firms (Bernini, et al., 2012).

purpose to pursue, and that is a real important and typical feature of this new contractual form. It has to create an impact.

That is also the starting point for the need of stability during the fulfilment of the contract, and assures the evolution and improvement of the relationship, to improve also individual and collective growth. Moreover, achievement measurement makes easier to understand if the network is producing real useful results.

The "Common Programme" represents the object of the contract: the series of activities which will be carried out by the network, by declaring rights and duties of each participants and achievement modalities. It is the real motive why firms decide to build up the network and sign the contract. The core business activities of each member represent auxiliary activities in support of that ones established in the Common Programme. Members could belong to the same or different sector of production. Therefore, it is reasonable to think that the contract should have a minimum duration, even if it is not explicitly specified by the law: the minimum duration which is necessary to fulfil the activities established by the Common Plan. The law does not specify neither a maximum duration, but it is assumed to be necessary. Interpreters assimilate the Network Contract to the non-competition agreements, which cannot last more than five years, and that it cannot be signed to enlarge the duration of a previous non-competition agreement.

It is also meaningful to mention the relationship between the Network Contract and the antitrust rules and controlling authorities, as sometimes it could have some features with doubtful compatibility to them. Indeed, it could represent a sort of "State aid" to enterprises, by favouring only some firms without justifiable motives, because many forms of financial support to these types of networks have been introduced, including tax reduction. Nevertheless, European Commission stated – with the decision on the January 26th, 2011, C(2010)8939 def. – that these measures do not represent an unjustifiable case of State aids according to the TFEU (art. 107), because the network does not have autonomous juridical personality: it is connected to those ones of the member firms. Anyway, European Commission also points out that: (1) It does not affect the application of the art. 101 TFEU (*"The following shall be prohibited as incompatible with the internal market: all agreements*

between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the internal market. (...)"); (2) If public authorities encourage the formation of a Network contract, it does not mean that it is compatible (Communication 2011/C-11/01). As far as national antitrust authorities are concerned, in Italy, we state that the Network Contract cannot constitute a dispensation from the application of the principle to assure competition in the market (Communication of May the 11th, 2011).

Therefore, European and national antitrust authorities **do not allow Network Contracts when they have the purpose (the "object") or the effect to reduce, impede or distort competition**. Minor agreements are allowed, that is to say that ones that in any case cannot have a decisive impact on the competition in the market they are operating in, because of the small aggregate size. Those agreements can be authorized by the antitrust authorities when they envisage an improvement in the offer conditions for the users, which have the power to assure a substantial benefit for customers and, at the same time, allow the necessary competitiveness to other firms at international level. These improvements should be related to an increase in production levels, better quality of the products or services, or even of the distributive process due to technical, technological or economic progress. Although, two more requirements are necessary: (1) the agreement is indispensable to the purpose; (2) it is impossible to eliminate the competition in that market.

Also in case of dominant position, it is important to pay attention, because it could be possible that two firms, one of which has significantly great power on the other one, compose the network: hence, the letter's decision are in a situation of dependency on the former's decision. Even in this case, the Network agreement is not allowed because it eliminates a situation of free competition between firms. Some doubts on compatibility arise also in case of the creation of "concentrations" through the establishment of the Network Contract.

Because of the fact that the Network Contract **is born to support the innovative capacity and competitiveness of small and medium enterprises**, it seems difficult that they can give rise to a forbidden anti-competitive behaviour capable to significantly reduce, impede or distort competition. Moreover, in principle they have the aim to increase competitiveness in the market, not to reduce it.

Anyway, what is important is that the benefits to the customers resulting from the network should be greater than the anticompetitive effects caused in the market.

To conclude, despite some reasonable limits to their expression, Network Contracts seem to be a very effective organizational, juridical and economic tool to foster cooperation between firms, mainly of small and medium size, because otherwise they would not be able to reach the same joint result.

4.1.2. Scrum: a new Agile Project Management approach

Quite recently, also a new agile project management technique has started to spread, even inside the major companies in the world, like Google, Microsoft, Oracle, Yahoo, Palm, Siemens, and many others. We are talking

about the Scrum approach to project management, created by Ken Schwaber²⁶³ and Jeff Sutherland²⁶⁴ in 1990s.

They use Scrum for the first time in 1993, when they worked at Easel Corporation to formalize the Scrum development process at the 1995-edition of the annual conference OOPSLA (Object-Oriented Programming, Systems, Languages & Applications), organized by ACM (Association for Computing Machinery). Afterwards, they have worked to spread the method, resulting in a book published in 2001 ("*Agile Software Development with Scrum: Series in Agile Software development*"), and the release of the first edition of the SCRUM Guide in 2010, the SBOKTM Guide. The methods became to spread, with the

| Adaptability | | |
|-------------------------------|--|--|
| Transparency | | |
| Continuous Feedback | | |
| Continuous Improvement | | |
| Continuous Delivery of Value | | |
| Sustainable Pace | | |
| Early Delivery of High Value | | |
| Efficient Development Process | | |
| Motivation | | |
| Faster Problem Resolution | | |
| Effective Deliverables | | |
| Customer Centric | | |
| High Trust Environment | | |
| Collective Ownership | | |
| High Velocity | | |
| Innovative Environment | | |
| | | |

Figure 46 – Benefits of SCRUM (Source:

The SBOKTM Guide)

²⁶³ Ken Schwaber (born 1945) is a software developer, product manager and industry consultant. He is also a founder of the Agile Alliance and Scrum.org, he is responsible for founding the Scrum Alliance and creating the Certified Scrum Master programs and its derivatives.

²⁶⁴ Jeff Shuterland was a fighter pilot in the US Air Force and then he joined the faculty at the University of Colorado Medical School. He has worked for eleven software companies, managing the last seven entirely using Scrum, and achieved industry-leading, hyper-productive results. He is now the Chairman of the Scrum Training Institute, and Senior Advisor to OpenView Venture Partners where he is Agile coach for portfolio companies.



Figure 47 - Scrum Principles (Source: the SBOKTM Guide)

organization of courses and the establishment of the several professional **SCRUM®** project management's certification, and now it has finally become preferred project development the methodology for many organizations globally.

Actually, the origin of the method have their roots in Nonaka and Takeuchi's approach to innovation and product development. Indeed, as we remember, they started the discussion around the knowledge-creating company by departing from the game of "rugby".

The "Scrum" is indeed a rugby concept, happening when a group of players form together to restart the game (ScrumStudy, 2013).

Hence, Scrum is conceived as a method to deliver meaningful results in a very short time period, requiring a very intense and concentrated commitment and effort as well as great collaboration among the members of the project team, which is cross-functional, selforganized, and empowered, composed by 6-10 members.

Scrum is based on six principles, representing its essential background: (1) Empirical process control²⁶⁵; (2) Self-organization²⁶⁶; (3) Collaboration²⁶⁷; (4) Value-based prioritization²⁶⁸; (5) Time-boxing²⁶⁹; (6) Iterative development²⁷⁰.

²⁶⁵ By emphasizing transparency, inspection and adaptation (ScrumStudy, 2013).

²⁶⁶ Workers self-organize their work and deliver of results, leading to a better leader by-in and shared ownership (ScrumStudy, 2013).

²⁶⁷ It focuses on awareness, articulation and appropriation, as project management is seen here as a shared value creation process (ScrumStudy, 2013).

⁸ The focus has to be to deliver the maximum value from the beginning to the end of the project (ScrumStudy, 2013).

²⁶⁹ Time is seen as an important constraint for projects, and to manage it, scrum practitioners arrange Sprints, Daily Standup Meetings, Sprint Planning Meetings, Sprint Review Meetings (ScrumStudy, 2013). ²⁷⁰ The development is seen a circle, to better manage changes, and build products that satisfy customers' needs (ScrumStudy, 2013).

Each Scrum cycle starts with a Stakeholders meeting, through which the Project Vision is created, so that the Project Owner can prepare the Prioritize Product Backlog, containing a prioritized list of business and project requirements, written in the form of "User stories". The core unit of the process is represented by short-time work cycles, called Sprints. Each Sprint starts with a Sprint Planning Meeting, where project team's member consider the various User stories to be included in the work, with the aim to produce (after usually 1-6 weeks) potentially shippable deliverables or product improvements. Then, they proceed with Daily Standup Meetings to discuss daily progress. At the end, we have the Sprint Review Meeting, where deliverables are delivered to the Project Owner and relevant Stakeholders. After the deliverables' acceptance by the Project Owner, the Retrospect Sprint Meeting discusses the lessons learned and how to improve the delivering process, before passing to the next Sprint.



Figure 48 - Sprint Flow Cycle (Source: the SBOKTM Guide)

Scrum can be used to manage projects, programs, project portfolios. It is very scalable, as it has the feature to be suitable for large and small projects, independently from the size, as it is based on teams, and multiple teams can be assigned to the project. By augmenting the level of complexity, however, it is recommended to appoint a Scrum Guidance Body, to coordinate the different and multiple teams.

As for organizational aspects, Scrum roles fall into two broad categories: (1) Core roles; (2) Non-core roles.

Core roles are "those roles which are mandatorily required for producing the project's product or service" (SBOK GuideTM, 2013), and are represented by the Product Owner²⁷¹, the Scrum Master²⁷² and the Scrum Team²⁷³. The **Non-core roles** are "those roles which are not mandatorily required for the Scrum project and may include team members who are interested in the



Figure 49 - Organizational Structure in Scrum (SBOKTM Guide, 2013)

project" (SBOK[™] Guide, 2013), and they include Stakeholders²⁷⁴, Scrum Guidance Body²⁷⁵, Vendors²⁷⁶, Chief Product Owner²⁷⁷ and Chief Scrum Master²⁷⁸.

Thus, Scrum represents a managerial solution to make project management more collaborative, to commit intense effort from people, in the attempt to share and create new knowledge and manage fast changes. After all, it is rooted into the Nonaka and Takeuchi's thought, and the well-known metaphor of Scrum and the game of Rugby.

The "game" of rugby. Thus, we are always talking about "gaming".

That is what make us closer to the "game" as a new form of knowledge sharing creation though cooperation that we would like to explore and understand how can practically be used and integrated with the already mentioned organizational practices.

²⁷¹ The Product Owner is "the person responsible for achieving maximum business value for the project. He or she is also responsible for articulating customer requirements and maintaining business justification for the project. The Product Owner represents the Voice of the Customer" (SBOKTM Guide, 2013)

²⁷² The Scrum Master is "a facilitator who ensures that the Scrum Team is provided with an environment conducive to complete the project successfully. The Scrum Master guides, facilitates, and teaches Scrum practices to everyone involved in the project" (SBOKTM Guide, 2013)

²⁷³ The Scrum Team is "the group or team of people who are responsible for understanding the requirements specified by the Product Owner and creating the Deliverables of the project" (SBOKTM Guide, 2013).

²⁷⁴ Stakeholders include "customers, users, and sponsors, frequently interface with the Scrum Core Team, and influence the project throughout the project's development (SBOKTM Guide, 2013).

²⁷⁵ The Scrum Guidance Body is "an optional role, which generally consists of a set of documents and/or a group of experts who are typically involved with defining objectives related to quality, government regulations, security, and other key organizational parameters" (SBOKTM Guide, 2013).

²⁷⁶ Vendors are those ones who "provide products and/or services that are not within the core competencies of the project organization" (SBOKTM Guide, 2013)

²⁷⁷ The Chief Product Owner is "responsible for facilitating the work of multiple Product Owners, and maintaining business justification for the larger project" (SBOKTM Guide, 2013)

²⁷⁸ The Chief Scrum Master is "responsible to coordinate Scrum-related activities in large projects which may require multiple Scrum Teams to work in parallel" (SBOKTM Guide, 2013)

4.1.3. Games as a starting tool

As we have seen, Network Contracts and Scrum Project Management approach might be useful practices and organizational choice to maintain and foster cooperation and knowledge creation management inside an organization (or between partner organizations).

However, perhaps something more is needed to trigger the process, to fire up the effective and widely accepted establishment and evolution of these organizational solutions. We argue that this trigger could reasonably be the "Game".

Now, as deduced by the conclusions of Chapter 3, we are not focusing on general "gamified activities", which try to reformulate ordinary activities as if people are continuously playing a game. We precisely focus on well-structured simulated serious games, conceived to simulate a specific context governed by its own rules where players assume specific roles, by identifying themselves with the characters and being immersed in the simulated reality, which has to be connected and related to the non-simulated reality - as we pursue to produce a significant impact on it.

By departing from that, it seems obvious to say that this type of Game is something that requires a great effort to be constructed and ready as a "product" to be used by organizations which need it. It also requires an element of surprise and a learning experience deriving by the fact that people have never played such type of a game. Indeed, if the same game is played multiple times, it becomes a repeated activity, without leading to the curiosity to explore every facets, because people become sorts of "experts" on it. This is not what we seek for. We want a game which is really challenging for people and that is something new for them. All these reasons suggest that the "Game", as we interpret it, to be effective and fruitful should be a one-time game.

What we suggest is that such one-time game could be played at the beginning of the changing process to a new organizational structure able to encourage cooperation and innovation for a long time. Thus, the "Game" would become the powerful "trigger" of the change. However, it could also be played for other reasons than changing the organizational structure, which is the extreme scenario. It could be played also to permit a major understanding of partners or colleagues, as a team building tool, to inspire new ideas in case of new product development, to better define relevant strategies, and so on. What is

important for us is that the Game should be one-time and thus considered as a great and rare opportunity by players, which do not want to miss it and they will commit the maximum effort.

In practice, there exist a few games in line with our requirements, conceived as "products" or as research tools. Some of them have been largely studied already, some others need to be further analyzed in literature. Here, we follow with a summary of the three major games which are now used and that could be useful for our purpose: The Barnga© cultural game, The Lego® Serious Play®, and The Future Game®.

4.1.3.1.



Figure 50 - The 1994-first-book on Barnga Game, by Thiagarajan and Steinwachs

THE BARNGA© CULTURAL GAME

The Barnga© cultural game is a sort of simulation of crosscultural encounters, and has the aim to tell us about culture and how we feel it. It was created during the '50s by Sivasailam Thiagarajan²⁷⁹ and Barbara Steinwachs²⁸⁰, two anthropologists who were working for the Foreign Service Institute (Bergelson, 2014). They invented the game because they needed something to make people understand that cultural knowledge is really important when interacting with people in professional contexts, business, politics and so on. The name of the game is the same as a West African Town, where the authors felt for the first time the shock of subtle cross cultural differences which

affected the functionality of their task group (Pittenger & Heimann, 1998). Thus, the game was born.

The premise of the game is that cultural differences are often very subtle, and this can be hidden by many apparent similarities. This can cause problems in interpersonal relationships and accomplishment of tasks, even if people are not really aware of the underlying reason.

²⁷⁹ Sivasailam Thiagarajan is the Resident Mad Scientist at The Thiagi Group, an organization with the mission of helping people improve their performance effectively and enjoyably. Thiagi has published 40 books, 120 games and simulations, and more than 200 articles, and has been the president of: North American Simulation and Gaming Associating (NASAGA), International Society for Performance Improvement (ISPI), and Association for Special Education Technology (ASET). He has received 17 different awards and Presidential Citations from ISPI, including the society's highest award, Honorary Life Member. He also received an Honorary Life Member award from NASAGA as well as its highest award, Ifill-Raynolds Award (Thiagi.com).

²⁸⁰ Barbara Steinwachs is a consultant in the use and design of simulation games and other interactive group methods for organizational planning, education and training, and program development. Her ongoing search is for ways to make group planning and learning more participative and experiential. She is also Game Review editor of the journal Keuka Lake (Steinwachs, 1992).

Participants are invited to a card game tournament, where some rules exist: they have to seat at a table of four people each, each table is given a list of rules, a stack of cards and participants can start to play the game according to these rules. Very important is the fact that people cannot talk, they can just draw pictures or make gestures if they need to communicate with each other. They play a couple of tournaments and they end up with two winners, those ones who have gained the best scores. Then, they move to another table, so people are changed between tables and then they re-start to play the same game. However, now something is different because the other players do not behave like they are expected to behave and things get somehow weird. The situation chances so much that they turn out to think that the other players are "stupid", "bad" or "cheaters", and they start having bad feelings about them. Things somehow do not work at all, players get emotional (they get angry, frustrated) and thus stop seeing the game as a simple game. At this point, at least someone tries to do something to fix the situation, to make these rules be applied, by drawing and gesturing. Eventually, they arrive to understand that they were given rules slightly different from those of people they were playing with during the second round. Tables were given slightly different rules, each. So, players were not "stupid", they were only playing different rules.

This is what exactly happens also in the real life, when people get to another culture, which has been found to be emotional. In real life, it also happens even if we use a common language (not only gestures or drawing), since sometimes, it is not sufficient to understand that, at a certain moment, you suddenly start playing different rules. You do not even think about these rules, as they are our culture and we do not really calculate how to behave. We do not feel this cultural "rules" until we come in touch with another different culture, as things become more difficult.

Finally, what participants learn at the end of the simulation is summarized below (Bergelson, 2014):

- The Feeling of Culture, including their own culture;
- **Culture is emotional and sensitive**, because it is a goal-driven activity²⁸¹;

²⁸¹ When we communicate, we wont to achieve something and we think to know the rules to do that. Thus, we do not discuss the rules and we just move and suddenly understand that it does not actually work. And we feel this understanding inside us, the understanding that culture is indeed sensitive and that it is around failures and successes (Bergelson, 2014).

• Going to another culture is like playing a game where you do not know (all) the rules but you still rely on them.

Barnga© is a simple and versatile game, as it could be used to explore various topics, namely diversity management, cross cultural communication and socialization, difficulties in international business, and so on.



4.1.3.2. THE LEGO® SERIOUS PLAY®

The LEGO® Serious Play® is "a facilitated workshop where participants respond to tasks by building symbolic

and metaphorical models with LEGO bricks and present them to the other participants" (Frick, et al., 2013).

LEGO® Serious Play was conceived by the LEGO Company²⁸² at the end of the 1990s, to be used internally to find new ways to develop their strategies. The game was officially launched and offered to the public in 2002, with the support of Johann Roos, Bart Victor, and Robert Rasmussen. In 2012, it even became the heart of a wide European project: **S-Play** (**Lego Serious Play for SMEs**²⁸³ - 2012-1-PL1-LEO05-27421).

S-Play is a 2-year project funded by the European Union under the Lifelong Learning Program (LLP) – Leonardo da Vinci – Transfer of Innovation, starting in January 2013 and concluding in December 2014, with the aim to adapt an innovative learning process to the needs of SMEs and, at the end, create a digitalized version of the game.

The invention of the serious game is rooted in some key theoretical backgrounds, namely the theory of play²⁸⁴, constructionism²⁸⁵, hand-mind connection²⁸⁶, imagination²⁸⁷.

²⁸² https://www.lego.com

²⁸³ http://s-play.eu

²⁸⁴ Two key components in serious play are storytelling, stimulating the production/reconstruction/elaboration/transformation of organizational values and beliefs, and metaphors, generating way to understand things and playing an active and creative role in human cognition (Frick, et al., 2013).

²⁸⁵ Constructivism is based on the assumption that learning happens especially well when people are engaged in constructing a product which is external to themselves, since constructing things and constructing knowledge go in parallel, as Papert and Piaget argue (Frick, et al., 2013).

²⁸⁶ The idea of the Lego® Serious Play® is that, for participants, it is like to use the hands "to build 3D-models of pieces of knowledge, ideas and feeleings", by ensuring a deep connection between the hands and the brain (Frick, et al., 2013).

²⁸⁷ Lego® Serious Play® is based on the belief that it is needed an interplay among three basic meanings of the term "imagination": (1) Descriptive imagination (describing something); (2) Creative imagination (creating something); (3) Challenging imagination (challenging something). The pursued interplay of these three builds the so-called "strategic imagination", which is the source of original strategies in companies (Frick, et al., 2013).

Large scientific literature has been produced around the theme of the Lego® Serious Game®, some more related to the theories and concepts behind it and the methodology itself, some others aiming at presenting concrete applications of it.

However, the standard applications of the Lego® Serious Play are:

- 1. *Real Time Identity for You*, to allow participants to better understand themselves and their colleagues;
- 2. *Real Time Strategy for the Team*, triggering the full potential of a team quickly, effectively, and deeply;
- 3. *Real Time Strategy for the Enterprise*, to develop strategies continuously in an unpredictable world.

LEGO® Serious Play® methodology is based on three basic values and on four essential steps. The three basic values are: (1) The answer is in the system²⁸⁸; (2) Everyone has to express his/her reflections²⁸⁹; (3) There is no ONE right answer²⁹⁰.

The process, to be successful, also needs to pass through four essential steps taking place in half a day or a couple of days. They are:







- 1. The facilitator poses a challenge, a question that must have no obvious or correct solution;
- 2. **Participants build their answers using LEGO bricks**, by building a story, assigning meanings to their models and thereby creating new knowledge;
- 3. **Participants share their answers with other participants**, and listen to the their stories as well;
- 4. **Participants reflect on what they have seen and heard,** with the support of the facilitator.

²⁸⁸ According to LSP research, it "is all about participants expressing themselves and listening to each other" (Frick, et al., 2013).

²⁸⁹ According to LSP research, "the multitude of contributions to the dialog is an important part" (Frick, et al., 2013).

²⁹⁰ According to LSP research, "different views and different perspectives (...) must come out in the open without anybody saying which is 'right' or 'wrong' (Frick, et al., 2013).

Thus, the game is thought as a tool to stimulate thinking, communication and problem solving. Someone has also argued that the LEGO® Serious Play® methodology could be also seen as a new way of communication within a scenario workshop, which has the aim to develop reasonable future scenarios in a short period of time by involving stakeholders and experts to the topic (Grienitz & Schmidt, 2012). As many times problems of lack of creativity and imagination can arise and can create problems in understanding the "future" and building new types of solutions, the authors think that the LEGO® Serious Play® could be used to avoid that, and experimented it. What they found is that the game helped to create a common starting point for all workshop members. Overall, it effectively helped in motivating intrinsically the workshop members, and communication was much easier, with everyone having the same picture in mind as a "shared model". It also allowed guided discussion and creativity to be expressed, and participants experienced more "flow".



4.1.3.3. THE FUTURE GAME®

The Future Game® is a premium quality, experiential learning teambased simulation tool offered by Future iQ Partners²⁹¹, and has the aim to train participants to face critical decisions which could have a significant impact in the long-term, by finally enlarging the participants' perception of the future. It is an excellent tool for people to explore decisionmaking, and to better understand their own leadership and decision making styles.

The game was conceived by David Beurle, Michael O'Connor and James Fisher (2009), and officially promoted and played for the first time in 2009. The game has been pioneered and refined by Future iQ Partners over the last 7 years. It was born specifically as a regional planning tool, and it has been played in many settings across North America, Europe and Australasia. Now, The Future Game® has also been adapted and tested to corporate and organizational environment.

²⁹¹ Head Company website: <u>http://future-iq.com/</u>; list of Future IQ Partners (Future IQ Team and Strategic Partners) at <u>http://future-iq.com/who-we-are/</u>.

The Future Game® has a workshop setting, with teams of maximum 5-6 members, and each session lasts around two hours, so it is very fast-paced. Each session develops across three steps:

 Each team is given a base map depicting a hypothetical region and they are asked to make decisions to arrive to the best 20year future scenario;



- 2. The active session is split into five stages, where each team has to choose between two critical decisions, by taking into account the particular situation characterizing the region in a particular time range: when they make a decision, they pass to the next stage, which is set in a future scenario some years later, resulted from the specific decision chosen. Teams are given a set of important national and international events, to be considered in order to come up with the choice, and, after each stage, they receive a new map depicting the impact of their decision on the region;
- 3. At the end of the game, the debriefing helps to reflect on the different "future paths" chartered by each team, by inducing to think about the decisions made in the game and their impact on the long-term future.

Future IQ Partners have found that The Future Game® has great results on participants: it "rewards collaboration and innovation, and highlight the dangers of 'status quo' thinking", by relating their Future Game experience to business and decision making challenges they face every day at work, and thus improving strategic planning, speeding up decision-making, and increasing collaboration within teams and groups. It is engaging and challenging, and sends a strong message of how companies and regions must operate to stay ahead in today's ever-changing world.

The most important outcomes produced by The Future Game® are:

- It demonstrates how Careful Planning is important to achieve the desirable future we aspire to create;
- It is capable to change the way people and leaders are thinking about the future;

- It analyses a triple bottom line in shaping the different future scenarios: social, environmental and economic factors;
- It increases awareness of the key elements of the decision-making process needed for a solid strategic plan or future vision;
- It encourages team collaboration in the creation of a shared future and objectives, by means of shared decisions.

Therefore, The Future Game® is suitable to be used in different settings and for different purposes, optimally for group's engaging in discussion about the future, efforts' increasing in strategic planning, nurturing of leadership and critical decision-making, team building and change-management.

What is important to stress is also that The Future Game® includes a storytelling approach: however, different "stories" can arise actually, and that "stories" are customized, as self-created by the team members through the decisions made at the end of each stage, according to the "future-scenario-paths" in the background, previously established. These "future-scenario-paths" can be considered as both the most important set of rules of the game, and also the most flexible way to allow teams to make different decisions, create different "stories", and at the end be still comparable according to "standard" elements. Indeed, on one hand, teams are forced to move across the various possible scenario alternatives provided, and they cannot get-off or avoid these "tracks". On the other hand, they are flexible and quite free, because – for example – two teams can get to the same future 20-year scenario but the decisions made are slightly different, so as the two "stories" thereby created. Despite that, the outcomes of each team can be usefully compared to each other, as everyone moves over the same standard background.

This is very interesting, and what is even more interesting is the work lying behind the creation of each Future Game® Pack. Indeed, different versions of the game have been introduced by Future IQ Partners, each one referred to a different "hypothetical region": the Western Australian Wheatbelt, the West Cork region of Ireland, the Prairie Canada of Alberta, the REZ (modeled on a Native American Tribal reservation), Midwest USA, the Pacific Northwest region of North America.

However, they are not really "hypothetical regions"; or better, they are hypothetical inside The Future Game® context when other external players are playing. But, each version has been created by departing from a real situation of each of the regions mentioned above. Each version has been created by thank to a scenario planning process of Future IQ Partners within that specific region, because of a need manifested by the major stakeholders which wanted to start to think and to have in mind the possible future scenarios which could have been produced by their current action. This is actually another service offered of Future IQ Partners, which is called Decision Path®.

Thus, each different version of The Future Game® in a particular "hypothetical region" has a solid theoretical and practical design foundation, and requires a developmental period of approximately 1-2 years, and involves extensive research, refinement and testing.

The simplicity of the game perceived by participants when playing, is sustained by a great complexity and scientific work in the background, which is necessary to "guide" the participants in their path.

To conclude, we have many elements in The Future Game® - more than the other games explored – which are very connected to our main topic and purpose: to find how collaboration is fostered within and between firms – by departing from the problem of the Prisoner's Dilemma Game, when it is convenient to foster collaboration, which kind of knowledge and innovation is produced and what are the effects.

Therefore, we decide to understand and analyze The Future Game in more details and to frame it into the different collaboration theories studied in the previous chapters.

4.2. The Future Game®: How does it work?

We will now discuss who are Future IQ Partner s– the founders, developers and sellers of The Future Game® – and what are the other services they offer, everyone related to the concepts of "future", "social interaction", "strategic decision-making".

tuture>

4.2.1. Future IQ Partners

Future iQ Partners (<u>http://future-iq.com/</u>) is a young PARTNERS Australian micro-multinational founded by David Beurle²⁹² in 2003, and It has expanded to form a global presence with projects and staff across Europe, North America and Australia. Their mission is to help people "to succeed in today's rapidly changing world" (Future IQ Partners), as a global consultant of to governmental, corporate and private organisations to optimise strategies for uncertain futures.

"Using best practice research, dynamic simulations, network analyses and contemporary science, Future iQ engages clients to build customised comprehensive future planning processes. We then help our clients position themselves for a positive future by turning the planning into resilient action plans that consider their local aspirations within the context of evolving global trends." (Future IQ Partners)

Currently, Future IQ Partners counts **Expert Teams** in several countries globally, namely Australia, USA, United Arab Emirates, Ireland, Germany, Netherlands, and Italy, and operates with clients coming from every part of the world. Nowadays, it counts four Strategic Partners:

- **KlinK** (Florence, Italy): consultancy company with the aim to help customers to create competitive advantage sustainable in the lungrun by providing innovative solutions to knowledge and change management.
- Desiree Futures (Perth, Australia): independent research and consultancy company that focuses on rural communities and industries;



²⁹² David Beurle is a world-renowned expert on community, regional and organisational economic revitalisation. His work extends from the local and regional, through to Corporate and Governmental levels with a focus on 'future thinking' and long term planning. He developed the Future Game and founded Future IQ Partners, and he has been twice awarded the International Community Development Society's "Innovative Project Award" (Future IQ Partners, 2014).

 Maher & Maher (New Jersey, USA): advisory company for advising governments and private organizations in effective strategies for addressing their talent development needs (http://www.mahernet.com/);



• **Optimice** (Sydney, Australia): consultancy company with the aim to improve collaboration and networking between professionals (http://www.optimice.com.au/).



The other services, besides The Future Game®, offered by Future IQ Partners are exposed in Table 6.

| | Decision PathTM is a "method for systematically |
|--|--|
| | understanding the nature and impact of the forces |
| | affecting our future. It allows us to break out of our |
| \leftarrow \rightarrow | traditional thinking modes and address the future in |
| | way that illuminates 'what could happen', giving us |
| Decision Path | the power to generate flexible long-term strategies |
| S C E N A R I O P L A N N I N G | towards our preferred future. The Decision Path |
| | process results in a useable comprehensive planning |
| | document" (Future IQ Partners) |
| | |
| | People Link^{IM} is a tool providing leaders "with visual |
| | maps and metrics of the connections among people or |
| | organisations - and the strategies to structure your |
| 29% | networks towards powerfully fulfilling your goals. |
| ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | People Link is a new virtual interactive network |
| or 9 80 | mapping platform that offers the ability to see into the |
| PeopleLink | network data in an unprecedented manner. This |
| N E T W O R K A N A L Y S I S | unique innovation allows clients to define and form |
| | optimal network associations, leading to greater |
| | collaboration, information flows and network agility" |
| | (Future IQ Partners) |
| | |

Table 6- Other Services offered by Future IQ Partners

| | Future Shift TM is a "customised comprehensive |
|--|--|
| | planning and culture change process. It is ideal for |
| 7777 | companies, organizations and regions which are |
| | undertaking long term planning exercises, and that |
| 24 | have a commitment to think 'outside of the box'. |
| Future Shift | Future Shift allows you to capture the full benefits of |
| M O B I L I S E + I M P L E M E N T | broad stakeholder engagement and collective action, |
| | and build long-term sustainable change" (Future IQ |
| | Partners) |
| - | Master Class TM is "a series of training, keynote |
| | presentations and study tours aimed at building 'future |
| | intelligence'. The Master Class offerings allow people |
| Masta Ola sa | to access global best practices and incorporate |
| Master Class | successful approaches into their regions and |
| C R E A T I N G R E SI LI EN C E | organisations" (Future IQ Partners) |
| | |
| | Future Makers [™] is "a series of think tanks, |
| | interviews and stories from people who are |
| | shaping the future. These 'Future Makers' |
| | are people who are actually influencing |
| Future Makers | thinking and actions to address the |
| | uninking and actions to address the |
| C H A N G E | challenges and opportunities in today's |
| | world" (Future IQ Partners) |
| | |

4.2.2. Playing for the Future...by following the Decision Path

As already mentioned, The Future Game® originates from the Decision PathTM.

But, what is the process in the background? How does this shift take place?

To answer this questions, we rely on the only published article exploring The Future Game®, written by its three founders and issued in 2009 (*"The 'Futures Game': A Scenario Game Workshop Package to Engage Futures Thinking"*). The paper explains how the game has developed and how it is adapt into a stand-alone kit.

We have already said that, to arrive to The Future Game®, a scenario planning activity is needed, taking the form of the Decision PathTM. However, Decision PathTM is not "only" a traditional scenario planning activity: it is conceived as a game itself and it is explored by another specific article "Development of a Process to Turn Plausible Scenario into On-Ground Action" (2009).

Indeed, contrarily to the traditional way of doing scenario planning²⁹³, the authors introduced a modified innovative scenario planning process incorporating the development of scenarios and "scenario story lines" with a simple game-workshop process. This innovative scenario planning process has a workshop setting and it is characterized by **three innovative components**:

- 1. **Single One-Day Workshop:** traditional scenario planning process usually takes weeks, or even months, to be completed. The one-day workshop structure has been introduced to meet mainly the needs of decision-makers to which the service is addressed who are generally busy and committed people; in such a way, they can feel more comfortable and well-disposed to spend their time to contribute and participate in a future planning process in an effective and efficient manner;
- 2. The "Scenario Game": even in this case, they rely on the power of a well-structured game, consisting of a series of fictitious maps (previously studied and duly prepared) representing aspects of the industry or community for which we need to develop future scenarios. Different maps are prepared to show changes through time. The use of interactive maps



²⁹³ Traditional scenario planning activities – and each scenario planning activity – involve a process which is actually flexible, but always present some important key steps: (1) focal issues or decisions' identification; (2) determination of driver forces and key factors influencing the focal issues; (3) key factors and driving forces' ranking, in terms of their importance to the success of the issue and their uncertainty; (4) identification of two or three most important and uncertain key factors and driving forces; (5) scenarios development based on the positive and negative expressions of the most important drivers previously identified; (6) scenarios enrichment by integrating also the other drivers/forces; (7) scenarios interpretation in a narrative form. (Fisher, et al., 2009)

introduces an important element in Scenario Planning, which is "visualization", enabling participants to explore plausible futures for their industry or community in an immediate manner and at a manageable scale;

3. "Scenario game" integrated in a workshop process: workshop assumes a very interactive nature, where everyone feels immediately and easily involved (it is not a presentation-and-Q&A session, as interaction starts from the very beginning) and that represents a key innovation. It enables participants both to "visualize" possible scenarios in a context reflecting their own region, and to become easily involved as active participants in the simulated decision-making regarding regional future outcomes of their own actions.

The final purpose of this new scenario planning process is to ease the next phase, which is "putting the scenario planning into action". Indeed, many times at the end of a scenario planning activity there is a lot of uncertainty about what we should really do, because results prepared by specialists in the sector are presented to stakeholders and decision makers and then they discuss on what is the most appropriate action to put into place. Actually, they discuss, but they have often doubts about what to do, as each of them has different perspectives on what these scenarios really mean. The Scenario Game enables decision-makers, and experts together, to actively participates in this definition and in the discussion of what could happen²⁹⁴. Thus, at the end, it exists a shared and conscious understanding - and agreement - on what should be done, and this has been demonstrated (Fisher, et al., 2009). Moreover, the authors found also that "the level of complexity decreases over the course of the process while the number of people involved increases" (See Figure 51). This a very important aspect of the process, as it encourages the participation of a wide range of decision-makers in rehearsing decisions which are often re-put into question, finding gaps in knowledge and exploring alternative futures.

A key next step to do so is **shaping the clusters of drivers**, which can be used to leverage the system. It is an alternative to the assignment of probabilities to each scenario, characterizing the traditional scenario planning. Indeed, it has been found that it is very

²⁹⁴ Obviously, the outcome of the Scenario Game also depend on participants, who are required to be broad-minded and free-thinking, so as to bring their thinking - collectively and individually - to the identification of the key drivers and to the development of the scenarios (Fisher, et al., 2009).

difficult to assign specific probabilities to each scenario and it is never accurate, because it is very subjective sometimes. In the Scenario Game, the alternative scenarios are used as means of testing the robustness of any next step, so that decision-makers can evaluate each decision accurately and by having in mind every significant factors and every possible outcomes.

Another consequent innovation has arisen from the above-mentioned process: it has been suitable to be generalized and "exported" for the realization of another related product. Indeed, contrarily to what generally follows a future planning activity - which is the publication of a report describing the scenario story lines - they found another useful way to exploit the new process' results fruitfully. Scenario story lines have been extracted and the regional context has been framed as a stand-alone background of a "hypothetical region". Everything resulting from the Scenario Game becomes immediately useful, not only to help decision-maker to decide how to move easily and quickly, but also to develop The Future Game®.

Therefore, the innovative way the scenario planning process has been designed within the Decision PathTM enables a further development into a workshop-kit allowing the Scenario Game to be used in a variety of settings. This stand-alone workshop-kit is actually The Future Game®, where visualization of future options and identification of players with a plausible simulated challenging reality are key and engaging aspects of the game.

After our discussion, we now know how The Future Game® works and how it is constructed. We also know that its construction involves the participation of decision-makers in another game, the Scenario Game. Hence, it is like if The Future Game® arises right from its "customers' needs"; or better, from the real needs of the Decision Path[™] customers which belong to the same "category" as The Future Game® customers: they are decision-makers in both cases. It is another reason why this process works so well and why players always become so "immersed" in the game, as it fits to them perfectly.

To conclude, The Future Game® and its developing process has proven to foster collaboration, future-thinking, knowledge sharing and creation, innovative ways to face possible future scenarios.
4.3. The Future Game®: closing the Circle

At this point of our discussion on cooperative action models and how knowledge and innovation are thereby created, what is very interesting is that now we have enough elements to close the circle open at the beginning of the paper with the Prisoner's Dilemma Game and the Axelrod's solution to the cooperative problem.

We will try to close the circle by analyzing The Future Game® further, within the different theoretical frameworks and models studied in the previous Chapters, with the aim to eventually come up with some interesting insights. We will proceed in reverse, by starting from the last chapter and moving backwards to the first.

First of all, we will try to understand how The Future Game® can be closed to the types of "gaming" we decided to focus our attention to, how it can be integrated into the theory of Knowledge Management, and whether it can be in line with the Sennett's "artisanal workshop" concepts). Secondly, we will continue our analysis by introducing The Future Game® process and outcomes within the different models of cooperation between firms explored in a managerial, financial and industrial perspective. The attempt is to understand if The Future Game is in line with the models, and if new (or modified) directions or adjustments are needed if we take into account the effect of gaming on firms' activities. Finally, we will re-interpret The Future Game® in a Prisoner's Dilemma perspective, by comparing the Axelrod's solution and his resulting suggestions to what our interesting game could produce.

4.3.1. The Future Game® within...Knowledge Creation and Cooperative Interaction

4.3.1.1. THE FUTURE GAME® AND THE THEORY OF THE "GAME"

Before discussion about the knowledge management and creation process endangered by The Future Game®, we believe it is useful to frame it inside the theory of "gaming" introduced at the end of Chapter 3.

First, it is clear that The Future Game® is a result of "**Gamification**", as we are talking about a case of "use of game design elements in non-game contexts", namely the context of scenario planning or strategic and training purposes. We can try to distinguish the different game elements in The Future Game®:

- Interface design patterns: the resulting maps from the decisions made by participants and the final 20-year-later future, which is compared with that one of other groups; at the end, the win is shared because everyone learn from the game and from each other through the debriefing;
- Game design patterns, or game mechanics: that is to say the rules of the game, cards, the alternative



Figure 52 - The Future Game as a Serious Game

future-paths in the backgrounds, the developments in five phases, the initial map, the initial presentation of the game and the problem, the final debriefing, etc;

- Design principles or heuristics: the principle is the people should be involved in plausible context very similar to their reality, and that they should "try it, before live it";
- Conceptual models of game design units: the game has a workshop setting, and comes from a process of simulation, scenario planning, game-workshop;
- Game design method: it is connected to the Scenario Game's resulting future-paths.

From an ontological point of view, we can consider The Future Game® as a **Serious Game**, because it is a "full-fledged game" and "arises for non-entertainment purposes"; or better, it uses entertainment to pursue other higher and meaningful purposes. However, it is also true that a **Simulation** lies in background of this serious game, and it is the simulation of a plausible hypothetical regional context where people have to make decisions to seek the best future scenario as possible. Indeed, this plausible hypothetical regional context has been constructed through "a mathematical model or at least an algorithm describing a sequence of events based on assumptions or pre-developed scenarios of actual incidents reproduced with a maximum commitment to realism". This simulation has been developed thank to a hard work in scenario planning for a real region, according to the real needs of population and to the real context, also in this case shaped as a game-workshop, the scenario game.

The Future Game® also presents the three principles introduced by Deterding and Schell to foster intrinsic motivation, instead of external motivation:

- 1. Relatedness: it "refers to the human need to interact and communicate with others". The Future Game® and also the Scenario Game extremely encourages interaction and communication, and also fits with "users personal goals", as they are discussing to change the future of a regional context where either they are "immersed" as very similar to their non-simulated reality (in case of The Future Game®), or it really represents their non-simulated reality (in case of the Scenario Game). In both cases, each user is connected to "a meaningful community with the same interests", which could be the work group or the regional population itself. In addition, not only developers create a series of possible "meaningful stories" in the backgrounds (the future paths) but the user itself jointly with the group is the creator oh their own "meaningful story", by becoming aware of the social contexts meanings;
- 2. **Competence**: it refers to "the universal need to be effective and master a problem in a given environment". The Future Game® is by nature created to create this feeling and to make people aware of the future implication of their decision. "Have-to-do" (necessity to make decision to change and improve the future of a local context) and "Want-to-do" (the challenge to help the local context to go towards the best future as possible) coexist. "Juicy feedbacks" are given at the end of each of the five stages, by delivering a map with the regional changes consequent to the decision made;
- 3. Autonomy: it refers to "the universal need to control one's own life". By enlarging the perspective of the future, it is exactly what happens with The Future Game®. Moreover, players decide to play on their own, as they had previously accepted the service from Future IQ Partners because they had necessity.

The Future Game®, together with the Scenario Game, also presents characteristics of the Nicholson's "**meaningful gamification**", to wit "the integration of user-centered game design elements into non-game contexts. Indeed, everything is constructed by taking into account the needs of the customer, or similar customers, specifically decision-makers. The Future Game is quite customized to the relevant needs, albeit it is the standardization and flexible version of the Scenario Game.

As for the feelings proven by participants by playing The Future Game \mathbb{R} , they "feel like are living in a non-simulated situation", as the immersive distance is very low – the simulated situation is very close to the non-simulated one – and the work activity is embodied as knowledge "is transformed into skills by action". Indeed, thank to the decision made they learn how to deal with the future, and they necessarily "feel the system". It seems also that, through The Future Game \mathbb{R} , participants pass through the different stages of immersion:

THE FUTURE GAME®: THE THREE STAGES OF IMMERSION





Moreover, we have also to stress that group organization is flat: decisions are made horizontally. Indeed, each participant gives its final opinion through a vote ("Decision A" or "Decision B") and majority wins.

It is also important to say something about the transversal skills developed during the game, besides the enlargement of future perception. According to McGonigal, they are:

- **Urgent optimism**: players become ready to act immediately to solve their own local (or business) problems, more optimistic about their probability of success;
- Social fabric: they become more close to their "companions" and trust is fostered between them, even with those ones belonging to other groups because at the end they discuss about their different decisions;
- Blissful productivity: they become in need to do meaningful work;
- **Epic meaning**: they feel to be empowered to shape the future of a regional context.

Indeed, what The Future Game[®] seeks to do is to put ordinary people to think about their future inside a game representing their own reality or a very similar reality. It is very close to the attempt of McGonigol **to make the world "become more like a game"**.

4.3.1.2. THE FUTURE GAME® AS A KNOWLEDGE-CREATING TOOL

As already said, we argue that "gaming" can be considered as a new form of knowledgecreating tool fostering cooperation.

We remember that we are talking about "well-structured simulated serious games, conceived to simulate a specific context governed by its own rules where players assume specific roles, by identifying themselves with the characters and being immersed in the simulated reality, which has to be connected and related to the non-simulated reality - as we pursue to produce a significant impact on it". We also said that this type of game requires a great effort to be constructed and an element of surprise and a learning experience deriving by the fact that people have never played such type of a game before.

Thus, a One-Shot Game. It could potentially be optimally played at the beginning of the changing process to a new organizational structure able to encourage cooperation and innovation for a long time, as the powerful "trigger" of the change.

The Future Game® seems to have these feature, and now will be better analyzed within the Nonaka and Takeuchi's school of thought.

First of all, we have to remember that Nonaka and Takeuchi depart from the "rugby" metaphor, where the ball represents the "concepts" shared by the company's team, including vision, mission, subjective insights, intuitions, values, emotions. The rugby actually is a game. Thus, the metaphor from which Nonaka and Takeuchi depart is exactly a game, what we want to propose as a "new" form of knowledge-creating tool fostering cooperation. Hence, our proposal seem to be in line with what that Nonaka and Takeuchi taught in 1995, and it could seems that what we argue is not so new. Actually, we reinterpret the "Game" no more like a metaphor, but like a tool, something that it could be practically used, capable to trigger the Nonaka and Takeuchi's Knowledge Spirals.

As for The Future Game®, it seems really appropriate to purpose. Indeed, we will try to frame The Future Game inside the Knowledge Spiral. As we know, it pass through the following stages:

- 1. Socialization: before the beginning of the game, participants have to choose a table, possibly with people who they are not familiar with, and start to talk (quickly or slowly, according to each one's nature) and they start to know each other. But, is at the start of the game that participants are really themselves, and start to tacitly share their experience, as they discuss and become committed to the game, and "socialize" by having in mind the same purpose: find a solution assuring the best future as possible. The dialogue is very open;
- 2. **Externalization**: while they become closer and closer to the end of each stages, they all externalize their opinions and then each one formally vote for one of the two alternative decisions. The solution is formally written in their "Decision Sheet". At the end, the major form of externalization of their decided future-story-path is represented by: the formal decision taken at each stage, the changed maps received after each decision, and the final scenario. That is the future path they have created;
- 3. **Combination**: during the debriefing, the different final scenario and future-stories are compared with each other, and integrated with the theoretical background of the game, which is explicitly explained by the facilitator;
- 4. **Internalization**: participants internalize the experience, and become ready to actively think about their future.





This spiral can be linked to the Spiral of Organizational Knowledge Creation, by having the support of an appropriate structure able to encourage cooperation and innovation in the long run. We found that this type of organizational structure could be found in Hypertext Organization, Communities of practice, but also in Network Contract ("Contratto di rete") and the Scrum approach to project management.

The "Game", therefore, and in our case specifically The Future Game®, can be seen as a tool capable of triggering the Individual Knowledge Spiral – from the epistemological point of view – and of being the starting point for the expression of the Spiral of Organizational Knowledge Creation – from an ontological viewpoint – if supported by the right organizational structure, which could be already present, or should be established.

Within Nonaka and Takeuchi's theory, also middle-up-down management is highlighted, by considering middle managers "at the very center of knowledge management", positioned "at the very intersection of the vertical and horizontal flows of information within the company". Thus, we can have the insight that The Future Game® should be addressed to Middle managers over all. Actually, often it involves middle managers, but it is particularly addressed to Top Management. Indeed, we are talking about the moment when decision about the future are made (in case of the Scenario Game) or when a training about future decision-making is made. These should be addressed to the Top Management, as they have the responsibility of the organization's direction. Middle managers could be still involved, to make them participated to their future's shaping or to the training about future-thinking, as they will have a prominent role in the organizational structure, as envisaged by Nonaka and Takeuchi. Thus, we conclude that middle management has a prominent role in the middle-up-down management process for knowledge creation, and Top management have a prominent role in shaping future direction and so inside The Future Game® played to trigger the Spiral of Organizational Knowledge Creation.

4.3.1.3. THE FUTURE GAME® AND THE "ARTISANAL" FLUX OF INTERACTION

After defining The Future Game® within the theory of "gaming", and having considered how knowledge is created and encouraged, we can further analyze the implication for cooperative interactions, to see if it really fosters cooperation and of which kind. Thus, we will refer to the Sennett's thoughts explored in detailed at the beginning of Chapter 3. Sennett defines cooperation as "an exchange in which the participants benefit from the encounter". Well, this is true even in The Future Game®, where each participant benefit from its group partners, to find a solution together, but also from the other groups in general, because the debriefing helps to compare the solutions and to understand how to move further.

While playing The Future Game[®], both dialogic and dialetic conversations take place. Indeed, dialogic conversation is present mainly during the phase of "socialization" but overall at the end, when members of each group talk together about the solutions found. On the other hand, dialetic conversation is needed, at least at the end of each stage, to agree about the decision to make. Actually, it is not required to agree, as the majority is necessary to make a decision not the unanimity. Anyway, we can even say that groups naturally pursue to a shared decision. Thus, both sympathy and empathy are involved in the process.

Within the Spectrum of Exchange proposed by Sennett, by departing from the consideration that competition and cooperation live together and should find a balance, The Future Game®



Figure 55 - The Future Game within the Spectrum of Exchange

seems to lie in the "Differentiating Exchange" segment. Indeed, we have Differentiated Exchanges where dialogic exchanges take place and "groups can balance cooperation and competition, by means of ritualized moments celebrating the differences between members of a community" and with the power "to reduce the 'acid invidious comparison' and foster cooperation". Indeed, we can see both competition among the various groups playing for the best future scenario, and cooperation within groups and between groups, since at the end every solutions found and every scenario is important to compare to analyze the decisions made and their implications. The debriefing represents the "ritualized moment", where differences between decisions and scenarios are highlighted to foster reflection by every participant.

As we know, Sennett says that cooperation in current capitalism is weakened by two factors: inequality and the new labour structures. The Future Game® can have a positive impact on the latter. Indeed, it presents each of the three elements composing the "Social Triangle" enabled by the "manual work":

- Earned Authority, by fostering reciprocal respect between managers of higher and lower level;
- Leap-of-faith Trust, as people are encourage to trust each other during the decisionmaking process;
- Cooperation, as people become really involved with each other to help the local community living in that hypothetical region.

Thus, The Future Game® can act as a tool to avoid the spread of the "uncooperative self", that is to that person "who cannot manage demanding, complex forms of social engagement, and so decides to withdraw, by losing the desire to cooperate with others". The Future Game® simply bring about the opposite. Also, in principle, it has also the power to "narcissism" – as it is easier for people to stop mirroring themselves by being completely involved in another reality making clear, at the end, that implications are uncertain and they depends on many factors and impact on much more people than just them – and "complacency" – as it might increase "the willingness to experiment, to unleash curiosity" about future. Anyway, it has to be supported, later, by the appropriate organizational structures previously discussed.

Given everything said since now, it seems that The Future Game® has the right characteristics to promote the Reformation of Cooperation envisaged by Sennett. It can be in line with the Sennett's "artisanal" workshop, as participants collaborate *together* to decide to "make or repair something" in order to follow the future path that they wish to pursue.

4.3.1.4. SUMMARY

To sum up, here are our major insights from reinterpreting The Future Game® within the theory of knowledge creation and cooperation as a flux of interactions:

• "Gaming" is a new form of knowledge-creating tool fostering cooperation;

- A well-structured and constructed One-shot game is our focus to "trigger" the change; however, to be able to continue to foster knowledge creation and cooperation, it has to be sustained by an appropriate organizational structure (i.e. Hypertext organization, communities of practice, Network Contract, Scrum approach to Project Management);
- The Future Game® is a One-shot game which has the nature of a Serious Game based on a Simulation in the background, represented by the outcomes of the Scenario Game, which is the very starting point;
- The Future Game® enlarges the "future intelligence" and the perception of how much decisions in the present can impact on the future;
- The Future Game® encourages interaction and communication, by enabling participants to connect to a meaningful community and to "play" a game very connected to their interests; it makes people give their maximum by involving their specific expertise to solve meaningful problems; thus, it represents an example of "meaningful gamification", providing a service customized to the customers' need, as the game has been constructed by departing from similar customers, namely decision-makers;
- The Future Game® leads to a Total Immersion of the participants in the simulated reality; it also has the power to permit the development of the McGonigal's "gamers skills": Urgent Optimism, Social Fabric, Blissful Productivity, Epic Meaning;
- The Future Game® is able to trigger the Nonaka & Takeuchi's Knowledge Spiral; it is also the start for entering the Spiral of Organizational Knowledge, if it is supported by an appropriate structure for the next maintenance;
- The Future Game® is characterized both by dialogic and dialetic communication, and it lies on the "Differentiating Exchange" level on the Sennett's Spectrum of Exchange: in other words, competition and cooperation are well balanced;
- The Future Game® has the right characteristics to promote the Reformation of Cooperation envisaged by Sennett, as it can act as a tool to avoid the spread of the "uncooperative self". It can also be in line with the Sennett's "artisanal" workshop, as participants collaborate *together* to decide to "make or repair something" in order to follow the future path that they wish to pursue;

In conclusion to this section, it is important to say that The Future Game® and the Scenario Game (Decision PathTM) go in line.

Actually, The Future Game® is a promotional tool for the passage to the Decision PathTM: the former makes organization(s) members have fun in being involved in a meaningful game, where they are asked to think about the best future direction of a certain hypothetical region, becoming more aware about the importance of present-day decisions for shaping the future. At the end of the decision, how this game has been developed is made clear to participants, so they understand the importance of the work in the background. If they want to "create something" or to "change something" in their own strategic direction, they are led to think about the Decision PathTM to maximize the expected results, and to have eventually in mind the possible alternative future scenarios to be sure to decide in the most informative and conscious way.

Thus, now we will better refer to the Scenario Game, which has been proven the *very starting of everything*, as it is from it that future scenarios are created, and what is important is also that they are created through a game which has, as participants, other decision makers.

We argue that Scenario Game has great potentiality and deserves to be studied in more depth by different disciplines.

We also argue that the **Scenario Game can be used to create meaningful partnerships**, by involving participants belonging to the partnering organizations and who have decision-powers. Scenario game could be used to create the strategic and/or action plan that the already established partnership wish to prepare according to the partnership's final objective (and also – if it is the case – by taking into account the antitrust rules). They could participate to the Scenario Game to understand the alternative future scenarios of the partnership's plan, to see if they will lead to the expected future outcome. That will become also a guideline during the years of implementation, enabling more participation by each partner and thus more cooperation, because they will have always in mind the real motives for the action carried out and the final objective. It could lead to higher reciprocal understanding and coordination.

The potential use of Scenario Game between partners, to create a common future path for their action, will represent our focus by now: indeed, we will frame it within the Models of Cooperation between Firms, previously explored in Chapter 2.

We want also to make clear that the Scenario Game has been used within public organizations so far, to promote and enhance urban territories. Here, we will give some insights also on other alternative potential new ways to exploit the Decision PathTM and The Future Game®, even if under a theoretical perspective.

4.3.2. The Future Game® within...Models of Cooperation between Firms

To sum up, we decided to frame the effect of the Scenario Game (promoted by The Future Game®) within the different models of cooperation between firms explored in Chapter 2, by taking into account the three different viewpoints: industrial, financial and managerial perspectives.

The major aim is also to "provoke" curiosity and scientific interest into the Scenario Game and the related Future Game®, to create a base for further discussions by departing from the insights that could come out from our analysis.

4.3.2.1. THE FUTURE GAME® AND COOPERATIVE INDUSTRIAL DYNAMICS

The Chapter 2's section about the "Industrial Perspective" had the aim to understand how

cooperation can influence industrial dynamics, and we tried to do that by having as a surrounding background the strategic competitive environment, specifically the evergreen Porter's Five-force Model, by adding the micro-economic conclusions of Belleflamme and Peitz.



We will discuss the Scenario Game (promoted by The Future Game®) within each of the forces identified.

4.3.2.1.1. Direct Competitors and Substitutes

In case of direct competitors and substitutes, we believe that we should focus on the case of "Horizontal Mergers", and not on "Cartels and Tacit Collusions".

Indeed, firstly, we assume that, if two organizations decide to work together and play the Scenario Game, it is not obviously the case of Tacit Collusion, as there is an explicit agreement between them. However, it is interesting the "Tacit Collusions" discussion about the finite or infinite time horizon: "if competition is repeated over a finite number of periods, firms play according to the (unique) Nash equilibrium of the static game in each period and tacit collusion cannot emerge. Instead, situation changes if we consider an infinite horizon, interpreted as 'there is no known end date to the game': at each period, there is a probability that firms will compete one more time. (...) In particular, tacit collusion can emerge, under the Grim Trigger Strategy", that is to say, if someone deviate, he/she will be punished, sustaining the cooperation phase.

Thus, it is true that, in our case, we do not have an infinitive time horizon, but we still have, for a long time, a 100% probability to meet the partner firm again: or better, they are committed to create an impact in the long-term, so, even if the partnership agreement has a few-year validity, partners know that they will be connected in some way also for many years after its formal conclusion. We can say, in a certain way, that a sort of tacit conclusion follows the termination of the formal agreement, sustained by the future they wanted to create together and for which they made specific decisions and collaborated. It is a strong tacit collusion, connecting the firms through the future they shaped together: the probability δ to meet again can be considered large enough, by allowing the tacit conclusion to be sustained by a sort of "Grim Trigger Strategy".

Secondly, even if we do not have – at least at the moment of starting the Scenario Game – a tacit collusion, but an explicit agreement, we think that it is not the case to talk of "Cartels" explicitly leading to an output reduction or a prize increase. Indeed, they have usually a short-time effect character, and their effects have high probability to be in contrast with antitrust rules. However, maybe it could possible to see them applied to the Scenario Game, for instance when "market sharing agreements" are considered, but it is quite reasonable to think that organizations in this case do not feel the need of a Scenario Game.

On the contrary, in case of "Horizontal Mergers" they could, in principle feel the need, as mergers have the characteristics to last long time, and organizations participating to the merger have to agree on shared vision and mission, and how to coordinate and assure the success of the merging operation. It is in principle more appropriate for the use of the Scenario Game. We saw that, according to Belleflamme and Peitz, "It is demonstrated that under Cournot, mergers of two firms are unlikely to be profitable if the market is fragmented but they are more likely to be profitable if the market is concentrated". Thus, the same seems to apply also in case the Scenario Game is used.

In addition, Scenario Game could have the effect to increase efficiency gains, as it has the power to reduce coordination problems, by even being able to reinforce Scale Economies and Synergies' effect. Indeed, it can be useful – for instance – to forecast the effective "ability of rival firms to expand in response to the merger", to established the best suitable lower marginal cost needed to lead to such a low rivals' ability that maximizes profits for the merged firms. On the other hand, it can also help in exploiting at the best "the synergies existing among merging firms, by allowing the merged entity to produce in a more efficient way"; Thank to a high-level scenario planning activity, it can also be able to reinforce "the positive effect stemming from the internalization of competition among the merging firms" and to relax "the negative effect stemming from the reaction of the outside firms".

However, we know that "even Belleflamme and Peitz admit that estimating the impact in practice seems to be very difficult" and that "quantitative and econometric methods may be of some help to valuate ex-post the likelihood of collusion in some industries", but not exante, and that is needed for organizations, but "no good methods have been proposed so far to tackle this challenging issue". Actually, Decision PathTM could be a step toward the answer. Indeed, as already said it was born in contrast with the traditional way to do scenario planning, when actors were too focused on deciding each scenario's probability of happing and that is considered a waste of time and object-focus, as they could be very subjective sometimes. We know that "In the Scenario Game, the alternative scenarios are used as means of testing the robustness of any next step, so that decision-makers can evaluate each decision accurately and by having in mind every significant factors and every possible outcomes". Therefore, it can be an useful alternative – not to establish "the probability" – but to have in mind how to behave in each scenario – about rivals' reaction, for instance – to increase "our probability" to maximize our final goal. So, the problem is not "to forecast the probability"

but to be ready to react at the happening of each alternative non-desired scenario to assure to remain in the right direction to maximize our outcome.

4.3.2.1.2. The Threat of New Entrants

In case of the threat of new entrants, we talked about cooperative behaviors in case of: Incumbents Cooperation for Entry Deterrence, and Incumbents and New Entrants Cooperation for Complementary Innovation.

We want to focus on the latter, as the first one seem to be no in line with the use of the Scenario Game, at least because it is very probable to be in contrast with antitrust rules. Indeed, it is capable to inhibit free competition in the market, by making it quite impossible for a new firm to enter. It is not allowed, and so, even if it could be desirable for many incumbent firms, it is not recommended to use the Scenario Game for this purpose.

Instead, the situation changes when we consider the second option, cooperation between incumbents and new entrants for complementary innovation, by paying attention that it will not give rise to power's abuse from the former to the latter.

We saw that even in this case there seems to be some limits regarding the fact that only cooperation between incumbents and complementary new entrants are considered as advantageous. Thus, we will try to frame the Scenario Game as a tool to be used between incumbents and complementary new entrants. When we talked about creative cooperation, we saw that it could have the power to significantly change the reference industry where collaborating firms are operating in. Thus, these changes have also a long-term nature, because to make a significant impact on a whole industry it takes time. The Scenario Game could thus be used to give partnering firms an idea of how these changes will take place and how they would like to "manage" this changing process by making right decisions in the present. This could reduce uncertainties and increase the operation's success for both organization. We have also seen that Saives, Desmarteau and Holford argue that this change has to be supported by: (1) a "Creative Strategy", and (2) a "Creative Organization which implies organizational innovation toward new partnership forms".

Therefore, we can reasonably interpret the Scenario Game has the tool to create a successful and future-oriented "Creative Strategy" and that it is in line with our argumentation that it

has to be supported by an "appropriate organizational structure fostering cooperation and knowledge creation", which we can interpret as the authors' "Creative Organization". As we know, they could be Hypertext organization, Communities of practice, Network Contract, Scrum approach to project management.

4.3.2.1.3. Buyers and Suppliers

We remember that buyers and suppliers are strategic players with market power, and "a company has to take it into account when making choices". In Chapter 2, we focus on the possibility to collaborate with buyers and/or suppliers to increase the share benefit of both.

We argue that the Scenario Game can help to relax the "double-marginalization problem", by sustaining the establishment of strategic agreements based on collaborative behaviors. In Chapter 2, we studied Resale-Price maintenance, Exclusive Territories, Exclusive Dealing and Vertical Mergers.

In case of Resale-Price maintenance, in principle, Scenario Game could be used to ease the establishment of the contract, in a way that "manufacturers are aware that their pricing strategy should not destroy retailer's investment strategy". To assure that, it is recommended also to take into account the market where the retailer is operating and its rivals' reaction. Under specific assumptions, Belleflamme and Peitz demonstrate that "the use of RPM by a manufacturer leads to higher retail prices and more retail services if consumers are more sensitive to service competition rather than price competition. Conversely, this leads to lower prices and fewer retail services if consumers are more sensitive to price competition". Scenario Game could be, in principle, use to understand the possible direction of consumers behavior as well as rivals reaction and take the right decision to assure the success of the Resale-Price maintenance agreement.

Scenario Game could be in principle also suitable for Exclusive territory's agreement, to help making the best decision for the assignment of specific territories each, for the same reason as for the previous mentioned agreement. However, we said that it is only in principle, because each of these agreements has a negative impact on consumers, who should face higher prices and limited choices. Thus, welfare decrease and it can also be in contrast with antitrust rules, if the social detriment will be higher than the firms' benefit. Thus, what we believe is that, in principle, Scenario game would be suitable, but, in practice, it is

improbable that it would be used for these purposes, which maybe are not in line with Future IQ Partners' values.

The same applies for exclusive dealing, as in a context of imperfect competition they can constitutes a barrier to entry, specifically in "markets in which incumbents enjoy a high degree of market power". However, they are not anticompetitive in the only case that "buyers can coordinate their decisions". Thus, Scenario Game could be, in principle, used instead by buyers to coordinate each other in case of the actual danger of exclusive dealings' negative effects. However, maybe Scenario Game is too long-term focus for this purpose.

In case of Vertical mergers, we saw that "the profit maximizing choice of a vertically integrated firm depends on its conjectures about the response of total quantity upstream and downstream to its activity on the input market". Scenario Game could be useful to help this conjectures and then to relax competition. Also in this case, vertical mergers can end up with being anticompetitive.

However, we see that every discussed strategic agreement to create vertical cooperation in the market could be anticompetitive. Thus, it seems that we cannot think to use Scenario Game for no one of them. Actually, this is not true. Scenario Game can also in principle include inside his forecasted scenarios also factors related to the evolving of the cooperation and anticompetitive effect, and try to help in avoiding to fall into excesses by the collaborating firms. In this way, firms will commit to make "usually-anticompetitive" contracts just agreements capable to enhance collaborating firms' competitiveness in their reference market.

Moreover, there is also the possibility to have a vertical collaboration with the aim – for instance – to establish a new distribution channel or a new supply management software. This could also happen in horizontal collaborations, to develop and launch a new product for example. That is the reason why R&D cooperation is treated in a separate paragraph.

4.3.2.1.4. R&D Cooperation

R&D cooperation seems to be the major case to which the Scenario Game is addressed. R&D has been defined as "strategic tool to use to increase a firm's competitive advantage through innovation".

In this case, Scenario Game could be useful to plan the development of the innovation and forecast the possible scenarios they can encounter. Then collaborating firms will be ready, and there will be also a disincentive to free ride, even if the spillovers are "large enough". In fact, it eases "larger investments in R&D, implying further reduction in unit costs and a larger output".

Thus, we propose that Scenario Game can lead the case of Cartel R&D to become similar to the case of Cartelized Research Joint Venture (RJV) where "firms not only coordinate their R&D decisions but also share their information completely so as to eliminate duplication of effort". That "tends to make cooperation more attractive from a welfare point of view". Indeed, Scenario Game has also the effect – among the others – to increase the coordination of efforts to follow a common future direction.

4.3.2.2. THE FUTURE GAME® AND CORPORATE VALUE

As we know, from a financial perspective, the final aim is to increase firm's value in the market. In Chapter Two, we focused on how it is possible to evaluate the financial feasibility and convenience to proceed with a M&A operation. Now, we will see how a game such as the Scenario Game can impact on the models and theories previously discussed.

First of all, it seems that the Scenario Game could be an alternative to the so-called Balance Model. The Balance Model of Farquhar & Rao (1976), in fact, proposes "a useful approach to identify an ideal profile of a firm based on a series of attributes desired in a prospective acquisition candidate that will be 'compatible' with the profile of the acquiring firm". To know if a candidate could be compatible or not, maybe also a scenario analysis could be suitable; or better, if an organization explicitly decides to make a structured analysis among several possible future partners to carry out a project, the balance model as well as a scenario analysis could be of some help. Nevertheless, the balance model presumes the use of an utility function depending on various factors, including: "the number of attributes on which the acquiring firm and the j-th firm to be acquired", "variance of the t-th attribute for the pair (0, j)", "the weights" both for the mean and the variance of each attribute identified. These are many factors that are difficult to be objectively defined. In fact, they are related to subjective preferences, perceptions, by departing from the choice of the attributes to analyze.

Thus, it could be a waste of time and resources to work hard to understand which attributes are the most significant, which weight for each variance and mean of each attribute, and so on, to discover that every calculus at the end could be vanished by reality. Instead, a scenario planning like the Scenario Game could be a solution to this complexity. Because the hard work in the background is easily presented to the firms, which 0will discuss the possible scenarios and then they will have possible actions to be carried out, each with a different future story, and they should "just" choose the most desired. Not only it could be useful to choose the "companion" but also for the execution of the partnership, by involving also the collaborative firm in a sort of subsequent game, when maybe part of the scenario-analysis can be extracted from the previous game session, to be refined with other possible scenarios coming from a further discussion with the chosen partner.

Therefore – as in case of horizontal mergers in an industrial perspective – the Scenario Game can increase the value of the synergies resulting from the operation of M&A: indeed, we argue that it could have the power to both/either increase the return for the i-th pair of combining firms, and/or decrease the systematic risk for the i-th pair of combining firms. Indeed, the risk to fail by working together should be lower if there is less uncertainty and asymmetry within the relationship under consideration. Less uncertainty and asymmetry can have also the power to reduce transaction costs (TCs), that is to say "costs for performing transactions, negotiations and organizing activities" and "both sides of M&A have to pay the TCs in each stage of the process". So, it could be a benefit for both.

Thus, it seems that from a financial perspective, the most important effect of the use of the Scenario Game could be a reduction of uncertainty and information asymmetry.

It could be – when demonstrated – a very important conclusion for two problems that era very difficult to handle: agency costs and managerial hubris. On one hand, a Scenario Game can be useful to relax agency costs, as stakeholders' needs are taken into consideration inside the scenario development: managers will play, will discuss future scenarios, and will act subsequently by having those in mind. On the other hand, Scenario Game could have the power also to limit (or avoid) managerial hubris: in fact, if a manager has a scenarios-map visualizing every possible future meaningful scenario, showing decisions which could to lead the best or to the worse scenarios, it is logically very unlikely for him/her to think that his/her

own irrational instinct is unquestionably correct. They have a study in front of them and they can check the impact of their current decision to the next future. In our, opinion this is the positive effect of the Scenario Game on the appearance of hubris in case of M&A operations.

Asymmetry has been found to be a problem also within the Aloysius's Joint Venture Game, which has "the aim to provide a decision-theoretic analysis which could help firms to consider both advantages and disadvantages of engaging in such types of collaborations". In this case we are talking about ex-ante asymmetries between firms, that is to say asymmetries in their capacity of funding, in the existing market shared gained, the ability to fund R&D at a lower cost. Scenario Game cannot do anything for these types of asymmetries. However, it can be useful to ease negotiations and agreement between the firms. In fact, Aloysius argues that the "final payoff" for the collaborating firm specifically depends on "the negotiations between the participating firms". Moreover, he states that "even if cooperation by firms may be theoretically optimal, negotiations and bargaining are necessary to provide an acceptable outcome to all parties involved. Indeed, it depends very much on the actual allocations of benefits to individual firms, which in turn depends on the specific cost sharing scheme agreed upon by them."

Thus, Scenario game can help in the negotiation phase, which is fundamental to assure a certain final outcome, compliance to internal partnership's rules and agreements on rights and duties for each firm inside the partnership.

4.3.2.3. THE FUTURE GAME® AND CORPORATE DYNAMICS

From a managerial perspective, in Chapter 2 we have discussed the way enterprise dynamics can affect cooperation and the relevant variables to manage in order to make it evolve efficiently.

By encompassing the two interesting articles by Ring & van de Ven (1994) and Lui & Ngo (2005), we found that these variables are represented by the starting conditions to the partnership and the characteristics of the partnership itself. Anyway, what is stressed is the importance to reach a Cooperative Equilibrium. In a cooperative equilibrium, "as long as the actions of both firms adhere to both the explicit and implicit guidelines, the partnership continues with repetitive sequencing of interactions".

Starting conditions are uncertainties, efficiency and equity criteria, need for internal resolution of dispute, importance of role relationships. Partnership's characteristics are interorganizational trust, asymmetric dependence, and firm similarity. The latter influence and action patterns (action acquiescence, action simplicity, action reciprocity).

Moreover, we know that if the inter-organizational relation is of long-term (as it happens often) "it is likely that misunderstandings, conflicts and changing expectations among the parties will occur", and these are known as Disruptive Events, forcing to renegotiations to preserve the ongoing relationships.

Well, first of all, Scenario Game could help in making partners ready to the happening of possible future Disruptive Events, by facilitating negotiations and avoiding frustrations. Thus, uncertainties could be mitigated and efficiency increased (as already said in other contexts), as well as the efficacy of internal resolution of dispute. That is to say that the Scenario Game will influence positively the starting conditions of inter-organizational partnerships, by facilitating the establishment and giving the base for the next maintenance. This makes sense because the Scenario Game should be done before the beginning of the negotiation stage, when partners could define rights, duties, future actions and direction by

grounding on the Scenario Game's outcome. Thus, the Scenario Game could be framed outside the process for framework the of interdevelopment organizational partnerships, as described by Ring & van de Ven. However, it would be in support of it before starting the process, to make



Figure 57 - The Scenario Game: Pre-starting condition to the Process Framework of the development of Cooperative IORs

easier its evolution and development and the passages from one stage to the next one by assuring the best and aware execution as possible. It could be considered as a pre-starting condition, facilitating the achievement of the Cooperative Equilibrium.

It seems also that the Scenario Game could influence the partnership's characteristics, in particular the development of inter-organizational trust. Maybe, it could do something also from the Firm similarity's viewpoint, since it engenders a common vision of the future, by making firms closer to each other in pursuing their common objectives. This, in principle, would increase the propensity to Action Acquiescence and Action Simplicity. However, we have also to count that, requiring (and paying) the support of the Scenario Game could be considered as a "non-recoverable and idiosyncratic" investment in that specific relationship, as it is an exogenous factor specifically acquire to sustain that relationship in that particular context. Thus, according to Lui & Ngo, it represents a Transaction cost which would mitigate, anyway, the positive relationship between inter-organizational trust and the action partners.

As far as culture is concerned, we explored various frameworks depicting how we can differentiate one culture to another. In this case, these frameworks cannot be integrated with the Scenario Game, as they should be considered as a support for firms to understand how far the other partner's culture from its own is, to be prepare to some apparently strange behaviors which could be difficult to comprehend. After all, we have just talked about these different perceptions within the discussion about the BARNGA© Game.

4.3.2.4. SUMMARY

To sum up, here follow the insights from interpreting the Scenario Game (the "father" of The Future Game®) within different models and theories belonging to three economic disciplines: Industrial, Financial, and Managerial.

From an **Industrial perspective**, here are our insights:

- The Scenario Game can support Horizontal Mergers, by allowing partnering organizations to agree on a shared vision and mission, to coordinate and assure the success of the merging operations. It could also have the power to increase Efficiency Gains, by reinforcing Scale Economies and Synergies' positive effects;
- The Scenario Game can support cooperation between incumbents and new entrants for complementary innovation, to manage the consequent changes in the reference industry, by developing a successful and future-oriented "Creative Strategy" and by

envisaging the support of an appropriate "Creative Organization" able to foster cooperation and knowledge creation;

- Even if partnership's agreement could have a finite time period, we argue that a strong Tacit Collusion is established after the formal ending of the contract, sustained by a sort of "Grim Trigger Strategy", represented by the fact that they planned outcomes in the long-run; so, they remain committed to "defend" the future they "shaped" together;
- The Scenario Game can help relaxing the "marginalization problem" in vertical relations, by easing the construction of conjectures about the response of total quantity upstream and downstream to the merging organizations' activity on the input market, and by integrating in scenarios also the evolving of the cooperation and the anticompetitive effect; in this way, "usually-anticompetitive contracts" are reshaped as agreements capable to enhance partners' competitiveness in their reference market, without distorting, avoiding or eliminating free competition;
- In R&D collaboration, we argue that the Scenario Game can create a disincentive to free-ride and has the power to make Cartel R&D's effects more closer theoretically to the Cartelized Research Joint Venture's effects;
- The Scenario Game has not the characteristics (and the purpose) to support explicit cartels and incumbents cooperation to avoid new entrants in the market.

From a **Financial perspective**, here are our insights:

- The Scenario Game could be a reasonable and more efficient alternative to the Balance Model, by using this innovative scenario planning methodology in case an organization needs to make a comparison between different (potential partners) firms in significant contexts. It could be also the departure for another Scenario Game to be played with the chosen partner(s), which could share in part the same scenario planning's base;
- The Scenario Game could be useful to relax Agency Costs, as stakeholders' needs could be taken into consideration inside the scenarios' development, before the game will be played by managers;

- The Scenario Game could have the power to limit (or avoid) managerial hubris, because irrational subjective emotions of managers, in judging their own ability to "forecast", are reduced at minimum by the scenario planning process;
- The Scenario Game could positively influence final payoffs of RJVs (as they have been defined by Aloysius), by supporting and easing negotiations, bargaining and partners' agreement;
- The Scenario Game could increase the value of Synergies because: (1) final payoffs could be higher (*see above*); (2) the systematic joint risk of the combining firms could be lower, because of reduced uncertainties about the future and asymmetries between firms.

From a Managerial perspective, here are our insights:

- The Scenario Game can be considered as a Pre-Starting Condition to the Process Framework of the development of Cooperative Inter-Organizational Relationships, introduced by Ring & van de Ven;
- The Scenario Game as Pre-Starting Condition has the power to facilitate the achievement of the Cooperative Equilibrium, by reducing the uncertainties and negative consequences coming from unexpected Disruptive Events;
- The Scenario Game has the power to increase Inter-Organizational Trust and Firm Similarity, by facilitating the actions patterns of Action Acquaintance and Action Simplicity. However, it is also true that this effect is mitigated by the fact that the decision to buy the Decision Path[™] represents a sort of "non-recoverable and idiosyncratic" investment in that specific relationship, namely "Asset Specificity" which is considered as a transaction cost.

These insights introduced by our analysis have the aim to encourage curiosity and interests in studying the effects Decision PathTM and The Future Game® can produce. Indeed, now we have a lot of starting points for further research to demonstrate if our reasonable insights can be corroborated empirically. Our insights within Industrial, Financial and Managerial perspectives are a sort of "requests" for more and deeper attention to this innovative emerging phenomenon.

4.3.3. The Future Game® within...the Prisoner's Dilemma Game and the Evolution of Cooperation

For the moment, thank to our insights related to cooperation as a flux of interaction and a knowledge-creating tool in the form of Serious Games, as well as to models of cooperation between firms (in an Industrial, Financial and Managerial perspective), we are now able to close our circle.

Our circle opened at the beginning of our paper with a discussion on the Prisoner's Dilemma Game – the basis for non-cooperative behaviour – and the solutions envisaged by Axelrod to foster an evolutionary stable TIT FOR TAT strategy, by ending with a "bridge" between "cooperative problems within individuals" and "cooperative problems within teams" through the support of Coordination Game's theory.

4.3.3.1. The Future Game® as interpreter of the Axelrod's Solution

So far, our analysis has emphasized, even from different viewpoints, that the Scenario Game (the "father" of The Future Game®) can lead to more coordination, more communication, more efficiency and less uncertainty.

Now, we will first explore if these conclusions are also in line with the theory on Coordination Games introduced at the end of Chapter 1.

Firstly, we know that Van Huyck asserted that inefficient outcomes are sometimes due to "coordination failures resulting from strategic uncertainty". Scenario Game seems to be in power of reducing strategic uncertainties, by exploring alternative future scenarios of present actions. Thus, it also seems that are able to reduce the reasons for coordination failures, in accordance to Van Huyck's assertion. Less uncertainty is also related to "uncertainty about others' actions", which can cause significant noise and problems in coordination games, according to Anderson, Goeree and Holt. Scenario Game is able to mitigate even this type of uncertainty.

We know also that Cooper, DeJong, Forsythe and Ross found that communication is another important factor that can prevent coordination failures. They asserted that "one-way communication is preferred in games of conflict, while two-way communication is needed to resolve coordination problems in games, where strategic uncertainty leads to coordination failures". They also envisaged a stage of pre-play communication to ease the whole process. Actually, we have seen that a "two-way communication" between individuals, and between teams, is fostered by the Scenario Game, and we have also proposed that the Scenario Game could represent the Pre-Starting Condition to enter the process of inter-organizational relationship's development. That seems in line with what the authors stated in their article.

Very important is the link between Scenario Game and the Feri, Irlenbusch and Sutter's assertions. According to them, "firms and organizations may be successful at sustaining efficient coordination not only through financial incentives, communication and a 'managed growth' of group size, but also by setting up teams that coordinate internally at first, but then coordinate across teams". This is, actually, what really happens within the Scenario Game. Teams start to coordinate "internally" to discuss the various possible changing factors and consequences in their "region" and what could be the most suitable alternative decisions. However, at the end, they have also to coordinate "across teams" because it is important to put every scenarios together in order to a have a full and complete understating of the possible future directions of present choices; and they have to make together an appropriate decision.

Thus, Scenario Game has also the power to turn a "group" into a "team", as it makes participants "committed to pursue a joint team decision by obtaining agreement by all team members"; it is not just an "entity of players interacting with each other". This is also in line with framing the Scenario Game at the 'Differentiating Exchange' level over the Sennett's Spectrum of Exchanges, as it has the power to well balance cooperation and competition among teams. This fact has great impact also on future participants' commitment to collaboration, because becoming a 'team' member "shifts their decision towards those that are more favorable and profitable for the group", by suggesting that organizations should "set up teams as a tool to enhance efficient interactions inside an organization and even in networks between organizations".

We have also seen that the Scenario Game is able to increase, in a certain way, "Firm similarity", by making organizations' cultures closer to each other. This, according to Jackson & Xing, increases the capability of participants to make predictions about how others would play, by increasing coordination significantly and enabling the achievement of

significantly higher payoffs. This is in line with what we said within our insights from a financial perspective, and also means that the Scenario Game has the right features to decrease participants' uncertainties, to increase coordination and efficiency, and also to increase joint payoffs.

At this point, we are ready to pass from a discussion on Coordination Games to the Iterated Prisoner's Dilemma Game. Indeed, in both cases **multiple equilibria** can exist. In Coordination games' multiple equilibria, "players have identical preferences over the set of possible outcomes", and "salient aspects of the equilibrium are removed to the extent possible"; in other words, Nash equilibria lie "in the diagonal from top left to bottom right, or vice versa". In case of the Iterated Prisoner's Dilemma Game, Axelrod demonstrated that also in this case multiple equilibria could exist. In fact, we saw that, given *w* the "shadow of the future", "For all values of *w*, the strategy of ALL D – All Defections – is evolutionary stable (...) However, other strategies may be evolutionarily stable as well. In fact, when *w* is **sufficiently great, there is no single best strategy regardless of the behavior of the others in the population"**. Axelrod has also demonstrated that both ALL D and TIT FOR TAT could be these stable evolutionary strategies. Because they are roughly the opposite of each other, we can say that they are like equilibria lying "in the diagonal", at two extremes: the same as multiple equilibria in Coordination Games.

Thus, we can try to figure out the Iterated Prisoner's Dilemma Game as a sort of Coordination Game, with one difference from the "traditional" one: strategies' payoffs are not the same for the two strategies. ALL D can be considered as a condition of stable sub-optimal equilibrium, and TIT FOR TAT a condition of stable optimal equilibrium since mutual payoffs are higher, but more difficult to reach naturally (*w* should be great enough). As a result, we can say that:

- If we have "coordination" among players, then TIT FOR TAT is the stable evolutionary strategy;
- If we do not have "coordination" among players, then ALL D is the stable evolutionary strategy.

However, to achieve "coordination" we have to do something. Maybe, the Scenario Game ("father" of The Future Game®) could be that "something". Now, we will try to understand

if the Scenario Game could be considered like that, and how it can create this type of "coordination".

As in the Axelrod's model, the same players (our partnering organizations) will meet more than once, both during the partnership's agreement and after, as they commit to a long term future outcome. As in the Axelrod's Model:

- "player's payoff need not to be comparable at all": indeed, everyone seek an "outcome" but there is not the need to "quantify" or "evaluate" it; the outcome could be roughly the same for both organizations, or could be different; but, both outcomes are able to be achieved only with a joint action;
- "payoffs do not have to be symmetric", for the reason above;
- "each payoff does not have to be measured on an absolute scale", for the reason above;
- "cooperation does not need to be considered desirable from the point of view of the rest of the world": indeed, Scenario Game is primarily focused on what participating firms/organizations seek to achieve; it could be also related to an enhancement in society, better conditions for consumers, more protection to the environment, urban improvements, etc., but not for everyone in the world. There exist everywhere someone a competitor, for example who cannot appreciate your agreement, but it is normal, actually;
- "no need to assume that players are rational": no one is completely rational and players in the Scenario Game obviously are not required to be rational; however, from their dialogic-dialetic discussion some interesting solution can be find to deal with the future;
- "players' actions are not necessarily conscious choices": when we have to deal with others, make a decision, start an action both conscious and unconscious influences are present, always; in Scenario Game, actually, the aim is to have in mind plausible future directions, able to make decision-makers more conscious about the future impact of their decisions in the present.

Thus, it seems that the non-restrictive assumptions of Axelrod apply also to the Scenario Game. Moreover, Scenario Game departs from cooperation in a small cluster of individuals,

and is able to reduce uncertainties and, as a contrary, to increase clarity and to engender a sort of Grim Trigger Strategy in case of defection. In fact, we saw that this permits the maintenance of a Strong Tacit Collusion after the formal termination of the partnership's agreement. Therefore, it is recommended now to make a distinction: while after the formal conclusion of the contract "players can communicate with each other only through the sequence of their behaviors" (to simplify the fact that we are talking about Tacit Collusion) as required by the Axelrod's Model, during the implementation of the partnership's agreement players have many ways and occasion to communicate.

To sum up, when the contract is alive, coordination is sustained by communication and the "team" created by the Scenario Game; when the contract is formally terminated, we can assume that communication is quite rare and coordination is mainly sustained by a Tacit Collusion based on the future they shaped together. Thus, the Scenario Game could encourage "coordination" both during the implementation of the contract and after its formal termination, as we have already concluded in the previous section.

However, does Scenario Game really foster the achievement of the optimal stable evolutionary strategy TIT FOR TAT?

To answer this question, it is important to depart from the Axelrod's suggestions on how to promote cooperation and understand if the Scenario Game could be in line.

For sure Scenario Game enlarges the "shadow of the future", as it enlarges participants' future perception and make them both think about the same long-term future. Scenario Game also "changes the payoffs", to be no longer in a Prisoner's Dilemma; indeed, we saw that Scenario Game could have the power to increase final joint payoffs. Scenario Game also "improves recognition abilities", as participants know each other much better. Finally, it does not directly "teach people to care about each other" or "teach reciprocity", but it could, in principle, also depending on the specific projects it has to deal with.

Thus, Scenario Game is in line with Axelrod's suggestions to promote cooperation, to "act to transform the strategic setting itself". What is important to stress is mainly its capability to enlarge the "shadow of the future", which is the most fundamental factor to sustain the optimal stable evolutionary strategy TIT FOR TAT, but also the most difficult to achieve.

Indeed, among other solutions that we can find, the Scenario Game and The Future Game® are the only ones enabling this feature, so far. Thus, TIT FOR TAT strategy could be established through the Scenario Game, in particular when no (or rare) communication is possible between the partners; that is to say after the formal termination of the partnership's contract. Hence, we argue that our Strong Tacit Collusion established after the contract's conclusion, enabled by the Scenario Game, is based on a TIT FOR TAT Strategy. Furthermore, by establishing the TIT FOR TAT we know that cooperation can evolve in three stages: Initial Viability, Robustness, and Stability.

To conclude, we finally argue that the Scenario Game (and – of course – the Future Game®) is the best empirical interpreter of the Axelrod's Solution to the Prisoner's Dilemma. In this way, also at the formal conclusion of the contract, mutual cooperation is established in a small cluster of individuals (Initial Viability) on the base of a TIT FOR TAT strategy represented by the Strong Tacit Collusion established and sustained by the Grim Trigger strategy, to "defend" the future they wanted to create together. This cooperative strategy of the small cluster will resist to external attacks (Robustness). Eventually, cooperation – once established – can protect itself from invasion by less cooperative strategies (Stability).

This is how, according to Axelrod's theory, cooperation evolves, and the Scenario Game could be the trigger of this evolution, by finally arriving to the point of reducing the spread of the Sennett's "uncooperative self", in a Reformation of Cooperation which could mitigate the weakening of "cooperative skills" caused by the modern capitalism.

4.3.3.2. SUMMARY

Finally, here are our insights from reinterpreting the Scenario Game (promoted by The Future Game®) within the Prisoner's Dilemma and the Axelrod's solution:

- The Scenario Game is in line with Coordination Game's theories: it increases coordination by reducing uncertainties, by augmenting efficiency, communication, joint final payoffs, and by transforming "groups" into "teams";
- We can figure out the Iterated Prisoner's Dilemma Game as a sort of Coordination Game: (i) if we have "coordination" among players, then TIT FOR TAT is the stable evolutionary strategy; (ii) if we do not have "coordination" among players, then ALL D is the stable evolutionary strategy. Scenario Game supports the achievement of

"coordination", both during the implementation of the contract and after its termination, when Strong Tacit Collusion is expected;

- Our Strong Tacit Collusion is based on TIT FOR TAT and it is sustained by the Grim Trigger Strategy, to defend the future which partnering organizations wanted to shaped together;
- The Scenario Game (and of course The Future Game®) is the best empirical interpreter of the Axelrod's Solution to the Prisoner's Dilemma, by engendering the evolution of cooperation. Finally, it could also arrive to the point of reducing the spread of the Sennett's "uncooperative self", which is now one of the cause for the weakening of individuals' "cooperative skills".

To conclude, we have finally succeed in creating our Mid-Range Theory, by combining an Entitative Perspective (Models of Cooperation) and a Process Perspective (Flux of interaction among individuals). That combination has allowed us to be ontologically and epistemologically aligned, and thus to create Justifiable New Theory.

Our Mid-Range Theory can be summarized in the picture below.

Figure 58 - Our Mid-Range Theory



4.4. Concluding Remarks

This final Chapter has given a successful end to our research, by closing our "cooperation circle". It was open with the Prisoner's Dilemma and the Axelrod's solution, followed by a screening of different models of collaboration between firms, explored from a "flux" point of view to understand its knowledge-creating power, and end up with an analysis of the "Game" able to practically interpret the above-mentioned Axelrod's solution.

Indeed, we finally come up with our mid-range theory on collaboration, by considering the Game – in our case The Future Game® in particular – the "Evolution of Cooperation", as intended by Axelrod, and the "new frontier" in Knowledge Management theory. It can also be an important contribution to the "Reformation of Cooperation" envisaged by Sennett, to avoid the spread of the "uncooperative self", and it is in line with the Sennett's "artisanal workshop". In any case, it should have the support of an appropriate structure maintaining and further fostering cooperation and knowledge creation, namely hypertext organization, communities of practice, as well as the network agreement and the Scrum approach to Project management, which we discussed in this chapter.

We confirmed that the "Game" – as we identified it – should be played at the beginning of a changing process undertaken by the organization(s), to become the powerful "trigger" of the change. We discussed three existent games that could have been suitable for the purpose: The Barnga© Game, The Lego® Serious Play® and The Future Game®. We concluded that The Future Game®, offered by Future IQ Partners, seems to be more in line with our purpose, from many points of view. Indeed, the process through which it is conceived is much more complex than we can expect. It has a solid theoretical and practical design foundation, based on a scenario planning process requiring a developmental period of approximately 1-2 years, involving extensive research, refinement and testing. The simplicity of the game perceived by participants, when playing, is sustained by a great complexity and scientific work in the background, which is necessary to guide participants in their "path" to shape their desired future. What is interesting is that also the scenario planning process consists of a game workshop, called the Scenario Game, which represents also another product, The Decision PathTM. The Scenario Game has the power to actively involved customers in shaping their

"possible-future-stories" and to be aware of how a present-day decision can impact on future outcomes, by enlarging the "future intelligence".

We discovered that The Future Game® is a promotional tool for the passage to the Decision PathTM, and we argued that the Scenario Game has great potentiality and deserves to be studied in more depth by different disciplines, and capable to trigger the Knowledge Spirals. For instance, it can also be used to create meaningful partnerships, by involving participants belonging to the partnering organizations and who have decision-powers. That is why it has been framed within the Models of Cooperation between firms. During this analysis, we saw that it could be used for different purposes in shaping industrial dynamics, and we argued that a strong Tacit Collusion is established after the formal ending of the partnering contract, which will take the form of a TIT FOR TAT strategy, sustained by a sort of Grim Trigger Strategy, according to the Axelrod's Metanorms Game. Indeed, organizations remain committed to "defend" the future they decided to shape together. We also argued that the Scenario Game could improve M&A or Joint Venture payoffs, from a financial point of view, and thus also payoffs in the Prisoner's Dilemma matrix can change, so that collaboration becomes more attractive. From a managerial perspective, we saw that the Scenario Game could be considered as a Pre-starting condition, which has the power to facilitate the start and the achievement of the Cooperative Equilibrium, by reducing uncertainties and negative consequences coming from the unexpected Disruptive Events. Thus, it permits to facilitate the development of cooperative inter-organizational relationships, with the later support of an appropriate organizational structure. Finally we saw that Scenario Game is in line with Coordination Game's theories and that the Prisoner's Dilemma Game can be seen as a sort of Coordination Game: if we have (i) if we have "coordination" among players, then TIT FOR TAT is the stable evolutionary strategy; (ii) if we do not have "coordination" among players, then ALL D is the stable evolutionary strategy. Scenario Game supports the achievement of "coordination", both during the implementation of the contract and after its termination, when Strong Tacit Collusion is expected.

We concluded, therefore, by arguing that the Scenario Game (and - of course - The Future Game®) is the best empirical interpreter of the Axelrod's Solution to the Prisoner's
Dilemma, by engendering the desired "evolution of cooperation" to foster innovation and knowledge creation through an enlargement of the future awareness.

CONCLUSION

We have just arrived at the end of our path. Eventually, we succeeded in finding reasonable answers to our starting underlying questions. Here, we will briefly summarize the final resulting insights.

What stops or could stop the self-interested behavior of the individual from damaging the interests of the group? What could deceive actors in making sub-optimal decisions?

We have seen, from the analysis on the Prisoner's Dilemma game, that people tend to be selfish if their time horizon is limited to the short term and if they are not expected to meet the other players again in the future. Axelrod gave us another, more realistic, interpretation of the Dilemma, by taking into account the possibility for participants to meet again. In this case, not only Defection is possible, but also Cooperation based on reciprocity - TIT FOR TAT strategy - is contemplated, and proves to be evolutionarily stable. However, it is evolutionarily stable and can strive in a world of unconditioned defection, if and only if the "shadow of the future" is large enough; in other words, when the probability to meet again and the time horizon enlarge. In this case, the self-interested behavior of the individual could stop from damaging the interests of the collectivity, by giving actors the possibility to avoid sub-optimal decisions. However, we need to lead the "shadow of the future" to enlarge. Axelrod argues that we can promote cooperation based on reciprocity also by changing the payoffs, teaching people to care about each other, teaching reciprocity, and improving recognition abilities among actors. He also argues that to enforce a norm - in this case, the cooperative strategy – it is also necessary to implement a sort of control on the norm's respect and a punishment for those who defect as well as those who refuse to punish the defectors. TIT FOR TAT is also a strategy able to reduce uncertainties, because of its intrinsic clarity, and that could also decrease noise. It also seems that talking about the Iterated Prisoner's Dilemma Game, we need a form of coordination. Thus, it is also recommended, for firms and organizations, to be successful at sustaining coordination also by setting up "teams" - not just "groups" - coordinating internally at first, but then coordinating also across teams, to enhance efficient interactions inside the organization and

even in external networks. Thus, we departed from considerations around individuals, to pass through coordination among teams, and to end up with interactions among multiple organizations. Indeed, we saw that increasing cooperation is an effective way to increase efficiency, coordination, return payoffs for partnering organization, and decrease uncertainty and asymmetries. In this way, organizations could reach the Cooperative Equilibrium, by adhering to both the explicit and implicit guidelines, to let the partnership continue with repetitive sequences of interactions. Cooperation could be also useful to limit (or avoid) managerial hubris, relax agency costs and increase the value of synergies, as well as to positively influence final payoffs of Research Joint Ventures, by supporting and easing negotiations, bargaining and partners' agreements. Meaningful cooperation seems to be able to support mainly horizontal mergers, complementary innovation from incumbents and new entrants, vertical integrations to relax the "double marginalization problem", R&D cooperation.

If they succeed, what are the potential benefits? And, how can they behave in order to internalize them?

Potential benefits have been studied from a Process dimension's point of view, by considering cooperation as a flux of interactions between human beings. This interactive process of ongoing exchanges let us able to combine and create new knowledge and innovation. We have eventually identified a new way to foster cooperation and knowledge creation, which is the "Game", which could be considered as "the new frontier" in knowledge management theory. It enables us to trigger the Individual Knowledge Spiral and the Spiral of Organizational Knowledge Creation. How knowledge and the new dialogic skills could be internalized depends on how organization can find a balance between competition and cooperation, in a way enabling dialogic discussion. Moreover, firms have to manage the mobilization of the tacit knowledge created at individual level to make it amplify organizationally, through the four models of knowledge conversion. This means that they have to create and develop an appropriate structure able foster cooperation and knowledge creation.

What can we do, in practice, to "trigger" as well as maintain cooperation alive?

We found that, what we need, to "trigger" cooperation, is a "Game" as well as an appropriate structure to maintain cooperation and knowledge creation alive. However, we need a specific type of game and a specific type of organizational structure. We need a well-structured serious game, conceived to simulate a specific context governed by its own rules where players assume specific roles, by identifying themselves with the characters and being immersed in the simulated reality, which has to be connected and related to the nonsimulated one. In fact, we purse to create a desired impact on the latter. On the other hand, we need an appropriate organizational structure created to maintain cooperation between people alive and allowing the continuous spirals of knowledge creation. We found that hypertext organization, communities of practice, network agreement and the Scrum approach to Project Management could represent appropriate organizational structures for the purpose. As for the "Game" we found three games which could have the right features, namely the Barnga© game, the Lego® Serious Play®, and the Future Game®. However, we concluded that The Future Game® seems to be more in line with our purpose, from many points of view. Indeed, the process through which it is conceived is much more complex than we can expect. It has a solid theoretical and practical design foundation, based on a scenario planning process requiring a developmental period of approximately 1-2 years, involving extensive research, refinement and testing. The simplicity of the game perceived by participants, when playing, is sustained by a great complexity and scientific work in the background, which is necessary to guide participants in their "path" to shape their desired future. What is interesting is that also the scenario planning process consists of a game workshop, called the Scenario Game, which represents also another product, The Decision PathTM.

Thus, our practical consideration at the base of our Mid-Range Theory is that the Scenario Game (father of, and – at the same time – promoted by The Future Game®) is the best empirical interpreter of the Axelrod's Solution to the Prisoner's Dilemma, by engendering the desired "evolution of cooperation" to foster innovation and knowledge creation through an enlargement of the future awareness. Indeed, it represents the "trigger" of the change and of the cooperative inter-organizational relationships, and permits to facilitate their subsequent development, with the support of an appropriate organizational structure. It also has the power to permit the establishment of a strong Tacit Collusion after the formal ending of the

partnering contract, which will take the form of a TIT FOR TAT strategy, sustained by a sort of Grim Trigger Strategy, according to the Axelrod's Metanorms Game (even if in a tacit form). Indeed, organizations remain committed to "defend" the future they decided to shape together. Thus, the Scenario Game eventually represents: (1) a practical embodiment of the 'Evolution of Cooperation' envisaged by Axelrod; (2) an example of the emerging practice of "gaming", acknowledged as the 'New Frontier' of Knowledge Management and managerial consultancy; (3) an important contribution to the "Reformation of Cooperation" envisaged by Sennett, to avoid the spread of the "uncooperative self".

Thus, our methodological approach, seeking for a combination of the Entitative and Process Dimensions by maintaining an epistemic-ontological alignment, has been an effective method for "Theory Creation" and "Knowledge Creation". Through the process of Conjunction, we can say to have created a new comprehensive *consistent* and *justifiable* Mid-Range Theory.

Finally, our curiosity has lead us to the conclusion of our research. Actually, this work does not want to be a conclusion. This work intends to become the new beginning for a new research stream. It wants to "provoke" curiosity and scientific interest around cooperation and knowledge creation through "gaming" and around the Scenario Game and the related Future Game®, to create a base for further discussions by departing from the insights produced by our analysis. For instance, we gave some insights about other alternative potential new ways to exploit the Decision Path[™] and The Future Game®, even if under a theoretical perspective. It could be analyzed in more deepness to understand if they could represent real opportunities. Further improvement on the topics could be done in order to corroborate our insights on financial, managerial, and industrial models of cooperation. Each of these fields of study could really give real advancements in the theory. Furthermore, the limits of our analysis is that we do not have yet compared our Mid-Range Theory with what has happened in reality. It could be a good idea to study how a Future Game® has been operatively developed and if the Scenario Game has actually given the same results as our Mid-Range Theory states.

There are a lot of hints to start a new research, to be even more curious to contribute to the future 'further evolution of cooperation'.

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