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BOUNDED RATIONALITY IN MANAGERIAL DECISION MAKING: ADDRESSING THE "WHAT", "WHY" AND "HOW" QUESTIONS.

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Ai miei genitori, e ai loro genitori, per i costanti sacrifici.

Senza di voi nessun traguardo sarebbe mai stato raggiunto.

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Introduction

Since the introduction of the *bounded rationality* concept by Herbert Alexander Simon in 1947 (first developed in his doctoral thesis in 1945) the original idea of the rational man by classical economists, who assigned an olympic rationality to him, collapsed and left space to the new era of the *administrative man*, who is only intentionally rational. Posing limits to the rationality of humans was a distruptive event in all the scientific fields – not only in economics and management – and contributed to a dramatic revolution in the understanding of human reasoning. That meaningful contribution redefined the role and functioning of human rationality, highlighting its importance in everyday decisions in organizations – where people (at different levels) are daily involved (e.g. Barnard, 1938; Cafferata, 1984; 2014).

According to Simon (1947), the restriction of human cognition is mainly due to: *i)* incompleteness of knowledge; *ii)* difficulties in anticipating the consequences; and *iii)* scarce knowledge of all the possible behaviours. At the basis of the limits above there are, mainly, the restricted computational capacities, access to information, and physical constraint which are innate in humans (Simon, 1955; 1957). As a cumulative effect of these bounded rationality limits, people do not make 'optimal' decisions, but just 'satisficing' ones.

On this premise, a second key turning point in the study of how individuals and groups make decisions emerged from the discovery of heuristic principles (Tversky and Kahneman, 1973; 1974) and cognitive traps (Russo and Schoemaker, 1989; Hammond *et al.*, 1998) at the basis of human decision making. These cognitive mechanisms represent the implicit processes in the minds of the decision makers that drive – in a positive or

negative way – the reasoning of the individual. The main theory ideated to deal with these new concepts was the *Behavioral Decision Theory* (BDT), mainly born from the deficiency of the previous theories, which did not seem able to explain the violation of expected utility axioms (Einhorn and Hogart, 1981). Thanks to the contributions of Kahneman and Tversky, BDT gained large consensus during the 1970s, because of its acquired completeness in terms of variables to be studied and methodologies to be applied.

Since the new developments above, the bounded rationality idea has been continously considered as a game changer concept in several different disciplines (e.g. management, psychology, neuroscience, sociobiology, etc.), from which it gained an increasing amount of insights that have enlarged its boundaries. In this regard, this doctoral thesis attempts to provide both scholars and practitioners with a useful contribution to these emerging new challenges. In particular, the thesis aims to address the following research questions: 'What' does bounded rationality mean after the developments occurred over time? 'Why' are some specific and important processes of managerial decision making in organizations boundedly rational? And 'how' do they occur in the way they do?. In order to answer these three questions, this thesis is structured as follows. Chapter 1 provides a historical literature review of the bounded rationality concept in management, highlighting the main cross-fertilizing contributions that modified and/or enriched its conceptualization and formed the new challenges in this domain; in this part of the work, the attention is positioned on what bounded rationality is to date and what it could become in the future, thanks to the advancements and developments of new streams of research, such as neurostrategy and behavioural strategy. This chapter faces the outlined question by comparing the advancements made in management and related fields divided by decades. The novelty of this chapter resides in having traced the historical evolution of this pivotal

concept, taking into account what has been done in other domains, redefining what bounded rationality is currently and attempting to clarify what remains unclear in this area. Moreover, the chapter identifies the major developments in management theory in terms of key discoveries and connections by theories that used bounded rationality assumptions. It is notable to highlight that the proposed future directions try to increasingly tie the management research with other scientific fields, such as sociobiology. In this vein, the evolutionary mechanisms used in biology and sociobiology appear as the most promising to be applied for understanding the scaling from individual to collective rationality. Some recently articles by organizational evolutionary scholars pointed out this cross-fertilization as the one that can better explain human decision making and firms' behavior (Abatecola, 2014a; 2014b; Breslin, 2014a; 2016b; Cafferata, 2014; 2016). However, this path still appears as quite underdeveloped.

In Chapter 2, a case study of a not for profit organization demonstrates why the flow of decisions, biased by cognitive distortions occurring in the mind of decision makers, has different effects according to its path. This contribution tries to shed light on the importance of the quality control of decisions (Kahneman *et al*., 2011) as a mean for improving decision success. In this regard, the novelty of this chapter lies in the approach to the research question and to the proposed solution; indeed, the methodology used is action theory research (White, 1991), in which the researcher is asked to take part in the study as an active observer offering a solution to an organizational problem. What this chapter adds to the existing literature is a problem structuring method that helps to face pivotal decisions in organizations in order to reduce the biases that can occur, taking into account the personality of decision makers (e.g. Abatecola *et al*., 2013) through a better

structuration of the decision flow. This chapter answers the question of 'why' distortions occur in organizations and provides a useful insight of 'how' to reduce/eliminate them.

In Chapter 3, an original research aimed at understanding 'why' decision makers follow different decision paths (with different outcomes) when facing interdependent decisions is proposed. This study, centred on Dynamic Decision Making (DDM) (e.g. Edwards, 1962; Engemann et al., 2003; Kleinmuntz and Thomas, 1987), clearly demonstrates that the decision behavior varies according to the decision maker's cognitive style. Moreover, the chapter offers a cognitive explanation to the divergences on the variables considered as pivotal in determining the quality of the decision outcome in DDM (e.g. Edwards, 1962; Eisenhardt, 1989): *rapidity* in taking action and *accuracy* in understanding the problem. The findings of this work can be considered as important for the current society, because of the hypercompetitive and fast paced settings in which firms are embedded (e.g. Hamel, 2000), that push decision maker to be more and more more responsive to the dynamic evolution of the decision flow (Abatecola, 2014b). To address the above outlined research question, a laboratory experiment was conducted for controlling the variables and investigating the possible cause-effect relationship between cognitive styles and DDM behaviours.

Finally, in Chapter 4, an experimental study that involved 100 professional recruiters tried to clarify 'how' biases occur during relevant managerial decision making processes. In this regard, this study tries to enrich an existing model that explains why candidates with greater attractiveness are perceived as more employable (Judge *et al*., 2009) through adding a new variable directly coming from the psychological studies, i.e. objectification. Through this implementation, a moderated mediation model that explains the connections between attractiveness, main personality traits looked for during recruiting, and

employability of a candidate, is offered. The value added of this chapter resides in offering a more comprehensive model that explains 'how' the attractiveness bias works, pointing out the mechanism that regulates all the factors (both old and new) that are at the basis of the final effect.

In conclusion, this doctoral thesis aims to offer useful insights on the different new trajectories, in terms of methodology and new challenges, that are emerging from a redefinition of the bounded rationality concept in management, in the light of its cross-fertilized evolution. In this regard, the thesis reflects the research interests in managerial decision making and organizational evolution which I have been mainly cultivating during the three years spent in the PhD Programme in Management at the University of Rome "Tor Vergata".

Chapter 1, 2 and 3 of the thesis were already accepted for publication in three different international journals, while Chapter 4 is currently under review. Moreover, I presented Chapter 2 at the EURAM Conference 2015, in particular at the SIG of Research Methods and Research Practice.

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Rome, 30th October 2016

CHAPTER 1: Bounded Rationality: the Meaningful Cross-Fertilizing Contribution by Herbert Simon

Outline

This work has the main goal of investigating the curcial chronological advancements undertaken in the research of bounded rationality in management research, taking into particular account the key influencing discoveries in related fields due to the cross-fertilizing nature of this meaningful concept. The adopted method is the historical approach; it helped to explain the evolution of the bounded rationality concept in management history and, especially, to identify the advancements that have been made in related fields that brought the cross-fertilization of concepts and theories. The irrational forces that drive human decisions are now at the centre of the research agenda rather than the bounded rational ones, claiming for an extension of the original concept. Moreover, the highlighted frontiers for future research suggest avoiding to fall in love with 'fashion of the month streams' and focusing the attention on the scaling of the understanding of bounded rationality. This is the first work that offers the key turning points of the evolution of the bounded rationality concept in management, considering the significant advancements in related fields that have over time affected its trajectories. Thanks to this, a first overall historical picture on the theories and concepts that have been followed each other is provided.

Keywords: Bounded Rationality; Management History; Management Research.

1.1 Introduction

From *The Administrative Behaviour* by Herbert Simon in 1947, the concept of *bounded rationality* has been permeating countless scientific fields. His watershed work drastically changed the study and consideration of the organizational decision making arena; in fact he strongly questioned the *homo economicus* rationality based on optimal preferences, highlighting the human being limitations in terms of rationality, that constantly bring him to deviate from the canonical models of decision making (Simon, 1955; 1956).

From this breakthrough work, the management literature and its further history has been completely recalibrated (Kerr, 2007; Kalantari, 2010), bringing the birth of new disciplines and theories that are still under development because they are undergoing cross-fertilization from other related fields (e.g. psychology, sociology, brain science, etc.), in which the bounded rationality concept has been recognized as having the same wide validity and influence (e.g. Becker, 1962; Kahneman, 2003).

This review has the main goal of investigating the chronological advancements undertaken in the research of bounded rationality, taking into particular account the discoveries in management related fields due to the cross-fertilizing nature of this meaningful concept that has driven reciprocal dynamic influences with the management domain.

Because of the above-mentioned effects, the method that has been adopted for this literature review here presented is the historical approach. This method is strongly considered as suitable for explaining the evolution of a key concept in management history (see Abatecola *et al.*, 2012) and, especially, for identifying the cross-fertilization of concepts and theories from related fields to the managerial one (see Akinci and Sadler-Smith, 2012). This last argument is even more important for a concept that was, from its

very beginning, strongly affected by studies in other fields (i.e. psychology and sociology, (Simon, 1947; 1957)).

Despite the huge interest in this monumental concept, many scholars have highlighted how a literature review on bounded rationality is both missing and needed because of the fact that it is clearly necessary to understand the major developments of bounded rationality before moving beyond it (e.g. Selten, 1999; Gavetti, 2012).

On this premise, the major strength of this article lies in: *i*) offering the key turning points of the evolution of this breakthrough concept considering the significant advancements in related fields, in terms of concepts and theories, that have over time affected bounded rationality trajectories in main management theories, *iii*) presenting some very handy recommendations in which unfilled gaps, in the management field, and future directions, coming from the consideration of other scientific areas of research, are detailed.

The contribution is structured as follows. Firstly, the initial conceptualization of bounded rationality is offered to the readers. Secondly, the evolution of this seminal concept in the management theory and related progressions in other fields is depicted, divided by decades (1960-1970; 1980-1990; 2000-onwards). Thirdly, thanks to the historical observation adopted, a comprehensive view of the enrichments of the bounded rationality concept is derived, highlighting some useful recommendations for the management research emerging from its cross-fertilized evolution.

1.2 Herbert Simon and the birth of the 'bounded rationality' concept (1947-onwards)

Alexander Herbert Simon's contributions share the same scientific root that has served as a breakthrough in various fields, the *bounded rationality of the human being*. This meaningful concept, emerging directly from his published doctoral dissertation in 1947, strongly contrasted the classical concept of the omniscient rationality of humans, thanks also to the the massive influence of positivist psychologists (Kerr, 2007).

Those influences favoured Herbert Simon to introduce the bounded rationality concept, mainly based on three major constrains that humans always undergo: *i)* incompleteness of knowledge; *ii)* difficulties of anticipation of the consequences, and *iii)* scarce knowledge of all the possible behaviors. What is at the base of those limits are mainly the restrained computational capacities, access to information and physical constraint (Simon, 1947; 1955; 1957). The cumulative effect of those limits is that people do not make 'optimal' decisions but just 'satisfying' ones, with the consequence that the organizations in which they may be embedded cannot maximize their own goals. In this vein, the breakthrough shift proposed by Simon is from *economic substantive rationality* to *administrative procedural rationality*, thus from the *what* decisions are made to the *how* decisions are made (Simon, 1978b).

From what is said above, it is clear that the revolution of thought that Simon has brought was basically philosophical and sociological rather than (solely) economical; indeed, he strongly refuted the implicit and explicit identification of Adam Smith's rationalism and Jeremy Bentham's utilitarism at the base of human behaviour (Simon,

1978a, 1978b), being more close to the Freudian unconscious view of human beings and Vilfredo Pareto's sociological consideration of society.

Those conceptual pillars at the base of bounded rationality have pervaded the current knowledge on decision making processes, and were based on the initial insight of Chester Irving Barnard[1] (1938) about the *non-scientific reasoning* that may occur for some men in organizations. However, Barnard's fallacious man is the one that uses *intuition*, defined as the *non-logical process* based on his own knowledge and experience, to make decisions; but, the man that deviates from the canonical model is more similar to an exception than to a normal condition of the human being in organizations (Simon, 1987).

In the same vein, other scholars subsequently used the term *irrationality* in order to define those non-scientific behaviours, but failing to understand the original Simon's thoughts; for instance, Becker (1962), also cited by Simon in his Nobel Memorial speech, claimed that the irrational behaviour is a decision rule at the base of utility maximization. Conversely, it is remarkable to notice that Simon never forgets that the *human being tends towards rationality*, indeed the reason 'is a tool that enables those institutions to act effectively toward goals' (Simon, 1973, p. 353).

On this premise, the Simon revolution is on the very fine line between the terms *rationality* and *irrationality* introduced above; in fact, his concept of bounded rationality is collocated between the *economic man* of classical economists and the man, deriving from the Freudian line of thought, whose cognition is *all reduced to affect*. Furthermore, he did not forget the important role of some sources of irrationality, such as the one deriving from emotions (although his focus was mainly on the role of motivation; see March and Simon, 1958; Simon, 1973).

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[1] To whom Herbert Simon 'owe[s] a special debt: first, for his own book, *The Functions of the Executive*, which has been a major influence upon my thinking about administration' (1957, xlvii).

This direction, in which the cognitive functions of the human being are positioned at the centre of the investigation in order to predict human behaviour, was later raised by Simon (1992) with the advent of cognitive psychology.

Figure 1.1 Key advancements on bounded rationality: a historical timeline.

**Bounded Rationality in
Management Research**

Institutional management rationality (Archer, 1964)	Behavior of organization as the the effect of executive cognitive style (Kets De Vries and Miller, 1984)

Hidden traps in decision-making (Hammond, Keeney and Raiffa, 1998)

Environment shapes rationality (Elbanna and Child, 2007)

Degrees of rationality (Good, 1962)

Rational apporach to rationality (Vazsonyi 1974)

Negotiation as social distorted situation (Neale and Bazerman, 1985)

Ecological rationality (Gigerenzer and Selten, 2002)

De-biasing checklist (Kahneman, 2011)

Logic and non-scientific reasoning (Barnard, 1938)

Incremental rationality (Lindblom, 1959)

Organizational rationality (Petit, 1967)

Set of givens as distortional filter (Hambrick and Mason, 1984)

1950   1960   1970   1980   1990   2000   2010

Bounded Rationality (Simon, 1947)

Left-Right brain (Bradshaw and Nettleron, 1981)

Social rationality (Short, 1984)

Dual-mind processing (Stanovich and West, 2002)

Two neural systems: intuition and deliberation (Kuo, et al. 2009)

Behavioral change as consequence of biological change (Shao and Lee, 2014)

Heuristics and biases (Tversky and Kahneman, 1974)

Intertemporal inconstincencies and mental accounting (Thaler 1981, 1985)

Brain-body integration (Damasio, 1994)

Fast and frugal heuristics (Gigerenzer and Goldstein, 1996)

Bounded personality (Myers and McCaulley, 1985)

Ecological rationality (Wang, 1995)

Neural complementarity between emotions and cognition (Sanfey, et al. 2003)

**Bounded Rationality in
Related fields**

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1.3 Towards the Understanding of the Psychological Determinants of Bounded Rationality (1960s-1970s).

During the next twenty years after the seminal bounded rationality concept by Simon, scholars in related fields were involved in the research on what is at the base of the human beings deviation from rationality.

On one hand, logicians and philosophers believed in the power of odds in order to explain what rationality is (Skyrms, 1975); according to them, chances tell us 'what we ought to *believe* will happen; what is rational to expect' (Kyburg, 1961, p. 200). On the other hand, psychologist were more concerned with the flaws of the human mind and its incorrect interpretations of chances; the main contribution in this field lay in the explanation of how the bounded rationality of human beings works in practice, showing evidence for the failure of the *expected utility theory* – replaced by their *prospect theory* (Kahneman and Tversky, 1979) – and for the existence of a subjective assessment of probabilities conditioned by heuristic principles (Tversky and Kahneman, 1973; 1974).

Indeed, in conditions of uncertainty – which affect the majority of events in our life – people weigh probabilities according to *subjective probability*, by which 'people replace the laws of chance by heuristics, which sometimes yield reasonable estimates and quite often do not' (Kahneman and Tversky, 1972, p. 430); this would let humans appear as irrational according to philosophers and logicians whose man was an *algorithmic decision maker* rather than an *heuristic man*.

Those works stimulated interesting new ideas on human rationality; for example, Taylor (1975), reviewing the human psychological limitations, proposed to overcome bounded

rationality through selecting the 'right' decision maker with good psychological prerequisites, and/or engineering the problem space in which the decision maker is embedded. In this regard, both the *satisfying* strategy and the *incrementalizing* strategy (i.e. the decision maker continuously compares the existing situation with alternative ones; Lindblom (1959)) appear as not posing a real effort in expanding or eliminating the bounded rationality.

From this, and other new standpoints in the rationality debate, greater emphasis was added to the study of individual characteristics and their psychological boundaries at the end of the 1970s and more and more on how to, respectively, start measuring and overcoming them. On this point, it started the investigation into the psychological differences among individuals that drive their rationality and how to scientifically measure them, raising initial problems on methodology and on the definition of the laws that govern the human mind (Jenkins and Likken, 1957) and its cognitive functions (Van de Geer and Jaspars, 1966).

The bounded rationality elements that were under investigation in those years (e.g. utility, subjective probability, personality variables) were considered at the base of a psychological theory that was and still is concerned with the 'shoulds' and whys' of choice behaviour, namely *Behavioral Decision Theory* (Edwards, 1961). This new theory and approach, later strongly developed by Tversky and Khaneman (1979), gained large consensus during the 1970s because of its completeness in terms of variables and methodologies of investigation.

The above exposed, stimulating investigation on bounded rationality – in management related fields – clearly positions at the centre of the research agenda the human being and

its psychological limitations; this opened new, extraordinary venues of research on what is at the psychological base of human bounded rationality.

1.4 Reformulating Managerial Decision Making in the Light of Bounded Rationality (1960s-1970s).

Thanks to the great advancements made in the psychological field, some important applications in management were expected through cross-fertilization. On the contrary, the introduction of the bounded rationality concept, shook management scholars and left them reconsidering theories and postulates on how humans act in organizations.

For instance, Good (1962) attempted to define a so-called *Theory of Rationality*. According to this author, the impossibility of complete human rationality comes from unconscious mental events, psychological events and external forces that may determine our decisions; from that, 'a conscious man can be only *more or less* consistent, in other words there are *degrees* of consistency or of rationality' (Good, 1962, p. 385). A theory of rationality, always according to Good (1962), was needed for top managers in order to justify their (complicated) decisions to other people, and the result of managers' justified actions – driven by the principle of maximizing the expected utility – will let them have a smoother organization that does not need too much planning.

However, as well defined by March (1978), the rationality of humans in general, and managers in particular, should be seen through different lenses, such as: *i) context rationality*, that emphasizes the structure and relationships in which the decision is embedded (e.g. Cohen *et al*., 1972), *ii) game rationality*, that defines the collective

decision as coming from calculations made by individuals, each one pursuing their personal objectives (Von Neumann and Morgenstern, 1944), *iii) process rationality*, in which it is pivotal to investigate the attributes of the decision process (Butler *et al.*, 1979), *iv) adaptive rationality*, based on the *Behavioral Theory of the Firm* by Cyert and March (1963) and on the specific idea of the experiential learning as an adapting behavior, *v) selected rationality*, that emphasizes the role of rules and standard operating procedures as drivers of decision making (March and Simon, 1958), and *vi) posterior rationality*, in which the relationship goal-action is inverted (March, 1971).

However, despite this number of different theoretical standpoints, the debate between *rationality* and *irrationality* continued. For instance, Vazsonyi (1974), starting from the assumption that humans are *emotional because of their nature* (also when trying to be rational), stated that the problem of being rational instead of irrational may be solved only by starting from the recognition of our own irrationality, and then proceed with the *peel off* of rationality from them in order to separate it from irrationality.

On the other hand, several different theories have been given in order to explain the rationality, in *strictu sensu*, behind organizational decisions; for instance, Archer (1964) introduced *Management Decision Theory* (MDT) for which organizations have strategies each one with a *payoff* which can be determined only if information is in the manager or staff possession. In the same vein, according to Petit (1967) and his *Behavioral Theory of Management* (BTM) 'the firm is unable to operate with complete rationality nor must it face complete uncertainty' (p. 344). In practice, it treats rationality and uncertainty in different ways, from classical *Decision Theory* (DT) and MDT; in fact, it does not consider only the technical rationality (how it is done in DT) or the organizational and institutional

management rationality (how it is done in MDT), but takes into account the problem of rationality in the overall organization[2].

From that, it is clear that rationality, managerial decisions and organizational behaviour have been perceived as strictly related in the management literature from the 1960s in order to explain rationality and its limits; the discovery of those relationships and the reshaping of differenct concepts occupied most of those decades in the management research.

1.5 The Branching of Bounded Rationality Studies (1980s-1990s)

The Contribution of the Sociobiological Theories

The main cross-fertilizing contribution of the 1980s-1990s came directly from the natural and biological science, in particular from Sociobiological studies. Wilson (1978)[3] defined Sociobiology (or *behavioural ecology*) as: 'the extension of population biology and evolutionary theory to social organization' (pp. xx); in practice, it investigates social behaviour as a result of the pressure given by the natural selection, that pushes individuals to adapt their behaviour in useful ways to interact with others.

Because of those particularities, *evolutionary psychology* was considered closely connected to sociobiology. Indeed, when humans answer to the uncertainty of the

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[2] DT and MDT start from the assumption that solving managerial problems is a rational process but it does not take into account perfect rationality.

[3] Even if the birth of this new field is in the 1970s, it is in the 1980s that the majority of publications with a clear contribution to bounded rationality appear.

environement, they activate their sense of survival that affects all living organisms as well as a process of learning and selection that improve efficiency (Tversky and Kahneman, 1986; Slovic, 1987). From that, the emphasis has been added to the so-called *social rationality* that has a social function in relation to the perception of risk; in particular, it pushes towards the differences in cognitive abilities among individuals, because they are at the base of social bonding (Short, 1984).

In this vein, later works, such as Wang (1995), provided purposeful empirical prooves of the utility of an adaptationist perspective on human rationality; in particular, it was found that the utility function associated with death-life problems is determined by the expected values and probabilities of choice outcomes and by biological adaptive variables.

Moreover, through this approach, modern economists started to extract value from older neoclassical theories considered as irreconcilable with the bounded rationality concept; the most known example is the *evolutionary game theory*. In this new approach, players can't foresight consequences of their decisions and are affected by bounded rationality; fixed preferences are not based upon human utility function anymore (Smith, 1982), but on the human adapting aspiration levels (Aumann, 1997).

In sum, sociobiology was perceived as a meaningful field whose dynamics can be applied to the bounded rationality question, because of treating the *social* (or *ecological*) *rationality* coming from the interaction with other individuals and the environment.

The growth of behavioural theories

The second direction proposed is, *de facto*, the claim of the scholar to the building of new rational choice models that should have taken into account the *real behaviour* of the

decision makers; this direction was initially pushed by Simon (1956), in which he embedded the psychological and biological limitations of humans in the same model in order to explain the false maximization behaviour of individuals and, subsequently, by Slovic and colleagues (1977), who positioned the *Behavioral Decision Theory* (BDT) and its adopted perspectives.

The behavioural field of study, is strongly linked with the advancements made by cognitive psychologists over time. Despite the difference in the assumptions made by behaviourists, who would like to explain in detail the behaviour of humans by avoiding assumptions on individual mental activity and looking at the objective probabilities instead of the subjective ones (Tallman and Gray, 1990), those two fields mutually reinforced their results over time.

In this regard, thanks to the pivotal discoveries made by Tversky and Kahneman (1973; 1974), new (but very close) branches in management related fields were born and grew such as *Behavioral Economics* and *Behavioral Finance*. Those streams are considered as direct consequences of the birth of the BDT, and their precise starting points are some key and recognizable works in the economic and financial literature. For instance, Thaler (1981) proved the *inconsistency* of individuals in the *intertemporal choices* postulated by Irving Fisher and colleagues (1981), as well as he identified the existence of *mental accounting* of people when deciding about their shopping (Thaler, 1985).

Those new works and theories, basically overcame the logical analysis of games of chance, mainly because they recognized the previous as based on an idealized decision maker whose proofs of fallacies were already impressive.

The development of cognitive studies

During the 1980s-1990s, cognitive scientists interested in decision making heuristics reinvigorated the perfect rationality fallacies against its detractors and, new models, such as the one by Gigerenzer and Goldstein (1996) proved that humans can cognitively succeed in the real world without the need to adhere to classical norms.

From that, a growing interest in the study of human cognition has always been supported by related investigations by psychologists who particularly looked at the personality *traits* of the decision maker and his *emotions*.

The interest in the self has been augmented during those years because of the justification that scholars wanted to give to the consistency of individual actions over time and situation (Simon, 1990). In this regard, a vast amount of psychometric tests to investigate the human information processing, such as the MBTI Test (Myers and McCaulley, 1985) and the Big Five Questionnaire (McCrae and Costa, 1987), have been experimented.

On the other hand, Damasio (1994) studied the profound biasing role of emotions in human cognition and decisions with important and stimulating results that confirmed the functional role of emotions to rationality. For instance, other scholars discovered how a positive mood drives towards a superficial process of the information collected, while a negative mood pushes towards more precise information processing (Isen *et al.*, 1988).

Due to those discovered interconnections, in Damasio's opinion (1994) the *brain* and the *body* are biologically integrated (supported also by philosphers, see Churchland, 1986) and the entire organism is embedded in and environment from which interplay derives the psychological functioning of our mind. The studies of Damasio and others in the field (e.g. LeDoux and Hirst, 1986), could be clearly considered as the linking-pin between

sociobiological theories, mostly based on the biological explanation of human behaviour, and pure behavioural and cognitive theories, principally concerned with the psychology of the human mind. In the same vein, philosophers (e.g. Finkelstein, 1997) and psychologists (e.g. Salas *et al.*, 1996) became more and more concerned with the effect of mental states (e.g. stress, depression, etc.) on human decision making, either conscious or unconscious, highlighting them as pivotal variables in the intended rationality of individuals.

From this view later emerged the study of neuroscientists on the division between the left and right hemispheres of the brain. In particular, different scholars (e.g. Bradshaw and Nettleton, 1981; Springer and Deutsch, 1985) deepened the understanding of the physically and functionally division of the human brain in two cerebral hemispheres, concluding thtat the left side is responsible for logical and inductive thinking, while the right is devoted to the intuitive and creative thinking.

In sum, this field of investigation was widely permeated by studies on the human mind and brain, later considered as the most promising fields for discovering the nature of human reasoning.

1.6 Bounded Rationality in Management Theories: New Models and New Applications. (1980-1990)

Upper Echelon Theory and Negotiation Theory

At the end of the 20th century some important developments took place in management research thanks to applications of the bounded rationality idea.

One of the most known is the *Upper Echelons Theory* (UET) by Hambrick and Mason (1984). This theory aimed at demonstrating that organizational outcomes, strategic choice and performance levels could almost be predicted if looking at the *managerial background characteristics*. According to the authors, the decision maker that faces a strategic decision 'brings a *cognitive base* and *values* to a decision, which creates a screen between the situation and his/her eventual perception of it' (Hambrick and Mason, 1984; p. 195). What the management team perceives, through its cognitive base and values' interpretation, is different from the real situation and, based on this biased perception, it makes a strategic decision. Subsequently, during later years there were tested and included some psychological factors, even if they were not psychometrically experimented (e.g. Hayward and Hambrick, 1997); those additions have let UET to increasingly absorb the developments of bounded rationality studies.

Moreover, according to UET the powerful managers of a company act as a dominant coalition (Cyert and March, 1963) and their inter-relationships are at the base of the strategic choice, because they let to overcome the individual cognitive limitations, bringing a satisfying choice (Daft, 1997).

This view of choices in organizations as a inter-relations process was a fertile filed for the birth of Negotiation theory; this approach is indeed concerned with decisions in which parties have different preferences but they have to reach a negotiated agreement in order to be *satisfied* (Lax and Sebenius, 1986).

The link with the bounded rationality and this approach is also highlighted by the study of the common errors that negotiators make (Caputo, 2013); indeed, from the first proof that the frame of the decision conflict and the tendency to rely too much on the self-attributes of a negotiator, affect the bargaining process (Neale and Bazerman, 1985), a

plethora of later studies were more and more concerned on how the assumption of the parties are affected by their cognitive abilities (e.g. Bazerman and Carroll, 1987).

To summarize, what were considered to be the most important in UET and bargaining processes were the identification of the individual as bounded rational and the process as a social situation; two elements equally important in the new wave of the decision making and bounded rationality literature.

Cognitive studies in organizations

Studies in the management field in those decades were also more and more involved in the examination of how managers process information and how their judgment is formed.

One well-known contribution in this direction was by Russo and Schoemaker (1989) who identified the common cognitive barriers that decision makers may encounter. Following, Hammond and colleagues (1998) went into depth in the cognitive bias concept, proposing their interpretation of some human brain flaws (i.e. *cognitive traps*) in order to explain all those situations in which the human brain is abnormally deviating. This contribution was a milestone because of being focused on executives' problems, and explaining how managers, affected by those cognitive traps, 'can undermine everything from new-product development to acquisition and divestiture strategy to succession planning' (Hammond *et al.*, 1998; p. 47).

However, management scholars focused their attention on the increasingly implementation of the psychological studies on personality traits in order to explain the erratic behaviour of decision makers. For example, Kets De Vries and Miller (1984) who discovered the existence of a relationship between neurotic styles of top executives and organizational climate, structure, and strategy.

In sum, executives in this historical phase were finally considered as 'cognizers' (Calori *et al.*, 1994) whose cognitive understanding – and related biases – is considered to be a cause of their background and personality characteristics.

1.7 The brain-mind revolution (2000s – onwards)

Dual-mind processing and the study of the brain

At the beginning of the new millennium, previous results on the right-left brain were deepened by cognitive scholars, who defined the human cognitive functioning as occurring in two different *systems* of our mind (Stanovich and West, 2002; Kahneman, 2003). It was recognized that the operations of our mind that may be regarded as spontaneous, fast and automatic, are associated with the 'System 1' of our mind, while cognitive operations of 'System 2' are 'more likely to be consciously monitored and deliberately controlled' (Kahneman, 2003, p. 698). More in particular, the way by which the mind processes information is at the base of the heuristics and cognitive biases of the decision maker (Kahneman, 2011).

Being rational was recognized as not only related with *logic*, but it is a matter also of both *thinking* and *reasoning*, which are responsible for the human metacognition that allows the consciousness of human inference, how postulated also by philosphers (Moshman, 2004).

Stemming from the fact that brain and mind are two distinct concepts, those works contributed to partially close the gap between what happens in the human biological system and what the effects are on cognition. In this vein, neuroscientists claimed to

enhance the study of mental processes by looking at the biology and psychology of the brain. For example, Kuo and colleagues (2009) investigated first the distinction between intuition and deliberative reasoning proved by the above cited, several psychologists, and found that what is at the base of a mind division between left and right thinking, seems to be based on the activation of different brain areas; Those two areas are proved to work differently according to the subject occupational background, and are basically product of the *emotions with cognition* (Sanfey *et al.*, 2003), and not only caused by the latter alone.

From those first steps, in recent years neuroeconomic studies have deepened the neural basis of heuristics and cognitive biases. For instance, Tom and colleagues (2007) and Shao and Lee (2014) highlight that contrary to the behavioural theories, potential losses are related to the activity in regions involving multiple neural systems responsible for subjective value and not with an increase of activity in brain regions linked with negative feelings.

From that, the emergence of a new framework of analysis that should be inclusive of the neurobiological and computational analysis of decision-making; this point signified the very new field of *decision neuroscience*, in which the biological variation has primacy in understanding what has not been mapped in the best economic models (Bossaerts and Murawski, 2015).

In those years a new man was born, the *homo neuroeconomicus*. His neuronal base constitutes the fundamentals of his decision process in which maximization of the utility is given by the maximization of positive feelings over negative ones; the human emotional system has been discovered as a key turning point in bounded rationality.

1.8 Present and Future of Managerial Studies on Bounded Rationality (2000s – onwards)

The rising importance of the context

Despite the rising neuroscience attention given to the individual side, in social science several scholars, recalling the older idea of March (1958) for whom the organizations adapt themselves to an environment, identified new models for explaining the surrounding distortional power.

In this vein, Gigerenzer and Selten (2002) clearly explained that heuristics have to be thought of as an *adaptive toolbox*, thus they are modelled according to the cognitive abilities of the decision maker and used only when matched with the particular organizational environment structure, so as to allow the decision maker to be *ecologically rational*. Following this path, Abatecola (2014b), used *biological philosophy* for proving how subsequent decisions in organizations are affected by the initial heuristics that were applied over time and that self-reinforced themselves thanks to the organizational environmental responses.

From that, management scholars directed their attention also to the institutional environment and, in particular, to the distortional power of culture in which the decision maker is embedded. In this vein, already existing strong voluntaristic theories such as the Upper Echelons Theory have been contaminated by the study of environmental features; for example, it was found that the culture in which the organization is embedded is at the base of the influencing factors that drive the firm expenditure (Verville *et al.*, 2010), reinforcing the already proved assumption that environmental variables fill the gap in the prediction of variance in decision-making rationality besides decision and firm-specific

factors (Elbanna and Child, 2007). Moreover, it was found that the environment has a moderating role in strategic choices besides the demographic characteristics of the executives, especially in eastern countries (Wei and Ling, 2015).

The context has been rediscovered for its importance because of its activation of decision makers' cognitive associations, and for this reason the cross-cultural differences are considered at the base of decisions and operate in combination with heuristics and biases (Pattaratanakun and Mak, 2015).

Heuristics and cognitive biases: the unveiled importance for management research

The birth of the heuristics and cognitive biases concepts between the 1970s and 1980s continued towards a climactic interest of management scholars, but only during the 2000s they finally overcame the problems related to the methodology of investigation in organizational contexts.

In this regard, Bingham and Eisenhardt (2011) contended that firms learn and apply heuristics in a strategic context when time is short, information is limited, and the situation is novel. Furhtermore, Malhotra and colleagues (2015) demonstrated the unconscious use by executives of the anchoring trap in Mergers and Acquisitions operations looking at the best similar deal concluded in the recent past in their industry.

Having defined that heuristics and cognitive biases also have important distortional effects in the managerial field, scholars have started to focus their attention on how to overcome those cognitive errors.

For example, Kahneman and colleagues (2011) ideated a *checklist* of 12 questions, each one linked to a precise cognitive distortion, through which a third person can recognize and

moderate the effects of the distortions in decision-making processes. A second important tool is the so-called *premortem technique* (Klein, 2007), used for discovering why future project may fail, assuming that the patient (i.e. the proposed project) will die (i.e. fail) and they need to presume the possible factors of failure. Another one, proposed by Adizes (2004), is the so-called *four management styles*; if the four manement roles characterized by different goals and duties are together performed by different people to solve a problem or taking a decision, they can considerably avoid the risk of incurring distortions.

The *red thread* of those tools, may be 'breathed' in the recent work by Zhang and colleagues (2015); they suggested that in order to avoid the unethical behaviour of decision makers, they should adopt a 'vigilant mindset' so as to notice what is going on and correct this behaviour.

In this historical phase management scholars tried to fill the existing gap with discoveries in the psychological field by incorporating their advancements; moreover, they looked further, by trying to build new organizational tools in order to reduce the bounded rationality of decision makers.

New venues: Behavioural Strategy and Neurostrategy

Despite the increased interested in behavioural theories in the 1980s and 1990s, the formulation of a strategic behaviour paradigm has not achieved a great spread in strategic management until recent times (Hodgkinson and Sparrow, 2002).

A first formal conceptualization of the *Behavioral Strategy* paradigm started with Powell and colleagues (2011); they seminallly identified the new stream as merging the 'cognitive and social psychology with strategic management theory and practice' (p.

1371). In particular, it is proposed to use this new theoretical field to look at four open statements: *i)* scaling individual cognition to collective behaviour; *ii)* identifying the psychological pillars of strategy theory; *iii)* understanding complex judgment in organizations; and *iv)* ameliorating the psychological architecture of the firm.

In this regard, behavioural strategies have been perceived more and more as a potential microfoundation of management research because of the link to different levels of rationality inside the organization (Greve, 2013). In particular, Greve (2013) proposed four behavioural strategies with the intention of enhancing the understanding of how organizations make decisions; the challenge is to provide some insightful rules that can link those strategies to lower-level processes.

In the same vein, Gavetti (2012) focused his attention on the building of a *Behavioral Theory of Strategy* that in some way can 'identify the behavioural drivers of superior performance systematically' (p. 268); in particular, he tried to isolate the factors that systematically bound the behaviour while competing. Contrary to Greve (2013), individual limitations are by him perceived as a more fertile field, through which can be explained the superior performance of some organizations.

Beside the claim for a greater involvement of psychology in the managerial field, on the other hand several management scholars have tried to incorporate neuroscientists and biologists in the discussion of bounded rationality.

Despite the raise of some ethical issues in the adoption of neuroscience in the management field, it has been considered as 'the next big thing in business for some time now' (Gazzaniga, 2006; p. 66). In this vein, Waldman and colleagues (2011) started a research programme on neuroscience and inspirational leadership; their results, highlighting differences in the neural connectivity in the right frontal cortex among

participants, have been considered as justifying neuroscience as the next step beyond the psychometric methods of psychologists. Following, Peterson and colleagues (2008) found that charismatic leaders use both the left and right brain areas more than non-charismatic leaders and the neural circuits of the former are more connected compared to the neural circuits of the latter.

From that, it emerges that psychology and neuroscience, with different commitments and history, have been continuing to inform the bounded rationality literature. A new stimulating era seems to have started.

1.9 Discussion and Implications for Future Reserach

What bounded rationality is, how this concept has evolved over time and how it has affected and been affected by managerial studies; that has been the scope of the presented historical literature review. This section is aimed at summarize the main open issues of this stream in management research, giving some useful recommendations for future research on the study of the limitations of human rationality in organizations.

First, although the bounded rationality theme has permeated all the scientific fields, this concept is now not so far from being confounded with irrationality. Even if *Simon (1997) tried to avoid speaking about bounded rationality as irrationality*, since the Barnard's masterpiece (1938) other studies on irrational forces (intuition, emotions, mental states, personality traits, etc.) has now enlarged the *spectrum* of human limitations (e.g. Kets De Vries and Miller, 1984; Damasio, 1994) that were firstly included by Simon in his bounded rationality. Being bounded rational and being irrational still remain two different concepts,

because making a bounded rational decision or an irrational decision is driven by different limitations (even if they may lead to the same results), but, at the same time, they now appear as less contrasting and more complementary than in the past. Studies on decision making in management research should investigate more and more the impact of the irrational forces and find their connections with the bounded rational ones in order to amplify the strength of both concepts.

Second, the raised attention to the context as a mean for investigating the so-called *construct rationality* (Moshman and Geil, 1998), let the environment now to be rediscovered as a field of investigation of human limitations, with more attention to the difference between western and eastern countries (e.g. Wei and Ling, 2015). However, the passage from individual rationality to construct rationality, both affected by the institutional environment in which they are embedded, is quite underinvestigated and it is now considered as the one most important challenge in the study of human rationality and behavior (Powell *et al*., 2011). In this regard, the interest of researchers should be on the socio-cognitive interactions occurring in the dynamics among group members, taking into strong account the socio-cognitive lens and the theory of social influence (Allard-Poesi, 1998).

Third, and connected with the *Second*, scholars over time have profoundly studied bounded rationality through different standpoints, to which is offered a complete overview.

Figure 1.2 Perspectives on bounded rationality. A timeline of the historical evolution.
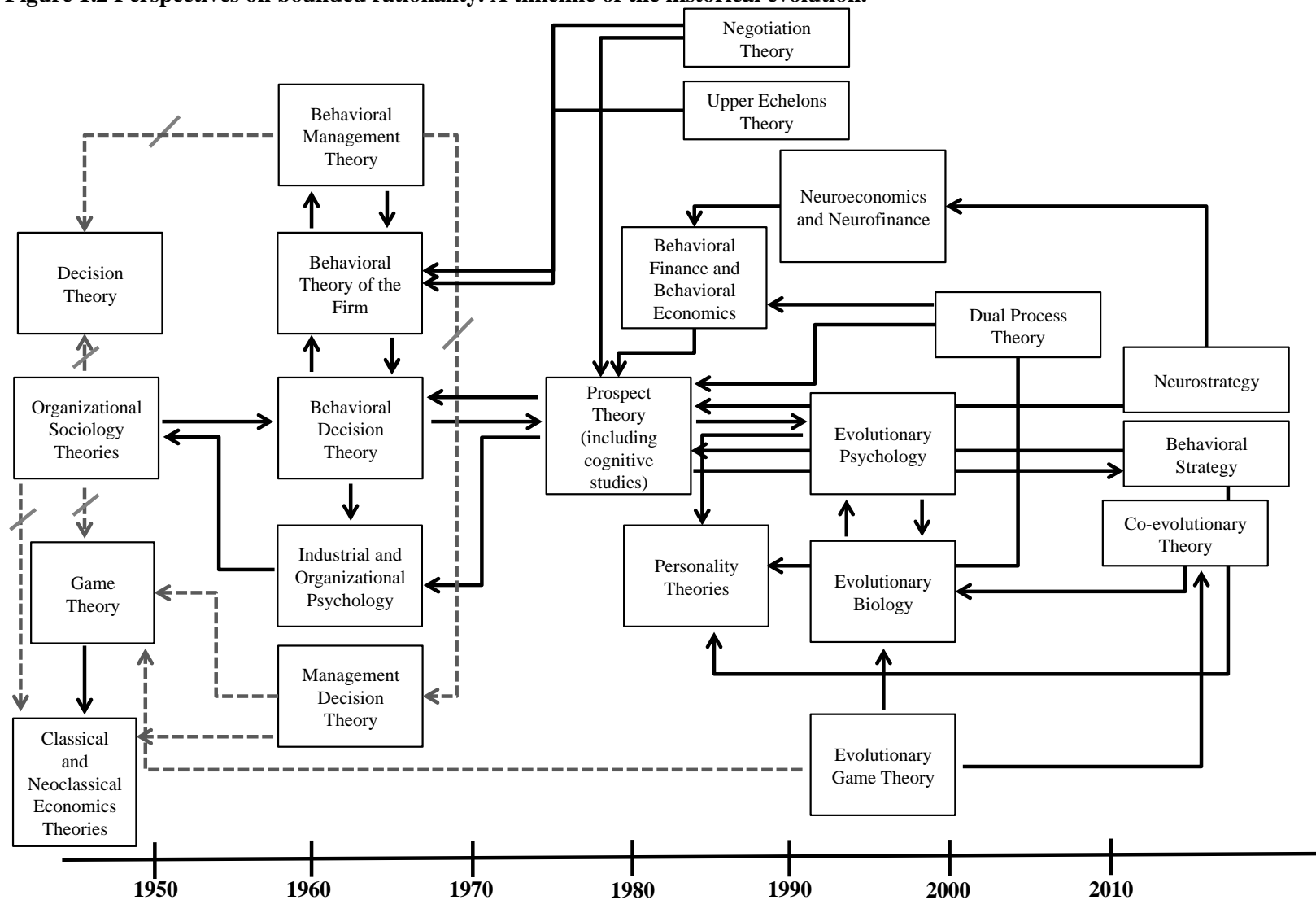
Notes: Strong ties between two theories/streams: ➔ ; Weak ties between two theories/streams: --->. Strong ties are used when a theory directly descends from another one and accepts all its assumptions and results; two strong ties are used when the influence is reciprocal. Weak ties are used when a theory either partially accepts (--->) or totally rejects (--/->) the starting assumptions of another one as the basis for new advancements. In the Organizational Sociology Theories are included the bounded rationality of Simon (1947) and the organizational advancements by Barnard (1938). Theories are chronologically ordered according to their contribution to bounded rationality.

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Along the proposed map, *bounded rationality* concept – identified in the *Organizational Sociology Theories* – has massively influenced all the further concepts and approaches; as a historical consequence, all the subsequent lenses have accepted the assumptions of bounded rationality.

The current problem for researchers is now to reconnect the theories that during the time were concerned with individual bounded rationality or collective one, through the investigation of how individual decision making *scales to the collective decision making*. In this regard, sociobiological theories that already demonstrated their power in showing how individuals act in their social environment outside the management domain (e.g. Shao and Lee, 2014), are the most promising to reconnect the two spheres; the reference is to the theories descending from sociobiology, and that have at their base evolutionary assumptions (e.g. evolutionary psychology, dynamic game theory) as well as new forms of behavioural decision theory (i.e. behavioural strategy). Some contributions in this direction have already arrived during recent years (e.g. Breslin, 2016a; Abatecola, 2014b), but the path still seems to be quite underdeveloped.

Fourth, and connected with the *Third*, even if neuroscience is improving the biological understanding of the brain, some flaws affect its assumptions. Indeed, the discovered *neuroplasticity of the brain* (Pascual-Leone *et al.*, 2011), thus the *adaptation* of the brain to environmental changes across the lifespan, considerarly prevent the use of this lens without the contemporary application of sociobiological lenses. From that, it is not possible to select leaders based on their neuroimaging, their success may well be affected by other factors and social variables deriving from their interaction with others (Gazzaniga, 1978). Finally, neuroscience has another flaw in not explaining either collective behaviour or the passage from individual behaviour to collective behaviour (Powell, 2011); that is

detrimental for the application in the management area in which decisions are taken in social environments. In this case, the cross-fertilizations that happened seems the results of following the 'fashion of the month' rather than the adoption of a useful perspective for new management challenges.

Finally, reaching a *general theory of rationality* that can determine all the unique implications of individual or collective behaviours, after having defined all the initial conditions, seems to be at least utopian because of the still unknown number of variables that situation by situation can govern our reasoning. We can state with certainty that one of the most important challenges for future research on bounded rationality is the identical one pointed out by Simon in 1983: a comprehensive theory of human rationality, that can compete with the classical one, still needs to be produced.

CHAPTER 2: Reducing Biases of Decision-Making Processes in Complex Organizations

Outline

Over the last 30 years, scholars interested in decision-making have been raising their interest in the development of quality control tools to mitigate the effects of cognitive distortions. However, they have often neglected the use of psychological instruments for understanding the role of decision makers' personality in the quality of the decision-making processes. This is an intrinsic case study about an Italian complex organization (i.e. Consorzio ELIS) which tries to shed light on the identified research question. Three decision makers responsible for the decision processes of three new business initiatives were interviewed using a recent quality control tool (i.e. checklist) and their personality types were tracked by performing MBTI® tests. The thematic analysis, approached by using NVivo software, and after six months of direct observations inside the organization, allowed an understanding of the decision processes and their distortions. The results of this study show how initiatives with frequent quality control mechanisms and different stakeholders are more able to pass the decision phase than initiatives with no controls, few participants and little difference between personalities.

Keywords: Decision-making; Heuristics; Personality.

2.1 Introduction

How could biases in decision-making processes in complex organizations be reduced? This question is addressed, from a scientific point of view, in the specific literature on decision-making known as the "behavioural theory of the firm", a pioneering idea which stimulated the interest of management scholars about the way decisions are made both within the company and on its behalf (e.g. Thompson, 1967; Grandori, 1984; Senge, 1990; Cafferata, 2014). In this regard, many scholars have, over time, placed the focus on the correlation between decision-making and the cognitive characteristics of the decision makers (e.g. Kahneman and Tversky, 1974); others, however, have focused their attention on the study of the role of personality types in decision-making processes (e.g. Henderson and Nutt, 1980; Hough and Ogilvie, 2005; Jennings and Disney, 2006), but without taking into account cognitive distortions and the quality of decision-making processes.

From this point of view, this work helps to build a bridge between management studies on cognitive distortions, quality of decision-making processes and psychological studies on personality types as influencers of the former. In this regard, the role of personality has been strongly considered as the link between cognitive processes and strategic decisions (Haley and Stumpf, 1989). In particular, during the past 40 years the Jungian psychological types, and cognitive styles, have been widely used as the theoretical lens for investigating managers' personality through the application of the MBTI® test (Armstrong *et al.*, 2012). Results of the studies linking the personality of managers and their choice have shown confirmative results of this connection in strategic situations (Stumpf and Dunbar, 1991),

highlighting the relationship between executives' personality type and recurrent strategic choice patterns when making a decision (Nutt, 1993; Gallén, 1997; Hough and Ogilvie, 2005; Cristofaro, 2016).

On the other hand, the complex debate regarding the role of cognitive distortions, has been pivotal in recent decision making literature (e.g. Langabeer and DelliFraine, 2011, Workman, 2012; Pleggenkuhle-Miles *et al.*, 2013; Abatecola, 2014b); as a consequence, more and more climactic have been both the tools and techniques elaborated to overcome those distortions (Waddell *et al.*, 2013) and the study of the cognitive characteristics of decision makers (through the MBTI® test), used for finding practical insights for strategic decisions (Jennings and Disney, 2006).

In this regard, the research question introduced above is addressed through the use of two different qualitative tools. The first is a quality control tool recently developed by the psychologist Daniel Kahneman and his colleagues (2011). This tool helps to identify and reduce cognitive distortions in decision-making processes through verification, *ex post*, of their quality. Second, in order to capture more effectively the role that decision makers' personality characteristics may have in these processes, we also use the Myers Briggs Type Indicator (hereafter MBTI®; Myers and Myers, 1980) personality test. Results of the interviews are analyzed through the thematic analysis approach (Braun and Clarke, 2006) which highlights the main difficulties caused by the identified distortions. At the centre of the work is the intrinsic case study of Consorzio ELIS, an Italian organization that provides higher education programmes. Stemming from the fact that decision makers very often are victims of cognitive biases (Langabeer and DelliFraine, 2011, Pleggenkuhle-Miles *et al.*, 2013; Abatecola, 2014b; Caputo, 2014a, 2014b), especially regarding long-term strategic

initiatives (Workman, 2012), this intrinsic case study analyzes the quality of the decision-making process related to the introduction of three new initiatives.

The added value of this work resides in the practical consideration of how reducing biases of decision-making processes in complex organizations can benefit from the simultaneous use of the checklist and MBTI®. In this regard, it follows the recent recommendations on how to conduct research in the decision making area by Nutt (2011); indeed, he strongly stressed the use of qualitative methods for understanding the decision making process (i.e. "the key factor") and, the adoption of action theory research that allows the combination of description and prescription, in order to know the tools and techniques needed to deal with conditions that can emerge during the decision making.

This article is specifically aimed at scholars and professionals interested in learning more about the way that psychological and behavioural aspects may influence decision-making processes, as well as the methods to investigate this phenomenon. Moreover, it is strongly focused on the application of the research method used here as one that can be used along with other problem structuring approaches.

The work is developed as follows: first, the theoretical framework underlying this contribution is reported, paying special attention to the literature about cognitive distortions, those tools elaborated for reducing biases, and the role of personality factors in managerial decision making. Then the case study at the centre of this work is introduced, placing particular emphasis on the decision-making processes under investigation. The article continues with a discussion of the results and, finally indicates the managerial implications and some possible ideas for future research on this subject.

2.2 Theoretical framework

As the recent literature on the behavioural theory of the firm recognizes (Argote and Greve, 2007; Gavetti *et al.*, 2012), the influence of cognitive and procedural distortions on decision-making processes is rooted in three major works: *Administrative Behavior* (Simon, 1947), *Organizations* (March and Simon, 1958) and *A Behavioral Theory of the Firm* (Cyert and March, 1963).

Herbert Simon, studying the actual process of decision-making in organizations, elaborated on the concept of bounded rationality and the idea of the so-called "administrative man" (1947). The administrative man is the one who seeks to mitigate the cognitive limitations (i.e. bounded rationality) inside organizations, because they are systems of cooperative behaviour (Barnard, 1938) in which people tend towards decisions that, although not maximizing, can be considered at least satisfactory (Simon, 1957).

Simon is also universally considered to be one of the precursors to problem solving studies to which subsequent research has contributed works of a psychological nature, because of the fact that "judgement refers to the cognitive aspects of the decision-making process" (Bazerman and Moore, 2009, p. 1). More specifically, stemming from the fact that the individual's representation of the objects, goals and actions in the problem situation (i.e. the problem space; Newell and Simon, 1972), have at their base a cognitive representation of the overall problem (Greeno and Simon, 1984), the distortions that may occur in problem solving are certainly linked with the cognitive functioning of the involved decision makers.

In this regard, Kahneman and Tversky (1974; 2001) and Klein (1999) mark a milestone on this pathway. In particular, Daniel Kahneman formalizes the existence of a set of

heuristics in humans, namely, cognitive shortcuts that affect decision-making processes. Added to such heuristics are a series of decision traps (Hammond *et al.*, 1998), indicating the cognitive errors that influence decisions. Heuristics and traps can both alter, *in peius,* the decision-making process.

Hence the interest, which has grown over time, is for an understanding of cognitive distortions in decision-making processes (e.g. Workman, 2012; Pleggenkuhle-Miles *et al.*, 2013) and for the elaboration of the tools needed to mitigate those effects (e.g. Russo and Schoemaker, 1990; Forgas, 2001; Waddell, *et al.,* 2013; Abatecola, 2014b). Today, these tools are called quality control tools; they strongly derive from the problem structuring methods and may operate both at the decision-making and implementation levels of decisions (Rosenhead, 1996; Adizes, 1999).

2.2.1 Reducing biases of decision-making processes

Improving the quality of decision-making means significantly increasing the effectiveness of the decision-making processes through correcting or anticipating the deficiencies which decision makers may incur (Adizes, 2004; Bazerman and Moore, 2009). On this premise, the first point in reducing biases is recognizing them, because only in this way are decision makers able to improve the quality of their own decisions (Bazerman and Moore, 2009).

In this vein, Simon's studies on the structuring of the problem situation were later expanded by the study of problem structuring methods (e.g. Rosenhead, 1996). Indeed, for authors interested in this field, problem structuring methods are needed for problem situations, embracing multiple stakeholders, perspectives, interests and uncertainties (Rosenhead and Mingers, 2001). In particular, they come before tackling the problems and

enable decision makers to solve them through the inclusion of different approaches in order to allow difficulties to be recognized and solved (Mingers and Rosenhead, 2004). Since the 60s, several tools in this area have been developed, with some of them focused on the cognition of decision makers, such as the cognitive mapping by Eden (2004) (also called SODA, Strategic Options Development and Analysis), who proposed structuring issues through merging the cognitive maps elaborated by each decision maker involved in the problem situation. In particular, through this approach decision makers are asked to hierarchically develop a complex issue by a means/ends graph, paying attention to the chains formed by them in order to find the virtuous and vicious circles within the problem being faced.

Later, other scholars tried to follow this path and started elaborating new problem structuring methods that have the purpose of taking into account the decision maker's cognition in order to better interpret problems and reduce distortions.

Having said that, a tool that is mainly focused on identifying those deficiencies is the so-called checklist of Kahneman *et al.* (2011). According to this tool, a third person is needed in order to recognize and moderate the effects of the distortions in decision-making processes through questioning decision makers with a set of 12 questions, each one linked to a precise cognitive or procedural distortion. The connections between questions and specific biases simplify the role of the third party who then identifies the distortions and attempts to minimize their impact. In particular, the above-mentioned checklist looks for the heuristics and cognitive biases that have received great attention in the management and psychological literature over time. Indeed, it is comprehensive of the seminal heuristics recognized by Kahneman and Tversky (1973; 1974) and the cognitive distortions identified by management scholars as Russo and Schoemaker (1990) and Hammond *et al.*

(1998). The contributions on heuristics and distortions were mainly based on psychological experiments in which participants were asked to respond to certain stimuli in order to verify the occurrence of the distortion; in this regard, the seminal work by Kahneman and Tversky (1973) on the study of the occurrence of the availability heuristic, through the testing of the individual assessment of the probability of events by the ease with which significant objects come to mind, opened the door to later works on cognitive distortions. Indeed, Kahneman and Tversky (1974) successfully proved the existence of the representativeness heuristic, by which probabilities are evaluated by the degree to which an object is representative of a category that people already have in their mind, and anchoring bias, by which people shape their estimations on initial values that they do not later adjust.

In the 80s, Russo and Schoemaker (1990) and Hammond *et al.* (1998) focused their attention on cognitive traps in managerial decision making, that always have a negative effect on choices (while heuristics can also be beneficial for the decision maker). In particular, they studied the major biases that affect the decisions of executives, such as the sunk cost trap – occurring when people base present decisions on past decisions that do not have any effect at the present time – or the confirmation evidence trap – which means looking for information that can confirm decision makers' initial choice. Those biases have recently been extensively studied in the strategic decision literature; for example Chen *et al.* (2015) proved strongly that CEOs with great overconfidence are less prone to improving their management forecast on which they received no confirmatory feedback.

All those heuristics and cognitive traps were later deepened by different scholars, and well organized and discussed in the worldwide bestseller by Kahneman (2011), which refers to all the distortions that are at the base of the Kahneman *et al.* (2011) checklist.
In the following table are detailed all the distortions that are investigated by the checklist.

Table 2.1 The Checklist of Kahneman et al. (2011)*

Distortions (heuristic or decision trap)	Description	Effect
Self-interested bias	The decision maker has a preference for a particular outcome through which he/she can gain more than usual in financial or organizational terms.	The decision maker recommends a preferred alternative not considering the organizational interests.
Affect heuristic	The decision maker tends to minimize the risks and costs and/or exaggerate the benefits of something he/she likes.	The decision maker has an emotional preference for an alternative and he/she does not take others into account.
Groupthink	The inclination of groups to converge on a decision because it reduces the conflict and can gain large support.	The decision group chooses the alternative that has the most common agreement, without considering more conflictual alternatives that can work better.
Saliency bias	The decision maker tends to approve a proposal that is similar to a successful one in the past.	The decision maker chooses a solution by analogy without weighing the pros and cons.
Confirmation bias	The decision maker tends to elaborate only one alternative for which he/she tries to find confirming data.	The decision maker does not pay attention to not confirming data and remains stuck with the alternative.
Availability bias	The decision maker makes the decision with the available data without making an effort to find other useful information that is uncovered.	The decision maker makes a decision without having a correct information base.
Anchoring bias	The decision maker makes the decision taking into consideration some initial reference data without adjusting its estimates according to the new information gained.	The decision maker makes a decision without having an updated information base.
Halo effect	The decision maker sees a story as more emotionally consistent than it really is.	The decision maker chooses an alternative because of its connections with some emotions that it recalls and not because of its strengths.
Sunk Cost	The decision maker makes a decision on new investments disregarding past expenditures that did not influence future results.	The decision maker chooses a less profitable alternative because considering already absorbed investments.
Overconfidence	The decision maker with positive track records is prone to excessive optimism in forecasts.	The decision maker overestimates his forecasting ability and makes wrong predictions.
Disaster neglect	The decision maker builds	The decision maker does not

	negative scenarios that are not bad enough.	correctly forecast a bad future and he/she will not be prepared for its consequences.
Loss aversion	The decision maker who faces risky decisions prefers to avoid losses than desire gains.	The decision maker tends to choose more prudent alternatives.

*All the definitions are taken from Kahneman et al., 2011.

In particular, Kahneman *et al.*'s (2011) set of questions originates from the ideas of Kahneman about the functioning of the human cognitive process. According to Kahneman's (2003) studies, that enhance the contribution by Stanovich and West (2000), human cognitive functioning occurs in two different "Systems" of the brain. System 1 is where the intuitive and unconscious thinking lays, rather than in System 2, where the thought is far more reflective and where individuals recognize the mistakes that occurred during reasoning.

The operations of System 1 are fast and automatic, usually also emotionally driven; thus, they are difficult to control or modify. The cognitive operations of System 2 are "more likely to be consciously monitored and deliberately controlled" (Kahneman, 2003, p. 698). Kahneman (2003) also underlines how the output of System 1 is unmonitored by System 2. In fact, although one of the duties of System 2 is to monitor the quality of both mental operations and overt behaviour, the self-monitoring by System 2 allows many intuitive (almost all of the time flawed) judgments to be explicated (Stanovich and West, 2000). It is important to notice how Kahneman (2003) identified System 1 as responsible for the Perception mechanism of our mind, while System 2 is devoted to the Judgment activity; moreover, he stated that that "intuition and reasoning are alternative ways to solve problems" (p. 1469) and because of that it is quite impossible to have them working jointly.

Due to the existence of these two Systems and their assumptions, the presence of a third party is particularly important in controlling the quality of decisions because this allows individuals to identify the distortions occurring in their own System 1; here, the third party's System 2 is able to mitigate the identified biases in the System 1 of other individuals. This intuition, about the intervention of a third external party, is strongly suggested for decisions that are biased by the cognitive perception of the decision maker (Caputo, 2016).

Correlatively, a second important tool for reducing biases in decision-making, one that is frequently used in managerial practice, is the so-called premortem technique (Klein, 2007). This tool is used at the beginning of the discussion of a project, rather than at its end; in fact, unlike a typical meeting, members of the project team are asked why the project may fail, assuming that the patient (i.e. the proposed project) will die (or fail) and they need to presume the possible factors of failure. This technique is very similar to the use of another quality control tool, the devil's advocacy, which aims to have individuals who take a contrary or alternative position in a team discussion explore solutions further. Although decision makers reach a better quality decision through the use of the devil's advocacy than is reached in a free discussion, recent studies (e.g. Waddell *et al.*, 2013) demonstrated how it raises the level of affective conflict and therefore implementation of the solution may be hindered.

Nevertheless, in this case study the checklist was adopted, rather than the premortem technique or the devil's advocacy, as the main tool of analysis. The checklist has greater effectiveness, when deciphering distortions that have occurred, because of the direct link between questions and biases and, for this reason, it is more appropriate for the

downstream implementation of decision-making processes; in essence, it is not limited to a more simplistic view on the feasibility or solutions of the projects.

Last but not least, it is worth mentioning another important theoretical contribution to the quality control of decision-making processes – the four management styles of Adizes. According to Adizes (2004), four roles (i.e. Producer, Administrator, Entrepreneur, Integrator) with different duties and goals, need to be performed during decision-making processes in organizations by four different people, who focus their attention on different sides of the problem: what, how, when and who. According to Adizes, if all the four management styles are together committed to solving a problem or taking a decision, they can considerably avoid the risk of incurring distortions.

Although this last technique may seem more committed to the characteristics of individuals within organizations, it has neither the aim to identify distortions nor consideration of the personalities of decision makers. Even if people with different management styles look at the same problem from different points of view, they do not avoid the risk of incurring the same biases, because of the probability of having the same psychological functioning due to the homogeneity in personality types.

For these reasons, a more comprehensive approach that considers both the distortions and personalities of decision makers could be more effective in detecting and reducing biases; that is what is going to be presented in the following pages.

2.2.2 The personality factor in managerial decision studies

Individual characteristics have, from time to time, been considered as "basic to some of the salient characteristics of human behaviour in organizations." (March and Simon, 1958, p.

24). Further scholars deepened this relationship. The main work in this area can be considered the Upper Echelons Theory of Hambrick and Mason (1984), in which the authors recognized the cognitive base of the decision maker as an influence in their final choice by working as a filter of the problem situation. For this reason, scholars over time have tried to understand human behaviour in organizations, as being driven by its cognitive base, through the application of several psychological measures (e.g. Abatecola *et al.*, 2013).

According to Nutt (1990; 1993) the unit of analysis of cognitive functioning is *decision style*, which is inclusive of the cognitive responsible functions for *gathering* and *evaluating* information, while the *attitude of people to the outer world* and their *style of dealing with it* are considered as *cognitive styles* that are complementary to the former (Gardner and Martinko, 1996; Hough and Ogilvie, 2005). A mix of these forms the personality type.

In this vein, management scholars that are focused on the study of personality factors in managerial decision making have taken strong account of the cognitive and decision styles of managers by using the MBTI® test during the last 40 years of research (Haley and Stumpf, 1989; Armstrong *et al.*, 2012), despite there being some critics (e.g. Schweiger, 1985). According to the extensive literature review by Gardner and Martinko (1996), this psychological questionnaire, apart from being the most administered test in research and practice in the study of stable decision and cognitive styles, has a test-retest consistency that often surpasses .80 in all the four dichotomies (reliability) as well as general criterion-related validity.

Each individual, according to the Jungian theory applied by the MBTI® test, has a personality type that emerges from his/her preference for each of four dichotomies, i.e. independent of the preferences for the other dichotomies. Those four dichotomies are: i)

Extraversion-Introversion (E, I), which refers to the attitude to the outer world with the first preference concerned with people and objects and the second with concepts and ideas, ii) Sensing-iNtuition (S, N), which refers to the gathering information process in which the first preference concerns an approach based on data while the second concerns a style focused on the connections between data, iii) Thinking-Feeling (T, F), which refers to the evaluating information process in which the first preference concerns an approach based on logical principles while the second concerns a style focused on values, and iv) Judging-Perceiving (J, P), which refers to the organization of people in the outside world in which the first preference implies order and planning while the second concerns a style focused on flexibility and spontaneity.

It is critical to underline that the Myers and McCaulley (1985) theoretical model based on the Jungian studies, has strong interconnections with Kahneman's thoughts on Systems 1 and 2; indeed, their Judging-Perceiving function, underlining the individual sight on the outer world and that it is also at the base of the information gathering and evaluation processes, is very similar to the conceptualization of Kahneman (2003) about the Perception and Judgment functions at the base, respectively, of Systems 1 and 2.

The different dichotomies previously exposed can form 16 possibile personality type combinations and their notation emerges from the mix of the four letters of the personality orientations (e.g. ESTP). Moreover, the mix between the preferences within the gathering and evaluation information processes shape the so-called decision styles (Myers and McCaulley, 1985). Those styles are given below:

Sensor-Thinkers (STs): Their concern is on facts about things rather than facts about people. They gather all the information through the five senses, while they evaluate them

through logic and impersonal analysis.

Sensor-Feelers (SFs): Their concern is on facts about people rather than facts about things. They gather all the information through the five senses, while they evaluate them through analysis influenced by personal warmth.

iNtuitive-Thinkers (NTs): Their concern is on possibilities rather than facts. They gather all the information through perception of new ideas in their unconscious, while they evaluate them through logic and impersonal analysis.

iNtuitive-Feelers (NTs): Their concern is on possibilities rather than facts. They gather all the information through perception of new ideas in their unconscious, while they evaluate them through analysis of the future benefits of ideas.

Scholars involved in the study of the personality factor in managerial decision making through the MBTI® test found strong results in identifying the NT dichotomy as the one that permits reaching more satisfactory results (Gardner and Martinko, 1996; Hough and Ogilvie, 2005), while Lang (1997) found that NTJ types are the most suitable for strategic planning. In sum, personality characteristics, as measured by the MBTI® test, matter.

However, even if attention is more and more paid to the role of decision styles, recent works have raised the importance of focusing attention on the other two cognitive style as being determinants in the variance of the choice outcome (Cristofaro, 2016). From that, the interest of scholars in looking at all the Jungian cognitive styles of the decision maker (i.e. the whole personality) has been raised. After having recognized the critical value of

personality in strategic decision making, and stemming from the fact that biases and heuristics have been widely discovered to explain a significant amount of the variation in strategic decision-making (Haley and Stumpf, 1989; Busenitz and Barney, 1997), later scholars tried to identify the connection between them and cognitive distortions. For example, STs have been discovered to be largely affected by the anchoring trap (Haley and Stumpf, 1989), while Stumpf and Dunbar (1991) identified, through a laboratory study involving 407 participants, specific patterns between personality types and biases, thus: STs tend towards selective perception, NTs tend towards overconfidence, SFs tend towards social desirability and NFs tend towards reasoning by analogy. Also Trippas *et al.* (2015), using a different inventory, arrived at the same conclusions, i.e. that analytic cognitive styles suffer from the most common biases.

What is important to notice is that decision teams that have been investigated through action research methods, in terms of personality composition and identified biases, have encountered difficulties in communication with external parties when composed of members with the same personalities, as discovered by Kaiser and Bostrom (1982) who raised the importance of more heterogeneous teams. In sum, even if from some studies it is possible to state that NTs can be considered as the most effective (and desired) styles (Gardner and Martinko, 1996; Hough and Ogilvie, 2005; Cristofaro, 2016), on the other hand other styles, such as STs and NFs, are welcomed in order to have more effective teams.

Unfortunately, none of those studies used a systematic method for identifying distortions, especially the ones pointed out by the cognitive psychologists previously discussed, nor were they aimed at analyzing an on-site managerial decision process.

2.3 Method

The applied research methodology is the intrinsic case study (Stake, 2005). This kind of case study is particularly used to obtain a nuanced understanding of a causal mechanism, rather than to make wide generalizations (Mills *et al.*, 2010), and fits the scope of understanding "new constructs with few formal measures in an open-ended inquiry" (Edmondson and McManus, 2007, p. 1160), such as how to reduce biases of decision-making processes in complex organizations.

The selection of this case study was driven by the aim to find a representative case (Seawright and Gerring, 2008) of a complex bureaucratic organization with an "active" board that, in such cases, controls the decision processes of new strategic initiatives taken at the managerial or operational level; Consorzio ELIS, as explained later, has those characteristics, thus is suitable for this study.

It is acknowledged that a single case study is likely to be biased because *a)* it represents a small sample and *b)* all the real playing variables are not always considered; however, if a single illustrative case, as in this article, does demonstrate how a construct really works and how the identified variables actually operate (in this case, cognitive distortions and personality types), showing the relationship between them, then this "is a quite powerful use of a case" (Siggelkow, 2007, p. 22).

To examine this complex case, composed of several interactions among participants, multiple methods were employed (Yin, 2004; 2014), such as interviews, questionnaires and direct observations, in order to strengthen ideas by triangulating sources of evidence; these methods are also in line with the research suggestions for methodological fit of Edmondson and McManus (2007). This is also perfectly in line with the new suggested

directions of research in the decision making area by Nutt (2011), who underlined the need for more qualitative methods for understanding decision making processes and the use of action theory research. White (1991), considered to be one of the intellectual founders of this approach, declared that "in participatory action research, some of the people in the organization or community under study participate actively with the professional researcher throughout the research process" (p. 20).

This method is considered useful in order to discover tools and techniques to adopt in decision making processes, thus using a description-prescription mixed lens (Nutt, 2011). The implementation of this research approach has followed the recommendations by White (1991). In particular, in order to have a better understanding of the decision processes, the structure of the organization and decision makers' behaviours, a direct observation over about six months (from September 2012 to March 2013) was conducted in the organization under investigation; this period of observation and mixing with workers was useful to identify the problems existing in the organization.

Subsequently, three semi-structured interviews with the decision makers involved in the three decision-making processes under investigation, were conducted, and they included, for the most part, the questions mentioned in the checklist of Kahneman *et al.* (2011). According to academic practice (e.g. Sutton and Callahan, 1987; Burgelman, 1988), the checklist was modified, adding a few questions in order to shed light on some important aspects of the processes. In particular, because the organization under analysis has several collaborations with other business entities at both governance and management levels, which significantly affects the shape of the initiatives, some additional questions have been included in order to recognize the presence of the following biases: i) lack of control, ii) lack of systemicity, and iii) external influence.

The first additional bias refers to the lack of effort on the part of the principal to "control" the behaviour of the agent (Jensen and Meckling, 1976), the second recognizes the overconfidence in own ability to retain all the pieces of information collected (also called "shooting from the hip", see Russo and Schoemaker, 1990), while the third identifies the proximate stakeholder (over)influence on companies and its decisions (Lee, 2011). The effects of those biases are respectively: i) not having a general understanding of the workflow from whoever is in charge of it, or, as in this case, to excessively control the activity causing its stall, ii) making a decision without taking into consideration some important information collected that is not recalled at the time of the decision (usually it is caused by the overconfidence of the decision maker), and iii) excessively shaping the firm's activity according to institutional and stakeholder pressures.

It is worth mentioning that only three decision makers are responsible for the newly investigated initiatives. Although it would have been useful to have formal interviews with other employees, it would not have added a greater value to this study because "those three people are the true decision makers of the Management Department that are in charge (depending on their role) for ideating, analyzing, evaluating and communicating new initiatives", as reported by the CEO and other employees in one of several informal conversations.

Furthermore, the MBTI® test was administered (Myers and Myers, 1980), which has been used more and more over time in order to analyze the role played by personality types in decision-making processes in organizations (e.g. Henderson and Nutt, 1980; Hough and Ogilvie, 2005; Jennings and Disney, 2006).

The application of this mixed approach, the checklist and the MBTI® test, is perfectly in line with the participatory action research, indeed "in complex organizations, few problems

arise in such form that they can be solved by the use of any single discipline" (White, 1991; p. 40).

Finally, the three formal semi-structured interviews lasted between 120 and 140 min and were conducted in private, audio recorded and at a later stage transcribed into data; the transcripts were then investigated through the thematic analysis approach (Braun and Clarke, 2006), following the suggestion for methodological fit (Edmondson and McManus, 2007).

The thematic analysis was performed using NVivo software and data were coded using a theoretical approach (i.e. deductive; Boyatzis, 1998) to focus attention on the particular features when coding the answers, thus the distortions. For this reason, biases' definitions were used to code the answers to the checklist questions, then the themes that emerged from those codes were selected for identifying the main difficulties of the decision processes under investigation.

2.4 Case study

The case study at the centre of this article is regarding a so-called *complex bureaucratic organization* (Weber, 1947) which, thanks to its hierarchy and rules, controls very effectively the productivity of a large number of individuals, because it eliminates, or at least restricts, the individual whim in decisions. From the six-month direct observation of the structure, procedures and operations of Consorzio ELIS, it was found that this firm has all the identified features later described.

Consorzio ELIS was founded in 1992 by Ericsson and other companies with the mission to realize and deliver higher education programmes. Today, it has more than 200

employees and its revenues have continuously grown from its foundation, reaching €7,885,000 in 2013. It provides hundreds of education programmes for thousands of students each year, reaching 90% employability, on average, for its students at the end of such programmes.

This *consortium* was established in order to formalize the relationships among a group of 76 highly qualified companies (including Accenture, BT Group, Cisco, DHL, ENI, Enel, E&Y, Nokia, Oracle, Sky, Vodafone) that are both the privileged partners (i.e. stakeholders) of the results of these higher education initiatives and shareholders in the company.

The organizational decision process is structured as follows: in order to become effective, organizational decisions must pass the scrutiny of the board, which is composed of executives of the associated companies; those decisions will also relate to the new higher education programmes to be implemented, which, in this case, form the core of this analysis.

Within Consorzio ELIS, the decision-making processes of new business initiatives may follow, in order of their implementation, two different streams: Top-Down and Bottom-Up; in both, the associated companies on the board, may control the decision processes of new programmes ideated at the managerial or operational level, and therefore, substantially could be seen as a quality control checker of decisions.

In the Top-Down processes the ideas are generated from the board of Consorzio ELIS. More specifically, the company that is in charge of the presidency, together with the other associated companies, sets the guidelines for the new programmes and controls the output of the sub-decisions at the managerial and operational level.

In the Bottom-Up processes, however, the ideas are generated from the bottom part of the hierarchical pyramid (e.g. Senior Consultants), or from middle management; these processes may be controlled by the shareholders in each moment of their flow.

Consorzio ELIS acts primarily through three centres of activity: the Management, HR and ICT Departments, where the education programmes take place; the three new programmes, that are the subject of this work, have the following names: Business Model Lab (BML), Pursuing Shared Value (PSV) and Business School (BS). Below is a brief description of the purpose of each.

BML is a new higher education programme focused on the modelling of business ideas, aimed at two different types of stakeholder: a) the associated companies and b) the university students selected to participate in the higher education programme. The new higher education programme was tested between September 2012 and March 2013.

PSV is a programme aimed at business executives on issues of innovation management. It arises from the need for managers to find new and better ways to develop products and to serve their target markets. Created in 2011, PSV had great success in its first edition, which encouraged its revival in the years 2012, 2013 and 2014.

BS is a programme aimed at transferring knowledge and tools for the realization of business ideas, the management of the business and/or of the start-up. This higher education programme, contrary to the other two, has been conceived and its most important parts designed. However, to date, it has not been launched.

Figure 2.1 Decision process flow of new initiatives in Consorzio Elis

BML/BS	PSV
Board of directors	Board of directors
↑	↓
Senior Consultants Middle Management	Senior Consultants Middle Management
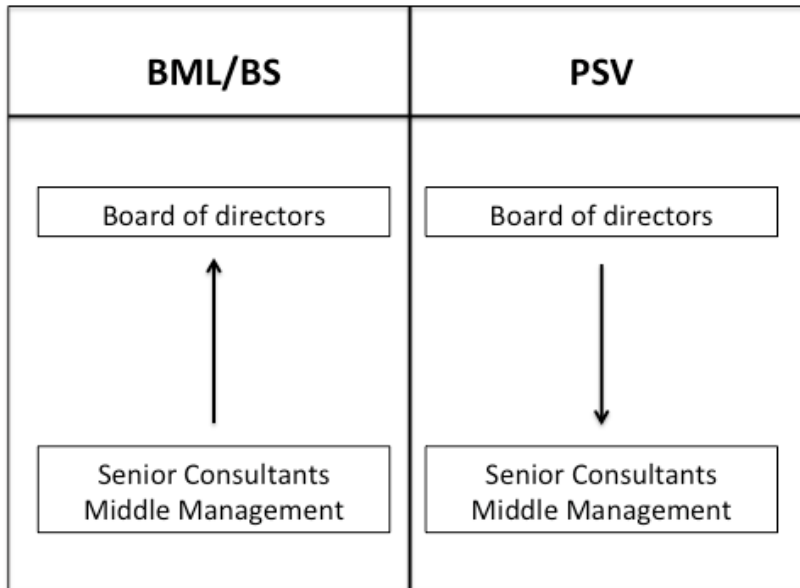
The decision makers who participated in the decision-making processes of all three initiatives under consideration are: a) the Head of the Management Department, who joined Consorzio ELIS through participation in one of its higher education programmes; b) the Head of Innovation and Entrepreneurship, who is currently focused on the development of new higher education programmes; and c) the Senior Consultant who also joined the company through a higher education programme.

2.5 Findings

This section reports the results obtained from the use of the two tools already described in the methodological section. In particular, in the two datasets reported (Tables 2.2 and 2.3) it is possible to find some of the characteristics of the investigated decision-making processes, the most relevant distortions (i.e. the codes of the thematic analysis), and the three main themes that emerged as common roots of the effect of the detected distortions,

thus: a) internal communication, b) management of corporate cannibalism, and c) lengthy decision-making process.

Table 2.2 Results of the checklist application (2011)*

Questions	Bias/Code	Content Example	Respondent(s)
**1-Was the decision process adequately controlled?	Lack of control	"The decision process went very smoothly because of the lack of supervisioning by the board due to the scarce resources to be invested"	Head of Innovation and Entrepreneurship; Head of the Department
		"Every two weeks some meetings were programmed for the evaluation of the idea"***	Senior Consultant
2-Have the people making the recommendation fallen in love with it?	Affect heuristic	"The wariness of those responsible for a similar programme wasn't taken into account because of the wide benefits being more than the costs of the cons for the new programme (BML)"	Senior Consultant
**3-Was the team overconfident in its ability to retain and process information?	Lack of systemicity	"In the initial phase of this project (i.e. BML) I collected all the data by myself because I knew all the different sources to take into consideration"	Head of Innovation and Entrepreneurship
**4-Have you given a positive opinion on the proposal on the basis of external factors?	External influence	"Some start-up incubators in contact with the Head of Innovation and Entrepreneurship influenced the structure of this new higher education programme (i.e. BML)"	Senior Consultant; Head of the Department
5-Can you see a halo effect?	Halo effect	"The new programme (i.e. BML) will have almost the same success as the older one because of the similarities between their marketing formula"	Senior Consultant

6-Could the diagnosis be overly influenced by an analogy to a memorable success?	Saliency Bias	"Due to the similarities between ideas and formula (between BML and the older one), we think that BML will have a great success"	Head of Innovation and Entrepreneurship
7-Is the base case overly optimistic?	Overconfidence	"I did not involve the other decision makers because of the fact that I have the expertise to judge the information gathered"	Head of Innovation and Entrepreneurship
		"For the new project (i.e. BS) the board always questioned about our figures, even if we were sure to reach a positive economic value!"	Senior Consultant; Head of Innovation and Entrepreneurship
		"The decision process for BS was not totally efficient because of too moments of alignment with the Board of the Consorzio"	Head of Innovation and Entrepreneurship

It is worth highlighting that the definitions of the codes used to identify the biases under analysis are those pointed out in the 'Description' column in Table 2.1 and in the methodology section of this contribution for the distortions that have been added to the initial checklist. * Only the checklist questions for which distortions occurred are reported. **Additional questions. *** This distortion is reported here as a contrast to the lack of control.

Table 2.3 Decision-making processes of the three new initiatives and biases.

Initiative	Decision process flow	Idea generation	Problem structuring in decision-making process	Biases/Codes	Main difficulties/Themes emerged
BML	*Bottom-Up* Individual-Collective	Individual	*Low*: few decision-making phases.	External Influences	Internal communication
				Lack of Control	
				Lack of Systemicity	
				Affect Heuristic	
				Saliency Bias	Management of corporate cannibalism
				Halo Effect	
PSV	*Top-Down* Collective-Individual	Collective	*High*: several decision-making phases.	Excessive control	Lengthy decision making process
BS	*Bottom-Up* Individual-Collective	Individual	*Lower Middle*: located in the operating unit but with many decision-making phases at board level.	Overconfidence (2)	Internal communication

Below the results summarized in the two tables are explained in more detail.

BML – The flow of the decision-making process of this initiative is individual-collective. The Head of Innovation and Entrepreneurship generated the idea for this higher education programme, but it was not brought to the attention of the company board because of the limited amount of resources available to be invested.

Looking at the biases, all three decision makers agreed to recognize that the individual background of the instigator, together with the external influences to his idea, influenced the structure of this initiative. The decision process was carried out without any external evaluator attending the group of decision makers (i.e. lack of control), leading the process to take place rapidly. Moreover, the Head of Innovation and Entrepreneurship did not

involve other decision makers until the final stage of the process because he considered himself able to evaluate the project without the need for other information (i.e. overconfidence). Among the identified biases, there is the so-called lack of systemicity that derives from the charge to collect data assigned only to the personal capacity of the decision maker (i.e. the Head of Innovation and Entrepreneurship).

The described biases are at the base of the main difficulty labelled "internal communication", that stems from the underestimation of cannibalization among programmes, driven by the fact that, for this new programme, "...the benefits would have been superior to the cost of the cons" (i.e. affect heuristic) as declared by the Senior Consultant.

The saliency bias occurred because the project was always compared with the same mature programme which has a wide success history behind it. The so-called halo effect played a pivotal role in the fear of cannibalism, because features of the above cited similar service were extended in the commercial proposal of the new one.

The last two distortions mentioned, which caused the difficulty in managing the cannibalism among the two services, are probably due to the participation of both the Head of the Department and the Senior Consultant in the similar education programme.

As a consequence, the initiative BML after a first trial of six months was no longer implemented because of the high probability of cannibalization; this would confirm the negative effect of the distortions detected.

PSV – The flow of decision-making of this new higher education programme is Top-Down. The idea came from an associated company that proposed the theme on which to set the new higher education programme. A survey of the Heads of the associated

companies has subsequently clarified the object of the programme, then the Head of Innovation and Entrepreneurship was charged with the detailing phase; this allowed the two different decision centres, managerial and operational, to find the same space (in terms of time) with no apparent imbalances in decisions. This choice was made in order to reduce the time needed to market the new higher education programme.

In this regard, as indicated by the Senior Consultant, "the collective phase was very complex and long; in fact, every two weeks some meetings were programmed for the evaluation of the idea" (i.e. excessive control). The new higher education programme was evaluated by both internal decision makers, such as the board of the company and the units involved, and external parties, such as faculty experts and potential participants.

The presence of various decision makers with multiple needs resulted in a lengthy decision-making process; this bias is understandable because of the company's legal identity (i.e. *consortium*) and the multi-stakeholder logic of its business model.

BS – The flow of the decision-making process of this new initiative is Bottom-Up. The Head of Innovation and Entrepreneurship generated the idea at the operational level, then a stage of idea evaluation with experts and external stakeholders took place and the decision maker came up with the idea of the Business School programme. After further refinement, the project was finally presented to the associated companies in its final form.

The decision-making process was focused, above all, on assessing the possibilities of the sustainability of the initiative in financial terms and of the possible target market to which to propose this project. The Head of Innovation and Entrepreneurship considered the process as "not totally efficient because of too moments of alignment with the board" (here, it is defined as overconfidence).

The disadvantages of the decision-making process are, without doubt, the alignment that occurred between the various business needs at various organizational levels. This alignment was probably caused by overconfidence based on their own opinions and assumptions, which affected the internal communication with the evaluators.

The initiative was not implemented because of the different needs among the board and decision makers; the internal communication of the programme's objectives hindered its implementation.

2.5.1 The relationship between cognitive distortions and decision makers' personality

For all three decision makers, personality types were detected through the MBTI® test and are analyzed as follows.

Looking at the cognitive dichotomies considered in the MBTI® test, it is possible to identify the affinity and occurring distortions among personalities. Starting from a more general analysis, it is possible to note that the personality types of the decision makers converge on the following characteristics: Extroversion (E), Sensing (S) and judgment based on Thinking (T), but diverge on the basic orientation in Judgment (J) or Perception (P).

The MBTI® test coded the Head of Innovation and Entrepreneurship with the personality type ESTP. According to Myers (1980), this type, also called the Doer (Jung, 1921), lives constantly in the world of action; he/she first looks at the facts of a situation, decides in a quick way what he/she should do, and performs the action; then, he/she performs the next task.

Turning now to the Senior Consultant and Head of the Management Department, they are identified with the personality type ESTJ, also called the Guardian (Jung, 1921). Those types live, principally, in a world of facts and concrete needs, constantly scanning their environment to make sure that everything is running smoothly and systematically. This type of personality, contrary to ESTP, respects laws or rules and has a clear set of them on which they are completely reliant (Myers and Myers, 1980).

According to Myers (1980), types with ST as their decision style have the primary object of interest in facts, which are approached with impersonal analysis that is conducted in depth, while, codes which include personality types starting with ES are described as those containing more practical and realistic personality types. In sum, all the decision makers have a common decision style (Sensing-Thinking) and cognitive style (Extraversion), while they differ on the Judging-Perception cognitive style.

The personalities of the decision makers taken into account are all extroverts (E) and conditioned by a sensory perception (S); these characteristics could be some of the causes that led the decision makers to generate new higher education programmes (i.e. BML) through an evaluation of external ideas and suggestions. The idea generation for the BML and BS programmes could be considered as the result of the experiences of the Doer and the assimilation of external ideas perceived through his senses.

The distortions characterizing the BML programme are probably due to the similarity of decision makers' perceptions about the new programmes. The Head of the Management Department and the Senior Consultant, in addition to the fact that they were involved, as users, in the higher education programme that now is the victim of cannibalization, also have the same characteristics of cognitive judgment (J). This judgment function was probably distorted and could not apply its function of contrast to the judgment, through

perception, held by the Head of Innovation and Entrepreneurship. Perception (P) implies an open mindset and a willingness to welcome new facts, ideas and proposals. The Head of Innovation and Entrepreneurship's perception type does not make many decisions but waits for new information, usually from outside. This characteristic of the personality, along with that of extroversion (E), is in line with the decision approach of the Doer, on the BML and BS programmes. In these two decision processes, the generation of the idea started from him, but was subsequently refined with adjustments resulting from the insights and ideas gathered from the outside.

It is important to notice, from the subtle differences in cognitive styles of the three decision makers, the effect of *commonality* in those styles. Even if some subtle differences exist among the personalities of the decision makers, what is important to highlight is that they share most of the personality characteristics; this determines an equal interpretation and analysis of the reality and, as a consequence, the occurrence of distortions because of the lack of different personalities (thus, different cognitive features) that can recognized or reduce distortions. Indeed, if on the one hand some cognitive distortions could be considered as the cause of the cognitive orientation of the decision makers, on the other hand having the same cognitive styles (i.e. EST) either worked as a facilitator of the BML and BS decision making processes or as a detractor in terms of not being able to recognize the *cognitive* distortions that occurred. This point is reinforced by the fact that the only process in which the decision team was enlarged to a greater number of decision makers, i.e. the PSV programme, did not suffer from cognitive distortions, but only from a *procedural* distortion, i.e. excessive control.

2.6 Discussion, managerial implications and conclusion

What seems to emerge from a more systemic view of these results is that the excessive individualization of the initial steps of the project development (BS and BML), allowing for a certain grade of rapidity, led to a greater number of cognitive distortions than those that occurred in the more collective and controlled decision-making process (PSV). Having a very similar personality, in terms of decision and cognitive styles, among the decision making team members, did not allow recognition of the presence and impact of cognitive distortions on the bottom-up decisions under analysis. That is in line with the assumptions of the Kahneman *et al.* checklist (2011), and more recently of Caputo (2016), by which the distortions that occurred can be recognized by third parties thanks to their System 2.

On the other hand, the *shared* decision process of the PSV initiative was influenced by the participation of different stakeholders, who promptly adjusted time after time the distortions that occurred, through an intensive exchange of feedbacks. In this case, the common vision (and distortions) shared by the members who pushed the bottom-up initiatives has been adjusted by the board of directors; in this case System 2 has worked thanks to this "external" check.

Two of the difficulties that emerged in the bottom-up processes, the management of corporate cannibalism and the internal communications, contrasted with the simple rules of managerial life, i.e. reviewing recommendations, transforming recommendations into decisions and evaluating decisions made by others (i.e. control the quality of decisions) (Bazerman and Moore, 2009); the only programme that proceeded without distortions was the one in which the application of those controls was massive (i.e. PSV).

It is worthy of mention that, in line with the recent literature (Pleggenkuhle-Miles *et al.*, 2013), although the quality control of decision makers was affected by the opinions of a third party in all three decision-making processes, these influences have been moderated in the initiatives in which the board played a pivotal control role (PSV and BS), while they remain embedded in the decision made without board control (BML).

On this basis, what seems to emerge is that initiatives with frequent quality control mechanisms and different stakeholders are more able to pass the decision phase than initiatives with no controls, few participants and little difference among personalities. Indeed, the problem revealed by the analysis of all three decision making processes, taking into account the intervening personalities, lies in the shared vision of the decision makers due to the common cognitive functioning (i.e. EST). While in the bottom-up processes the flaws that occurred may be attributed to the similarity in the cognition of the team members, which does not allow considering the cognitive distortions that were occurring, during the top-down process several stakeholders took part and activated an adjusting feedback mechanism that allowed them to overcome the ongoing cognitive distortions. This intervention only caused an excessive length of the decision process (thus a procedural distortion) but did not prevent the success of the new initiative, as occurred for the bottom-up processes that were affected by the cognitive biases determined by the similar personalities of decision makers.

So there is, as mentioned above, a trade-off between the quality of decision-making and the number and heterogeneity of the decision makers involved, as also identified in the previous literature (Kaiser and Bostrom, 1982). From that, it is important to notice that the similarity in personalities among decision makers, accompanied by a lack of "external" control, worked as a facilitator for the occurrence of the cognitive distortions; at the same

time, the controlling mechanism on the decision process, undertaken by the board members for one of the three initiatives, corrected the distortions that occurred and contributed to the success of the idea.

In this regard, the findings are in line with the literature; in fact, Kahneman *et al.* (2011) suggest that the role played by the characteristics of the decision makers, is to create a diverse group of decision makers resulting in a mix of different skills and views that may operate a better quality control. Myers (1980), on the same point, identifies that "if the group is composed of very different types, the agreement will be harder to reach than if the group was homogeneous, but the decision will be far more broadly based and thoroughly considered, and thus in less danger of turning out badly for an unforeseen reason" (p. 152). Moreover, even if the two streams of literature have different roots (personality psychology and cognitive psychology) they are quite similar in the interpretation of the human cognition functioning that is reflected in the personality features. Indeed, according to Kahneman (2003) the individual mind is divided into System 1 (oriented to Perception) and System 2 (oriented to Judgment), similarly to the dichotomous personality Judging-Perceiving orientation of Myers and McCaulley (1985). From that, the critical point of investigating the occurring cognitive distortions, due to the alternative functioning of the two systems, through the lens of the personality features clearly emerges.

Stemming from the fact that very often decision-makers are victims of biases, especially regarding long-term strategic initiatives (Workman, 2012), this work has tried to highlight how reducing biases of decision-making processes in complex organizations can benefit from the simultaneous use of the checklist and MBTI®. As demonstrated, when used together they can give a more effective use of and results for both. The first tool, without a complete understanding of personality types of decision makers, led to the identification of

a few biases occurring in decision-making. The second one, however, without a practical aspect in the life of the enterprise, is not effective as a management tool, but remains only an exploratory one (e.g. Coe, 1992; Jennings and Disney, 2006; Abatecola *et al.*, 2013). Having found those interesting results increases the willingness to understand how to implement this particular, but potentially effective, approach. The proposed methodology takes into account the problems derived from the relationship between personality features and distortions as well as from the lack of control by a third party, in order to reduce the distortions caused by participants' System 1 thinking.

On this basis, the main practical suggestions for implementing the approach are the following: *firstly,* structuring a team of decision makers – that have to elaborate a recommendation – in which are included participants with different personality features (in terms of cognitive and decision styles), as also suggested in previous literature (Kaiser and Bostrom, 1982). This is recommended in order to reduce the risk of not being able to recognize the cognitive distortions that occurred because of the presence of the same cognitive styles, which have been found to be related to specific recurring biases (Haley and Stumpf, 1989). *Secondly*, applying the Kahneman *et al.* checklist (2011) for non-routine decisions by a third party that has the duty to make the decision. In this phase the external party is able to recognize, through its System 2, the cognitive distortions that occurred caused by participants' System 1.

This is needed in order to avoid the potential biases that had not been reduced by the automatic cognitive adjustments made by the presence of different cognitive and decision styles. While applying the checklist, the third party should also investigate some *procedural distortions* that are considered important for the decision process. The questions to be implemented have to be identified from the procedural distortions that

occurred in the past for the same or similar decisions and/or from the risks from which those processes can generally suffer; having one of the decision members acting as a third party, taking into account the needs of other decision members and of the organization itself, should also avoid the excessive length of the decision process caused by the presence of a multitude of decision makers in the controlling phase.

This proposed approach in reducing biases in non-routine decisions fits the problem situation in which are involved multiple stakeholders, perspectives, interests and uncertainties (Rosenhead and Mingers, 2001). Moreover, it is in line with the recommendation of the inclusion of different approaches while investigating a problem in order to allow difficulties to be recognized and solved (Mingers and Rosenhead, 2004). This suggested approach might also be implemented along with the Eden (2004) cognitive map problem structuring method; indeed, thanks to the explication of the participants' beliefs through cognitive mapping of decision processes, it is possible to detect the most important vicious circles, to which to apply the Kahneman *et al.* (2011) checklist, in order to identify the managerial decision processes that are affected by cognitive distortions.

At present, there is great interest in stimulating the cross-fertilization of two different disciplines, namely cognitive psychology and management, in the field of organizational decision-making. In this vein, a cue for future research is to accurately identify the role of the third party who has to monitor decisions, in fact, while Kahneman *et al.* (2011) argue that a dedicated organizational figure for the quality control of decisions is not needed, on the other hand, it is believed to be at least essential that those who perform such control have deep competencies in terms of cognitive psychology. The quality control tool of organizational decision-making leaves many areas open for future research, especially regarding finding stronger links between the performance of decision-making processes,

the personalities of decision makers and the demographic characteristics of the same, considering other theoretical strands, such as the Upper Echelons Theory (Hambrick and Mason, 1984). From that emerges the need, already highlighted by Nutt (2011), of reinforcing the study of this research area with qualitative research methods that allow understanding the key factor in decision making (i.e. the process), and discovering the tools and techniques that are suitable when some problematic situations arise in decision making contexts, thus following an action theory approach analogous to the one proposed in this work.

CHAPTER 3: Cognitive Styles in Dynamic Decision Making. A Laboratory Experiment.

Outline

Dynamic Decision Making processes of executives are pivotal for a company's performance, especially in hypercompetitive environments in which firms face high discontinuity; in those fast paced settings, executives constantly interpret the environment and, accordingly, adapt their decisions. This work investigates, in the Dynamic Decision Making process setting, the differences, in terms of cognitive style, rapidity and accuracy, among the recently identified – by the Dynamic Decision Making literature – adaptive behaviour and the others deviating from it (i.e. fixated, stalled, vagabonding). A laboratory experiment was conducted in which 203 graduate students coped with a dynamic multi-step business case and also completed the Myers Briggs Type Indicator test. Results show how Dynamic Decision Making behaviours have some differences in rapidity and accuracy and major differences among cognitive styles. The slight difference between some behaviours, such as adaptive and vagabonding, on cognitive styles previously regarded as uninfluential, have here re-emerged as pivotal, raising the interest in their study.

3.1 Introduction

Real world choices are rarely stand-alone decisions because they are more the link between a series of interdependent decisions in which the choice of environment changes as an effect of the actions of decision makers and/or by external factors; this is called Dynamic Decision Making (e.g. Birchall and Smith, 1998; Brehmer, 1995; Edwards, 1962; Engemann et al., 2003; Kleinmuntz and Thomas, 1987).

Nowadays, Dynamic Decision Making (hereafter, DDM) has been receiving climactic attention by scholars and practitioners because of the hypercompetitive and fast paced settings in which firms face high discontinuity on game rules and industry structure (e.g. Hamel, 2000); indeed, the dynamicity and complexity of the environment, caused by the emerging of new disruptive technological patterns, changes in industry regulation and other variables, create a steady turbulence whose effects are almost unforeseeable. Those competitive changes reduce periods of competitive advantage for firms, making it possible now to talk about the age of temporary advantage (D'Aveni et al., 2010) in which business entities may have a multiplicity of strategies that over time adapt to their rivals according to the changes in the environment (D'Aveni, 2010).

From what has already been said, it emerges that adapting the DDM processes of executives, based on rich real-time information is pivotal for a company's performance (e.g. Eisenhardt, 1989), especially in environments featured by high rapidity, because dynamism affects how executives interpret the environment (Nadkarni and Barr, 2008). In this regard, Rudolph et al. (2009) identified that adaptive behaviour – i.e. taking effective action after having investigated different plausible alternatives – is only one of four common behaviours when dealing with DDM based on instant flow of information; the other possible behaviours are: (1) being stuck in the problem without generating any

diagnoses (*stalled*), (2) producing alternatives without choosing one (*vagabonding*), (3) choosing an initially erroneous alternative and 'falling in love' with it (*fixated*).

On this premise, the challenge for organizations and researchers is to improve the quality of those dynamic complex judgments tending towards the adaptive behaviour – in accordance with the conditions in which organizations are embedded (e.g. Lester, 2004) – and the main way to do this, according to the shift of investigation from stand-alone decisions to complex judgments proposed by the new stream of 'Behavioral Strategy' (Powell et al., 2011), is to "focus on managing the psychological architecture of the choice environment" (Powell et al., 2011, p. 1378).

Scholars have therefore tried to deepen this psychological architecture (and its behavioural consequences), having produced a vast amount of knowledge during the last 40 years in the study of the personality factors of decision makers (e.g. Abatecola et al., 2013; Caputo, 2014b; Jones, 2007) almost using the cognitive style construct in the management field (Armstrong et al., 2012). In particular, the cognitive style concept is composed of four interrelated cognitive functions: i) gathering information process, ii) evaluating information process, iii) attitude of people to the outer world, and iv) their style of dealing with the outer world.

Although providing a pivotal role in the decision-making literature, the cognitive style of decision makers at the base of their different behaviours in DDM is still uninvestigated (Jensen and Brehmer, 2003; Kampmann and Sterman, 2014; Rudolph et al., 2009). Therefore, the aim of this article, and its added value, is to fill the outlined gap by shedding light on the cognitive styles at the base of the four common behaviours in the DDM and their divergences on the variables considered as pivotal in determining the quality of the

decision outcome in the DDM (e.g. Edwards, 1962; Eisenhardt, 1989): *rapidity* in taking action and *accuracy* in understanding the problem.

Only by answering the following research question: '*What are decision makers' cognitive styles at the base of their behaviours in dynamic decision making*?' is it possible to understand what makes, from a psychological point of view, DDM behaviours different and, as a consequence, suggesting the cognitive levers to train in order to have suitable people to deal with high-velocity settings.

To address the above outlined research question, a laboratory experiment was conducted for controlling the variables and investigating the possible cause-effect relationship between cognitive styles and DDM behaviours. In particular, 203 graduate students in business administration were asked to: *a)* cope with a dynamic multi-step business case in which their DDM behaviours, measures of rapidity and decision accuracy were collected; and, *b)* complete the personality test 'Myers Briggs Type Indicator' (Myers and Myers 1980; hereafter, MBTI) in order to collect participants' cognitive styles. The analysis of the resulting comprehensive dataset was done through a frequency analysis and a series of Multivariate Analysis of Variance (MANOVA) in order to test group differences among the variables under investigation.

The work is structured as follows. First, readers of the *International Journal of Management & Decision Making* are provided with the theoretical lens at the base of the contribution. Second, the data collection and data analysis methods are detailed. Third, the major results of the analysis are shown. Fourth, as the work's core contribution, the results are discussed and the most important links among cognitive styles and behaviours in DDM are highlighted. Finally, conclusions point out the theoretical and practical contributions and suggest future avenues for research in this field.

3.2 Theory and Hypotheses

3.2.1 Dynamic Decision Making

Choices start with pieces of information collected (also externally) and finish with the feedback of information provided by the choice environment (Child, 1997); between those extremes is the evaluation of the initial information base, the learning of decision makers, the choice, and its subsequent action and outcome (Child, 1997; Simon, 1957). From this perspective, in which the information flow and its updating are pivotal, choices are considered as continuing processes in which they "present a dynamic rather than a static perspective on organizations and their environments" (Child, 1997, p. 60).

Early scholars concerned with the practical understanding of the pivotal role of individuals in DDM were Kleinmuntz and Thomas (1987), whose attention was centred on the difference in performance between action oriented problem solvers – that use improper and poor actions to gain information – and judgmental ones – who rely on their judgment rather than acting. Subsequently, Eisenhardt (1989) offered a point of view on how decision makers make rapid decisions in high-velocity environments. Those environments offer a poor starting information base but new pieces of information may be gained by the action, which may create an advantage – if that action is right and made within a short time (e.g. Kownatzki et al., 2013) – or a crisis (e.g. Rudolph and Repenning, 2002).

From this insight and the subsequent literature on DDM, it is possible to deepen its definition seminally introduced by Edwards (1962) as follows:

Dynamic Decision Making is a decision flow in which individuals, embedded in high-velocity environments, are concerned about the uncertainty of the situation and they need to overcome it through matching their decision-making with the evolution of the surroundings (e.g. Ketchen et al., 2004). In those situations, decision makers through their actions upon interrelated decisions (e.g. Brehmer, 1995), partly modify the context (e.g. Eisenhardt, 1989) and subsequently adjust their initial response to the environment with the information gained, in a co-evolving way, that reinforces or reduces the plausibility of their initial or refined decision (e.g. Abatecola, 2014b).

This outlined dynamic model is well defined on how it should work at the individual level, linking the decision-making and sensemaking (i.e. interpretation of ideas) parts of the DDM functioning offered by Rudolph et al. (2009), under the title of action-oriented problem solving. Their framework is composed of three phases linking the moment when the decision maker acts to gain new cues (*taking action*) with the moments in which the individual continually *makes sense* of the flow of information (*interpreting*) – in order to reassess the plausibility of the investigated diagnoses – and the moment in which decision makers cultivate alternative diagnoses, even if the leading one is pursued (*cultivating*).

Those scholars surprisingly discovered that decision makers fell into four well-defined problem solving behaviours when trying to find a solution for an acute clinical crisis: (1) being stuck in the problem without generating any diagnoses (*stalled*), (2) producing alternatives without choosing one (*vagabonding*), (3) choosing an initially erroneous alternative and falling in love with it (*fixated*), or (4) taking effective action after having investigated different plausible alternatives (*adaptive*).

In particular, some important features of those behaviours provided by Rudolph et al. (2009) need to be highlighted; adaptive people are supposed to have a canonical model of effective clinical reasoning whose interplay between the consideration of a leading diagnosis and alternative diagnoses is well balanced, providing the time to take action and interpret the results. This correct balance and strength of the effect of plausibility on interpretation are at the base of the difference with other behaviours; indeed, if the

plausibility of the cue is low, then decision makers need a fast action for avoiding vagabonding and being adaptive as well as when the pace of cultivating alternatives is fast; on the other hand, when the plausibility is high, then the pace of cultivating needs to be slower. Moreover, if the pace of cultivating is too slow there is a high risk of falling into the fixated behaviour, even when the plausibility of alternatives is low. Conversely, when the plausibility is high, then having a slow action drives to a fixated behaviour because the decision maker is more and more convinced of an alternative that may be erroneous; in this case having a fast pace in cultivating when the plausibility is low, as well as having a little scepticism, may help in avoiding fixation.

Those insights specify what, in general terms, had been previously studied by some scholars but did not look at the DDM process taking into account the sensemaking literature. For instance, Judge and Miller (1991) found that the number of alternatives that are considered simultaneously are always significantly and positively associated with decision speed, whatever the environment; thus, according to those authors, the more the alternatives are taken into account simultaneously the greater the decision making speed.

From that, it derives that the DDM behavioural model of Rudolph et al. (2009) is more comprehensive than the previous ones, because of their link with the sensemaking process, the better declination of rapidity in different terms and the definition of accuracy's role; from that, its adoption is pivotal for understanding decision makers' behaviours in DDM settings at the individual level.

3.2.2 The Role of Accuracy and Rapidity in DDM

Several scholars over time have investigated, in different ways, the decision making processes in dynamic settings, alternatively giving more importance to the speed of the decision making or to the accuracy in terms of amount of information collected.

With regard to the weight of time in DDM, scholars have been interested over time in its relationship with feedback loops (e.g. Kleinmuntz, 1993; Leonard et al., 1999). Gonzalez (2005), for example, discovered how the more detailed and frequent feedback did not improve performances of individuals in DDM as well as was suggested by Lurie and Swaminathan (2009) in their research about timely information. On the same point, Van de Calseyde et al. (2014) stated that the amount of doubt in decision making is reflected in the time spent on that decision; therefore, people with the greatest level of time spent in decision-making should be those who are inept at reaching a final decision, or, if reached, are not confident with their choice.

From that, the link between time and accuracy seems pivotal in DDM settings; indeed, decision makers in DDM act by accumulating cues across time and favouring the choice among alternatives (e.g. Brehmer, 1995; Diehl and Sterman, 1995); if an alternative has accumulated enough confirmed cues, thus improving the accuracy (Lusk and Hammond, 1991), then it is ready to be chosen.

According to Sterman (1989) and Brehmer (1992), as individuals become more familiar with DDM because of accumulating new cues, they will process it ever more intuitively, overshadowing analytic processing and other learning effects (Stanovich and West, 2000). On the same point, Gonzalez et al. (2003) discovered that people who faced more and more tasks in dynamic environments experienced performance improvements in terms of positive outcomes and/or less decision time.

On the other hand, according to Svenson et al. (1990), the quality of decisions depends on the time spent in decision-making, because limiting people to make a decision in a fixed lapse of time may create pressure on them with the consequence of deviating from their natural behaviour. In this regard, slow decision makers were found to spend much more time on a single alternative (Payne et al., 1996), thus dedicating a great level of accuracy to one option, while the evaluation of different options – without dedicating the highest level of accuracy – was found to be more fruitful in decision situations under time pressure (Payne et al., 1988; Eisenhardt, 1989). However, as for stand-alone decisions, decision makers in DDM settings under time pressure tend to process information as fast as they can and requesting less information, but, if the cost of information is high, then the trade-off between its cost and the possible benefits gained – in terms of amelioration of the decision – makes the decision makers deviate from adaptive behaviour (Kerstholt, 1995).

In sum, the importance of accuracy and rapidity was well stated when referring to DDM settings, but, the existence of different patterns – in terms of rapidity and accuracy – among the four common DDM behaviours was not investigated, not even by Rudolph et al. (2009), who were more concerned to explain the mechanism behind the four DDM behaviours than identify their possible significant differences in rapidity and accuracy. Therefore, on this basis:

H1: In DDM settings there are significant differences in terms of accuracy and rapidity among those who have an adaptive behaviour and from those who deviate from it.

3.2.3 Cognitive Styles, Decision Styles and MBTI

Since the seminal work by March and Simon (1958) and, subsequently, by Cyert and March (1963), the characteristics of individuals have been considered as "basic to some of the salient characteristics of human behaviour in organizations" (March and Simon, 1958, p. 24). The understanding of human behaviour in organizations has been carried out by several scholars who have measured the cognitive style of managers in different fields because its use is widely considered fruitful when examining human cognitive functioning on different tasks (e.g. Abatecola et al., 2013; Aggarwal and Woolley, 2013; Gallén, 1997).

Cognitive styles are formed by the cognitive responsible functions for *gathering* and *evaluating* information (e.g. Nutt, 1990; 1993), the *attitude* of people to the outer world and their *style of dealing with* the outer world (Gardner and Martinko, 1996; Hough and Ogilvie, 2005). In this regard, scholars interested in understanding the contribution of cognitive styles in decision-making have more often studied them through the MBTI test (Armstrong et al., 2012), despite the existence of some limitations concerning its use (e.g. Schweiger, 1985).

Essentially, the MBTI test is a psychological questionnaire aimed at discovering people's orientation towards four different dichotomies, in which three of them represent preferences based on the Perception and Judgment functions stated by Jung (1921), while the last one was successively added by Myers and Myers (1980) for determining the *attitude to the outer world* of individuals.

For a comprehensive understanding of this tool, the four dichotomies of the MBTI test are now introduced (and their respective preferences) according to the definitions given by

Myers and McCaulley (1985), which comprise the comprehensive concept of cognitive styles:

Table 3.1: MBTI dichotomies.

Dichotomy	Aim	Preferences	Orientation
Extraversion-Introversion	Attitude to the outer world	Extraversion (E)	People and objects
		Introversion (I)	Concepts and ideas
Sensing-iNtuition	Process of perception (i.e. gathering information)	Sensing (S)	Five senses to become aware of things
		iNtuition (N)	Indirect perception of things (by the unconscious)
Thinking-Feeling	Process of judgment (i.e. evaluating information)	Thinking (T)	Logical process
		Feeling (F)	Relying on personal and social beliefs
Judgment-Perception	Style of dealing with the outside world	Judgment (J)	Preference for the process of judgment
		Perception (P)	Preference for the process of perception

The preference for each dichotomy is independent of the preferences for the others and the mix of all those preferences yields 16 possible combinations called *types* that are given the four letters of the personality orientations (e.g. ESTJ; acronyms for the MBTI features are provided in Table 3.1).

What is important to highlight from the Jungian theory at the base of the MBTI test, is its description of the human cognitive functioning being composed of two mental

processes: *automatic* and *controlled*, and those are reflected in the dichotomy Judgment-Perception (Beyler and Schmeck, 1992). In this regard the Judgment orientation in dealing with the outside – regarded as rational – is explicated in the Thinking-Feeling dichotomy, while the Perception orientation in dealing with the outside – regarded as irrational – is explicated in the iNtuition-Sensing dichotomy (Jung, 1921).

Moreover, Myers and McCaulley (1985) defined the differences among all the possible cognitive styles responsible for the information gathering and evaluation processes, identifying their divergences on: i) focus of attention, ii) gathering information approach, iii) evaluating information approach, and iv) personality tendency. In particular:

Sensor-Thinkers: their focus of attention is on facts, with a special focus on the things involved; they have an information gathering approach based on the five senses and an evaluating information approach based on logical and impersonal analysis; finally, their personality tendency is practical and matter-of-fact.

Sensor-Feelers: their focus of attention is on facts, with a special focus on people involved; they have an information gathering approach based on the five senses and an evaluating information approach based on analysis featured by personal warmth; finally, their personality tendency is sociable and friendly.

iNtuiting-Thinkers: their focus of attention is on possibilities rather than facts; they have an information gathering approach based on perception of new ideas in their unconscious and an evaluating information approach based on logical and impersonal analysis; finally, their personality tendency is logical and ingenious.

iNtuiting-Feelers: their focus of attention is on possibilities rather than facts; they have an information gathering approach based on perception of new ideas in their unconscious

and an evaluating information approach based on analysis of future benefits of ideas; finally, their personality tendency is enthusiastic and insightful.

Having identified the characteristics of the cognitive styles it is important to understand their different influences on decision making processes; that is the aim of the next sub-section.

3.2.4 The Role of Cognitive Styles in DDM

In DDM the link between feedback and choices is pivotal for reinforcing leading alternatives or advancing new, more plausible ones due to the numerous cues collected; hence, the interest in the cognitive styles at the base of DDM tasks.

On the manner in which feedback is processed, Ferguson and Fletcher (1987) found that Thinkers process impersonal and objective data better, while Feelers process personal and subjective feedback better. Those feedbacks affect choices; indeed Nutt (1990; 1993) found that Sensor-Feelers, because of perceiving the least risk in new project choices were the most risk tolerant for new project adoption, while, for the opposite reason, Sensor-Thinkers were the most reluctant for their adoption. Moderate level of risk aversion were found for iNtuitive-Thinkers and iNtuitive-Feelers.

On the same point, Ruble and Cosier (1990), confirming the work of Nutt (1986), indicate that those preferences in choices, made by people with different cognitive styles, are affected by the decision environment. In fact, those studies, investigating different kind of financial choices through experiments, revealed that Sensor-Thinkers, who perceived a low grade of risk, are the most risk tolerant when the decision environment was compatible (in terms of firm's culture); on the other hand, Sensor-Feelers, iNtuitive-Thinkers and

iNtuitive-Feelers were who perceived as less risky when they were in incompatible decision environments.

However, in DDM decision environments, as previously stated, accuracy and rapidity have a pivotal importance as well as their trade-off; from that, there is a need for a deepening of the difference in rapidity and accuracy among cognitive styles.

According to the Jungian theory previously reported, people with Judgment, Thinking and Feeling cognitive styles are considered slow and accurate in decision making, because of their rationality and controlled reasoning, while, people with Perception, iNtuition and Sensing cognitive styles are rapid, but not accurate in decision making, because of their irrationality and automatic reasoning.

On the role of intuition in decision making Wally and Baum (1994) stated that intuitive decision makers have a faster pace in information processing than those who rely on formal mechanisms, because they synthesize information quickly and effectively (Campbell and Kain, 1990; Davis and Elnicki, 1984). On the other hand, despite iNtuition helping managers in decision making under time pressure to speed up the decision processes (Miller and Ireland, 2005), the trade-off between iNtuition and accuracy remains alive because iNtuition "may simply facilitate speed at the expense of accuracy" (Dane and Pratt, 2007, p. 34). From the study by Taggart and Valenzi (1990), because of the different grades of logic among iNtuitive and Sensor people, the latter would have a higher level of accuracy than the former.

According to Hough and Ogilvie (2005), who studied the influence of cognitive styles in stand-alone strategic decisions, the powerful integration of the Judgment and Perception processes lies in the iNtuiting-Thinkers who usually have better results and greater accuracy with respect to others with different cognitive styles, also suggesting that their

iNtuitive function yields high levels of decision performance; this evidence contrasts with the conclusions of Taggart and Valenzi (1990) on the low level of accuracy of iNtuitive people, whose results were the opposite. On the same point, Gardner and Martinko (1996) highlighted that scholars interested in the influence of cognitive styles in decision making discovered that iNtuiting-Thinkers are those, among all the cognitive styles, who take more time to make decisions.

Hough and Ogilvie (2005) in the same above-cited study, found that Sensor-Feelers are discovered to be those who investigate less the problems faced (i.e. few decisions are taken) than decision makers with different cognitive styles. However, those conclusions by Hough and Ogilvie (2005) are in contrast to both the empirical findings of Taggart and Valenzi (1990) on the accurate attitude of Sensors, and those of Campbell and Kain (1990) and Davis and Elnicki (1984) on the low and high speed of decision-making, respectively of Sensing and iNtuitive people.

Moreover, according to Campbell and Kain (1990) and Davis and Elnicki (1984), Sensing-Thinkers are empirically proved to be those who take the most time to make decisions, contrasting with the conclusions of Hough and Ogilvie (2005) for whom Thinkers are more rapid than Sensors. On the same point, Nutt (1990) discovered that Sensing-Feelers were more action-oriented, while the Sensing-Thinkers were action averse.

Finally, taking into account the other two important dichotomies of cognitive styles, i.e. Judgment-Perception and Extraversion-Introversion, Gardner and Martinko (1996) found that Extraversion and Introversion do not affect performance or speed of individuals, and the same has been said for the Judgment and Perception functions (e.g. Hough and Ogilvie, 2005). Those evidences would support the interest of scholars over the years towards the

influence of the sole information gathering and evaluation cognitive style rather than the comprehensive cognitive make-up (Gardner and Martinko, 1996).

Due to the fact that cognitive styles are, according to the discussed literature, at the base of the decision makers' divergences on the rapidity and accuracy that drive decision makers to deviate from (or adhere to) the adaptive behaviour, the second hypothesis that is going to be tested, is the following:

H2: In DDM settings, there are significant differences in terms of cognitive styles among those who have an adaptive behaviour and those who deviate from it.

3.3 Method

The research methodology implemented is a laboratory experiment, which has been considered as the most compelling for this research because of possibility to the test of 'specific hypotheses that are developed through logical argument that build on prior work (Edmondson and McManus, 2007; p. 1159). Indeed, this research design has given the possibility to simulate a dynamic decision making context in which the experimenter was able to isolate the variables under investigation (i.e. cognitive styles, problem solving behaviours, rapidity and accuracy) and avoid other situational variables that could affect responses due to their contingency (Shadish et al., 2002). In order to do that, a dynamic multi-step business case was developed in order to have participants in the same situation and for controlling the variables under investigation. To track the cognitive styles of participants, the MBTI test was administered.

Sample, Stimulus Material and Procedure

Participants. A total of 203 Italian graduate students in business administration (104 male, 99 female, Average Age= 23.88, SD= 1.21) were selected by random sampling for the laboratory experiment and compensated only with the gratitude of the researcher.

Stimulus material. Participants were individually provided with the dynamic multi-step business case. From the text, respondents were appointed Chief Executive Officer (CEO) of a manufacturing leading firm (i.e. Andromeda) in the Italian clothes market, who was going to meet CEOs of the three main competitors (i.e. Anthares, Pegaso, Atena) at the annual meeting of their industry. At the beginning of the meeting the CEO of Andromeda is provided with the quarterly financial statement of their firm which shows bad performance in terms of revenues, despite a high level of appreciation among customers; the first cue given to the CEO of Andromeda is that maybe some of the other firms had applied unfair business practices that led them to gain higher revenues at the expense of Andromeda.

Participants were asked to clarify the bad performance of Andromeda by collecting information – through the help of their general manager – on the other firms' business practices. Initially, the general manager introduced the first company to be investigated (i.e. Atena) and a first cue was released. Each time the general manager gave a new cue – always disconfirming the unfair business practice of the competitor investigated – participants were asked whether they would like to investigate more the same firm or shift to another one; after each decision a new cue was released and a new question introduced.

The outlined mechanism is consistent with the theory about the action-oriented problem solving by Rudolph et al. (2009); indeed, it contains the following fundamental elements:

acting for making information available for interpretation, interpreting the flow of information, feedback among processes that reinforce or discard the most plausible information. The only divergent element is the pro-activity of the decision maker in generating diagnoses that in this dynamic multi-step business case was not made available.

The different dynamic decision paths that could be followed by participants are displayed in Figure 1 which has a particular decision tree structure that lets participants experience the dynamicity of the decision-making process.

Figure 3.1: Structure of the dynamic multi-step business case.

START OF THE INVESTIGATION INTO ATENA'S
BUSINESS PRACTICES

Checking brands business
practice of Atena

Investigate Pegaso's
business practice

Checking product
imitation by Atena

Investigate Pegaso's
business practice

START OF THE
INVESTIGATION INTO
PEGASO'S BUSINESS
PRACTICES

Investigating the
possibility of dumping

Investigate Pegaso's
business practice

Investigating ads
misrepresentation by
Pegaso

Investigate
Anthares' business
practice

Accusing the CEO of
Atena of unfair business
practice

Investigate Pegaso's
business practice

Investigating acts of
denigration by Pegaso

Investigate
Anthares' business
practice

Fixated behaviour

Accusing the CEO of
Pegaso of unfair business
practice

Investigate
Anthares' business
practice

START OF THE
INVESTIGATION INTO
ANTHARES' BUSINESS
PRACTICES

Fixated behaviour

Investigating parasitic
competition by Anthares

Request detailed data
on your own firm

Investigating acts of
denigration by Anthares

Request detailed data
on your own firm

Final
choice

Accusing the CEO of
Anthares of unfair business
practice

Request detailed data
on your own firm

Fixated behaviour

95

Experimental Design and Procedure. The dynamic multi-step business case was initially built by the researcher and discussed with two academics that are experts, respectively, on decision making and on the use of psychometrics in social science.

Firstly, because the dynamic multi-step business case does not have the structure of a questionnaire but of a task to be performed in order to track behaviours, the validation of the case adheres more to the validation of a simulation than the validation of a questionnaire. In this case, the aim is to build a system which can support an assignment to be performed and to record participants' behaviour in any attempt; in those simulations, face validity (by experts and/or by people involved) is a robust and essential validation (Banks et al., 2004).

On this premise, in order to validate the business case the above introduced experts were asked how they would rate the quality of the structure of the business case, by considering how well it detects the DDM behaviours of participants. The two experts looked at the questionnaires completed by 30 graduates in business administration as a pre-test and rated their quality, defined as the business case suitability to build a DDM environment in which participants really perform according to the four DDM behaviours, on a 5-point Likert scale (1= Poor; 2= Fair; 3= Good; 4= Very good; 5= Excellent). The results show a high quality assigned to the dynamic business case (M=4.1, SD=0.99) with high a substantial agreement among raters (Kappa = 0.90 (p <.0.001), 95%); the sample of participants was later involved in the same face validation procedure and both results and the inter-rater agreement were found to be very positive (M=4.3, SD=1.61; Kappa = 0.91 (p <.0.001), 95%).

The dynamic multi-step business case reliability was assessed through a test-retest process in which the same group of 30 graduates dealt with the business case twice, i.e.

two months apart, changing in the retest phase the name of the firms to investigate and swapping the possible investigation to take so as not to fall into a kind of learning effect. During this test-retest procedure the reliability of the questionnaire was investigated, looking at the consistency of the DDM behaviour of participants in those two rounds of performance. In this regard, through a paired t-test no significant difference was found between the two DDM behaviours ($t(29)= .22$, $p= .83$) that also have a strong correlation ($r= .79$, $p < .01.$); thus, the dynamic multi-step business case was considered to be reliable in reproducing a DDM environment in which people perform according to the four DDM behaviours.

Finally, the laboratory experiment was conducted as follows. At the beginning the researcher explained the interest in studying the relationship between problem solving behaviours in DDM and their cognitive styles; for this reason, participants were provided with the dynamic multi-step business case and the MBTI test. Before starting, respondents were instructed on how to respond to the dynamic multi-step business case and told that the researcher would have tracked the time for each answer given. At the end, participants were debriefed, any questions dealt with and thanked for their participation.

Dependent Measures

Problem Solving Behaviour. Problem solving behaviours of participants were deduced from the answers provided in the dynamic multi-step business case. If the participant investigated all the competitors without being fixated on accumulating cues on just one rival, then at the end he/she was asked to indicate (by ticking a box) who had been responsible for the bad performance of Andromeda choosing among: Andromeda (their own firm), Atena, Pegaso, or Anthares. If the respondent was not sure about the

responsibility of that bad performance, they could tick another box beside which it was stated that the general manager would have taken the decision on their behalf.

In particular, participants that stuck at investigating just one firm and concluded the case accusing a competitor's CEO of unfair business practice – despite the several disconfirming cues – fell into the fixated behaviour and in this case the interviewee does not come to a final choice, ending the business case earlier (see Figure 3.1). Whoever investigated the business practices of different firms but at the end of the case accused a competitor of unfair business practices, fell into the vagabonding behaviour. Adaptive CEOs were those who, after collecting disconfirming cues about unfair business practices, recognized that more investigations would have been needed on the efficacy of their own marketing and sales strategy; while, stalled people were those who, after having investigated different competitors' business practices, showed indecision in the formulation of a solution hypothesis to the problem and appointed the general manager to make the decision. The validity and reliability of this measure were investigated in the experimental design and procedure sub-section through face validity and test-retest reliability.

Rapidity in taking action. The researcher tracked the time spent by the respondent on each answer provided, taking notes of the lapse of time between two moments: i) the moment in which the respondent finished reading the question posed by the general manager, and ii) the moment in which the respondent took the decision to tick the box beside the answer. Having taken notes of those lapses, three different measure of rapidity in taking action were built:

1) Total Time (hereafter, TT), measures the time spent on the whole DDM process. It was calculated summing the time spent for all the answers provided; 2) Average Time for Decision (hereafter, ATD), measures the time spent in making a decision on average. It was calculated by dividing the TT by the total number of answers provided; 3) Tendency to Make Quick Decisions (hereafter, TMQD), measures the tendency of decision makers to be more or less rapid in further decisions in comparison with the average. It was calculated by using the difference between the linear trend of the time spent on each answer, provided by the TREND function of the software package Microsoft Excel® that is used to perform linear regressions through the method of least squares, and the ATD. All of those three measures have been adopted in order to consider the time needed to take steps introduced in the action-oriented problem solving of Rudolph et al. (2009).

From the results of this test-retest a Principal Component Analysis (hereafter, PCA) was also conducted on the use of rapidity measures in order to understand if all of them underlie the same construct. Firstly, it was observed that two of the three items (Average Time per Question and Total Time) correlated at .6, suggesting a possible factorability. Secondly, the Kaiser-Meyer-Olkin measure of sampling adequacy was .54, in line with the commonly accepted value of .5 (Shadish et al., 2002), and Bartlett's test of sphericity was significant (p < .05). The diagonals of the anti-image correlation matrix were also all over .5. Finally, two communalities out of three were all above .7, confirming that those two items shared some common variance. Initial eigenvalues indicated that the three factors explained about 57%, 30% and 13% of the variance respectively. Solutions for two and three factors were each examined using varimax and oblimin rotations of the factor loading matrix. The two-factor solution (i.e. Average Time per Question and Total Time), which explained 87% of the variance, was preferred because of: (a) its theoretical support (i.e. the

average time spent on each question is the total time divided by the number of answers); (b) the 'levelling off' of eigenvalues on the scree plot after two factors. The two remaining items in this analysis had primary loadings over .5. Internal consistency for those factors was examined using Cronbach's alpha; the alpha for Rapidity was moderate: .67.

As indicated in the procedure, the first two variables underlie the same construct (i.e. Rapidity), while the Tendency to Make Quick Decisions is disconnected. The PCA conducted *ex post* to the experiment, confirmed those of the PCA in the pilot study; eigenvalues indicated that the two factors explained about 69% and 31% of the variance respectively and have primary loadings both equal to .83. Internal consistency for those factors was examined using Cronbach's alpha; the alpha for Rapidity was moderate: .65.

A composite score for the outlined factor was built based on the mean of the items which had their primary loadings on the factor (i.e. regression-weighted) with higher scores (reported in seconds) indicating less rapidity. Descriptive statistics of the outlined resulted variable, called 'Rapidity', are the following: M= 336.44; SD= 85.51; skewness= .58; kurtosis= 1.07. The skewness and kurtosis were well within a tolerable range for assuming a normal distribution (Field, 2013).

Accuracy in problem solving. A variable called Decisions for Participant (hereafter, DP) was built in order to measure the amount of information gained through the decision taken for investigating the problem. The amount of cues collected, thus the amount of information gained, is equal to the amount of decisions taken and these vary from a minimum of four to a maximum of ten. In order to avoid unequal comparisons due to the difference number of firms investigated (e.g. a participant that collects five cues on two firms may be considered as more accurate than who collects four cues on three firms),

accuracy has been weighted for the number of firms investigated multiplying the DP by the number of firms investigated. This was done because the utility of one more information on one firm, after having collected other cues on the same firm, was considered less than the utility of collecting a first information on a new firm. From that, accuracy may vary from a minimum of four (i.e. the case in which participants continue to investigate firm 1 until being fixated) to a maximum of 30 (i.e. investigating all the firms and collecting all the cues available on all the firms without being fixated).

This measure is supposed to study only the abundance of information on the different firms and it is in line with the study on accuracy by Sutcliffe and Weber (2003), used also by Rudolph et al. (2009), in which they argue that information and its interpretation improves accuracy; in this case, the quality of the interpretation of the information is left to the study of the cognitive styles.

From measuring a construct of one item, it is impossible to measure its validity, but, because investigating the validity of a tool is investigating if a tool measures what it claims to measure (Shadish et al., 2002) validity was investigated by asking the same two experts previously mentioned to rank how much the way in which accuracy is measured adheres to the definition given by Sutcliffe and Weber (2003) looking at the accuracy's scores and cues structure along the two business cases completed by the 30 participants. The two experts ranked this quality on a 5-point Likert scale (1= Poor; 2= Fair; 3= Good; 4= Very good; 5= Excellent); the quality of the measurement was found to be very high (M=4.4, SD=.20) and the inter-rater agreement was found to be Kappa = 0.68 (p <.0.001), 95%; thus considered to be in substantial agreement.

Reliability was assessed through the test-retest process, which is a solution when assessing single items for which the construct is unambiguous (Wanous et al., 1997), as in

this case, where only the abundance of accuracy was studied through this item. Through a paired t-test no significant difference was found between the two levels of accuracy ($t(29)$= 1.48, p= .15) that have a strong correlation (r= .89, p < .01.).

Cognitive styles. Cognitive styles were measured through administering, in electronic form, the MBTI test Form G (Myers and McCaulley, 1985); this way to measure cognitive styles in the management field completely adheres to the methodology used by scholars involved in that topic (Armstrong et al., 2012). The automatic report for each participant provided the grade of clarity for the preference resulting from each of the four dichotomies. The grade of clarity varies from a minimum of 1 (slight clarity) to a maximum of 30 (very clear); the grade of clarity of a couple of cognitive styles' items is simply calculated as the sum of the grades of clarity of the resulting preferences given by the electronic report (e.g. Sensation= 7, Feeling= 14, Sensation-Feeling= 21) as proposed by Myers and McCaulley (1985).

Sample Description

Firstly, descriptive statistics of the rapidity and accuracy variables respectively are: M= 336.44; SD= 85.51 and M= 12.79 SD= 5.30.

With regard to the DDM behaviours, the distribution of the sample of 203 participants who took part in the experiment is the following: 75 vagabonding (37%), 59 adaptive (29%), 52 fixated (26%), and 17 stalled (8%). Table 4 helps to understand the distribution of the sample in terms of cognitive styles.

Table 3.2: cognitive styles of participants.

Cogntive Style Information gathering and evaluation Style	N	%	M	SD
NT	77	37.9%	13.4	18.7
NF	45	22.2%	4.3	9.0
ST	47	23.2%	8.0	15.1
SF	34	16.7%	5.2	12.3
Attitude to the outer world				
E	118	58.1%	8.8	9.2
I	85	41.9%	6.5	9.1
Style to deal with the outside				
J	130	64.0%	8.7	10.7
P	73	36.0%	5.4	9.1

From a frequency analysis of the four dichotomies tested, the results show a strong propensity for Extraversion in the attitude of people to the outer world (58.1%) and an even stronger one for Judgment in the style of dealing with the outside world (64.0%). Looking at the frequency data of information gathering and evaluation cognitive style, it can be deduced that Sensing-Feelers and iNtuiting-Thinkers are respectively the majority and the minority groups in the sample, while the Sensing-Thinkers and iNtuiting-Feelers are near the average of an ideal division of the sample (i.e. 25%) among the four possible cognitive styles related to the gathering and evaluation information processes.

For the purpose of this work, it is also important to analyze the frequencies of the cognitive style features among the four different behaviours.

Table 3.3: Cumulative frequencies of cognitive style by problem solving behaviour.

Cognitive Style Information gathering and evaluation	Adaptive	%	Cumulative	Fixated	%	Cumulative	Stalled	%	Cumulative	Vagabonding	%	Cumulative
NF	8	14%	14%	8	15%	15%	5	29%	29%	24	32%	32%
NT	27	46%	59%	15	29%	44%	8	47%	76%	27	36%	68%
SF	12	20%	80%	16	31%	75%	0	0%	76%	6	8%	76%
ST	12	20%	100%	13	25%	100%	4	24%	100%	18	24%	100%
Attitude to the outer world												
E	32	54%	54%	32	62%	62%	10	59%	59%	43	57%	57%
I	27	46%	100%	20	38%	100%	7	41%	100%	32	43%	100%
Style to deal with the outside												
J	36	61%	61%	34	65%	65%	7	41%	41%	52	69%	69%
P	23	39%	100%	18	35%	100%	10	59%	100%	23	31%	100%

Evidence from Table 3.3 shows iNtuitive-Thinking to be the most frequent information gathering and evaluation cognitive style in three out of four problem solving modes, except for the fixated behaviour in which it is the second most frequent.

With regard to the attitude to the outer world and the style to deal with it, the most frequent preferences in those dichotomies are, respectively, Extraversion and Judgment (both around 60% on average), with the exception of the stalled behaviour in which the most frequent preference for the style is Perception (59%). Looking at the data, it can be deduced how great percentages of iNtuiting-Feelers, Sensing-Feelers and Sensing-Thinkers are present in the adaptive behaviour (i.e. 14%, 20% and 20% respectively).

In order to test if any difference exists among DDM behaviours based on their cognitive styles and DDM measures (rapidity and accuracy), a Multivariate Analysis of Variance

(MANOVA) was conducted and is presented in the next section. This multivariate statistical test was regarded as a suitable method because it has the power to detect whether groups differ from each other along a combination of dimensions and it is used in cases in which the aim is to look at one or more independent variables and several independent variables simultaneously (Field, 2013); as also done in other researches (Gruenfeld et al., 1996).

3.4 Results

Variance Analysis

In order to test hypothesis 1, a MANOVA analysis was carried out; however, before conducting the MANOVA, Pearson's correlations were performed in order to test the MANOVA assumption for which the dependent variables would be correlated with each other in the moderate range; for instance, a significant correlation between rapidity and accuracy ($r(203) = .66$, p< .01.), which suggests the appropriateness of a MANOVA. The first multivariate tests provide evidence that there are significant differences (p < .005) among DDM behaviours on accuracy and rapidity.

Table 3.4: Multivariate tests – Rapidity, accuracy and DDM Behaviours

Effect		Value	F	Hypothesis df	Degree of freedom	Sig.	Partial Eta squared	Noncent. Parameter	Observed power
Intercept	Pillai's Trace	0.939	1517.635	2	198	0.00	0.939	3035.27	1
	Wilks' Lambda	0.061	1517.635	2	198	0.00	0.939	3035.27	1
	Hotelling's Trace	15.33	1517.635	2	198	0.00	0.939	3035.27	1
	Roy's Largest Root	15.33	1517.635	2	198	0.00	0.939	3035.27	1
DDM Behavior	Pillai's Trace	0.263	10.06	6	398	0.00	0.132	60.361	1
	Wilks' Lambda	0.74	10.721	6	396	0.00	0.14	64.329	1
	Hotelling's Trace	0.347	11.382	6	394	0.00	0.148	68.293	1
	Roy's Largest Root	0.333	22.76	3	199	0.00	0.25	66.228	1

In particular, as Table 3.4 shows, $F_{(6, 396)} = 10.72$, $p < .0005$; Wilk's $\Lambda = 0.74$; partial $\eta^2 = .14$. To determine how the DDM behaviours differ for the rapidity and accuracy, we need to look at the Tests of Between-Subjects Effects table here reported.

Table 3.5: Test of Between Subjects-Effects - Rapidity, accuracy and DDM Behaviors

Source	Dependent variable	Type III sum of squares	Degree of freedom	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed power
Intercept	Rapidity	17311940.53	1	17311940.53	3018.722	0	0.938	3018.722	1
	DP	23901.926	1	23901.926	910.147	0	0.821	910.147	1
DDM Behaviour	Rapidity	366948.169	3	122316.056	21.329	0	0.243	63.986	1
	DP	443.248	3	147.749	5.626	0.001	0.078	16.878	0.942

We can see from Table 3.5 that the rapidity ($F_{(3, 199)} = 21.33$; $p < .005$; partial $\eta^2 = .24$) and accuracy ($F_{(3, 199)} = 5.63$; $p < .005$; partial $\eta^2 = .08$) variables are statistically significant in this model.

In order to understand in what way those particular and different problem solving behaviours differ, a *post hoc* analysis (i.e. Tukey's HSD Test; not displayed here) was

conducted. From this analysis emerged the following significant differences: i) fixated people are more rapid than adaptive people (-83.8 secs.), stalled people (-126.7 secs.), and vagabonding ones (-94.8 secs.); ii) fixated people have less accuracy than adaptive people (-3.1 cues collected) and vagabonding people (-3.6 cues collected).

A subsequent MANOVA was necessary to test the hypothesis 2; also in this case a meaningful pattern of correlations was found (for instance, iNtuiting-Thinking cognitive styles is correlated with Perception at r=.29, p< .01). Multivariate tests provide evidence that there are significant differences (p < .005) among cognitive styles of the four common DDM behaviours; the results are shown in Table 3.6:

Table 3.6: Multivariate tests – Cognitive styles and DDM Behaviours

	Effect	Value	F	Hypothesis df	Degree of freedom	Sig	Partial Eta squared	Noncent. Parameter	Observed power
Intercept	Pillai's Trace	0.926	300.999	8	192	0	0,926	2407.995	1
	Wilks' Lambda	0.074	300.999	8	192	0	0,926	2407.995	1
	Hotelling's Trace	12.542	300.999	8	192	0	0,926	2407.995	1
	Roy's Largest Root	12.542	300.999	8	192	0	0,926	2407.995	1
DDM Behaviour	Pillai's Trace	0.545	5.388	24	582	0	0,182	129.3	1
	Wilks' Lambda	0.534	5.608	24	557.46	0	0,189	129.63	1
	Hotelling's Trace	0.729	5.791	24	572	0	0,195	138.996	1
	Roy's Largest Root	0.446	10.808	8	194	0	0,308	86.463	1

In particular, as Table 3.6 shows, $F_{(24, 557)} = 5.61$, p < .0005; Wilk's $\Lambda = 0.53$; partial $\eta^2 = .19$. Also in this case, in order to determine the DDM behaviours on cognitive styles, we need to look at the Tests of Between-Subjects Effects table here reported.

Table 3.7: Test of Between Subjects-Effects – Cognitive styles and DDM Behaviours.

Source	Dependent variable	Type III sum of squares	Degree of freedom	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed power
Intercept	NT	23124.794	1	23124.794	69.403	0	0.259	69.403	1
	NF	4292.788	1	4292.788	55.08	0	0.217	55.08	1
	ST	8439.999	1	8439.999	36.74	0	0.156	36.74	1
	SF	3202.417	1	3202.417	23.375	0	0.105	23.375	0.998
	E	10958.078	1	10958.078	129.717	0	0.395	129.717	1
	I	6283.326	1	6283.326	75.18	0	0.274	75.18	1
	J	9605.8	1	9605.8	99.273	0	0.333	99.273	1
	P	7964.253	1	7964.253	107.722	0	0.351	107.722	1
DDM Behaviour	NT	4200.154	3	1400.051	4.202	0.007	0.06	12.606	0.852
	NF	923.537	3	307.846	3.95	0.009	0.056	11.85	0.827
	ST	111.342	3	37.114	0.162	0.922	0.002	0.485	0.08
	SF	3123.886	3	1041.295	7.601	0	0.103	22.802	0.986
	E	285.397	3	95.132	1.126	0.34	0.017	3.378	0.301
	I	168.778	3	56.259	0.673	0.569	0.01	2.019	0.191
	J	3804.348	3	1268.116	13.106	0	0.165	39.317	1
	P	2171.76	3	723.92	9.792	0	0.129	29.375	0.998

From Table 3.7 it emerges that iNtuitive-Thinking (F (3, 199) = 4.20; p < .005; partial η2 = .06), iNtuitive-Feeling (F (3, 199) = 3.95; p < .005; partial η2 = .06), Sensing-Feeling (F (3, 199) = 7.60; p < .005; partial η2 = .10), Judgment (F (3, 199) = 13.11; p < .005; partial η2 = .16), and Perception (F (3, 199) = 9.79; p < .005; partial η2 = .13) cognitive styles are statistically significant in this model.

Also in this case a Tukey's HSD Test (again, not displayed here) was conducted, and from this analysis it emerged that generally: i) the iNtuiting-Thinking cognitive style is more marked in adapters and vagabonding people than in fixated ones (respectively +11.3 and +9.31); ii) the iNtuiting-Feeling cognitive style is more marked in stalled people than in adapters (+7.7), fixated people (+7.8), and vagabonding ones (+6.3); iii) the Sensing-

Feeling cognitive style is stronger in fixated people than in adapters (+6.0), stalled people (+11.3) and vagabonding ones (+9.2); iii) the Judgment cognitive style is stronger in fixated than in adapters (+5.2), stalled (+12.2) and vagabonding (+10.1), but at the same time is stronger in adapters than in vagabonding people (+4.8); and iv) the Perception cognitive style is stronger in stalled than in adapters (+11.4), fixated people (+12.1) and vagabonding ones (+11.8).

3.5 Discussion

This laboratory experiment has been carried out to understand decision makers' cognitive styles at the base of their behaviours in DDM and their differences in the main drivers of the quality of those decisions, thus rapidity and accuracy. In this regard, specific evidence has been collected from a laboratory study that involved 203 graduate students in business administration, in which they experienced a DDM task.

Starting with the first hypothesis tested, namely if significant differences on accuracy and rapidity exist among adaptive behaviour and who deviates from it in DDM settings, evidence from the variance analysis, related to the first MANOVA, support this hypothesis. Indeed, adapters and fixated people have different taking action paces and accuracy, with the former being more rapid and having less accuracy than the latter, as well as fixated people having less accuracy than vagabonding ones and are the most rapid of all.

Firstly, it is important to look at those results, taking into account the conclusion of the work by Rudolph et al. (2009). Those scholars stated, based on their simulations, that the

high grade of plausibility of a cue, accompanied with a slow action, drives towards a fixated behaviour because the decision maker is more and more convinced of a possible erroneous alternative; in this case, having a fast action pace drove to a fixated behaviour. This result is in contrast with Rudolph et al.'s (2009) findings who support that having a high plausibility and a slow pace bring a fixated behaviour, while incrementing the rapidity when the plausibility is low, may avoid the fixated mode. From this study clearly emerges that a really fast pace, whatever the plausibility assigned to a cue, brings the decision maker to deviate from the adaptive behaviour and to fall into the fixated mode.

Looking at other studies on the influence of rapidity and accuracy in DDM settings, reinforces the above outlined considerations; indeed, how it was experienced in this case, having a faster taking action pace, that allowed the collection of feedback in a more frequent way than others, did not improve the performance of individuals, but, on the contrary, let people become fixated with a single hypothesis; this is in line with previous studies on timely information (Gonzalez, 2005; Lurie and Swaminathan, 2009). On the same point, the great amount of time spent by stalled people brings us to the conclusion that this overthinking is a symptom of the massive amount of doubts and uncertainty in the action to take (as previously discovered by Van de Calseyde et al. (2014)), thus carrying a low grade of confidence on that decision and, in this case, letting the general manager make the choice on their behalf. On the other hand, because the accuracy of some DDM behaviours was detected as not being so different among the behaviours, it is not possible to support previous studies declaring that an increment in accuracy brings adaptive behaviour (Gonzalez et al., 2003).

In addition, it has been detected that the time spent in DDM, which is dependent on decision makers' perception of it (Zakay, 1993), affected the accuracy of their decision

processes, as stated by Svenson et al. (1990); in fact, adapters, vagabonding and stalled people, who were detected as more accurate than fixated people, spent much more time than the latter. Taking into consideration the higher level of accuracy of adapters than fixated people and the timely feedback perceived by fixated people – because they were more rapid than adapters – concurs with Rudolph et al. (2009), for whom also a small change in the taking action pace determines the passage from the problem solving behaviour to another one.

The above discussed results clearly show that some pivotal differences among DDM behaviours on rapidity and accuracy exist; notwithstanding, several commonalities among those (e.g. the equal grade of rapidity between vagabonding people and adapters), raise the interest in investigating their cognitive style differences that are here considered to be at the base of the remaining unexplained divergences of DDM behaviours; this was done through the testing of the second hypothesis.

Results from this test show that the clear difference in rapidity and accuracy between adaptive and fixated people is accompanied by a great difference in the cognitive style of people in those groups; indeed, on the one hand adapters have an iNtuiting-Thinking cognitive style more marked than fixated people; on the other hand, fixated people are those that have the most marked Sensing-Feeling cognitive style as well as having the most marked level of Judgment cognitive style.

Deepening in particular the cognitive styles of adapters, it was recognized that they have a similar grade of iNtuiting-Thinking cognitive style – that characterizes half of the decision makers in that group – to vagabonding and stalled people. However, adapters generally diverge from vagabonding and stalled because they have a stronger grade of

clarity of Judgment than vagabonding and a lesser grade of clarity of Perception than stalled people.

From what has been said and from the results of the variance analysis, it is possible to draw the profiles of the other DDM behaviours thus: stalled people have the most marked iNtuiting-Feeling cognitive style as well as the most marked clarity in Perception cognitive style; vagabonding people have a similar grade of clarity of iNtuiting-Thinking to the adapters, but the former have a lesser grade of clarity of Judgment than the latter.

From this it emerges that well-defined iNtuitive-Thinkers with a higher sense of Judgment are the most suitable candidates for being the best problem solvers in DDM, supporting previous studies (Gardener and Martinko, 1996; Hough and Ogilvie, 2005), while the strong cognitive styles' difference between adaptive and fixated people could be the cognitive explanation of the feedback loop misinterpretation in the DDM, as stated by Brehmer (1995) and Diehl and Sterman (1995).

With regard to the cognitive style literature, results highlight that those who better processed information were iNtuitive-Thinkers, confirming that they are not as good at processing subjective data (Ferguson and Fletcher, 1987) as those given in the dynamic multi-step business case. On the other hand, the results do not support the study by Wally and Baum (1994) in which iNtuitive decision makers have a faster pace in information processing than other cognitive styles, or that of Taggart and Valenzi (1990) for whom Sensor people have a higher level of accuracy than others. Moreover, neither is the statement that iNtuitive-Thinkers are those who take more time to make decisions (Gardner and Martinko, 1996) confirmed.

Looking at the other DDM behaviours, the insight of Hough and Ogilvie (2005) on the scarce accuracy of Sensor-Feelers is quite supported; indeed, they are the majority in the

fixated behaviour which has a lower level of accuracy than adapters and vagabonding people (but equal to stalled ones), contrasting with previous works for which they were considered to have the greatest accuracy (Campbell and Kain, 1990; Davis and Elnicki, 1984; Taggart and Valenzi, 1990).

Furthermore, the results of this work do not show any influence of both the Extraversion-Introversion and Judgment-Perception dichotomies on the rapidity and accuracy in DDM settings, supporting the intuitions of Gardner and Martinko (1996) and Hough and Ogilvie (2005). On the other hand, it is pivotal to highlight that the difference among the DDM behaviours is influenced by the clarity of cognitive functions in those dichotomies and, for this reason, it is necessary not to overlook their study.

Finally, recalling the results of Hough and Ogilvie (2005) for whom Sensing-Thinkers, iNtuiting-Feelers and Sensing-Feelers have decision qualities that may be considered approximately the same, the present work suggests that differences exist because the intensity of their clarity, accompanied by the clarity of other cognitive styles, make all the difference in having a DDM behaviour.

3.6 Implications and Conclusions

This study linked the cognitive styles of decision makers with their behaviour in DDM as well as their rapidity and accuracy, topics to which scholars of this field have paid limited attention (e.g. Jensen and Brehmer, 2003; Kampmann and Sterman, 2014). Through a laboratory experiment, based on a dynamic multi-step business case, and the study of cognitive styles of participants, it was possible to define the cognitive functions at the base of their behavioural differences.

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The added value of this work is in showing that differences in DDM behaviour are not only based on discrepancies in the accuracy and rapidity of decision makers, but also accompanied by divergences in the clarity of their cognitive styles; this would also shed light on the differences of decision quality among different cognitive styles, previously regarded as not distinguishable (Hough and Ogilvie, 2005).

In particular, it is interesting to outline how this research has not only reinforced the general agreement for which iNtuiting-Thinkers basically are the most likely adaptive problem solvers, but it has also shed light on the difference, in terms of cognitive styles, from the other DDM behaviours. On this point, the marked Sensing-Feeling cognitive style with the most marked level of Judgment are at the base of fixated DDM behaviour, while the most marked iNtuiting-Feeling cognitive style with the most marked clarity in Perception are at the base of the stalled DDM behaviour.

On the difference between adapters and vagabonding people, the significant divergence in intensity among Judgment values, previously considered as not interesting in the related literature, has been seen to be pivotal in falling into one problem solving behaviour than into another. In fact, iNtuiting-Thinkers combined with a marked Judgment cognitive style are likely to be adapters, while if it is combined with a low level of clarity they fall in the vagabonding behaviour, even if they share the same level of accuracy and rapidity. This difference in cognitive styles is really important between those two behaviours because vagabonding people constitute the majority of the sample as well as the people more inclined, in terms of cognitive style, to be adaptive.

The outlined important conclusion raises the interest in debating decision makers' cognitive style make-up than sole information gathering and evaluation of cognitive style,

as also stated by Gardner and Martinko (1996) but subsequently refuted by Hough and Ogilvie (2005).

This study suggests focusing on the cognitive styles as the object to look at in order to manage the decision makers' behaviour, rather than varying the sensemaking during the different phases of DDM. Training in the chosen cognitive style (not only the adaptive), would be an easier approach than simultaneously training in managing the weight of cues under investigation, confidence in plausibility on each diagnosis or the pace to take in the three different phases. For example, if iNtuiting-Thinkers comprising the vagabonding behaviour are trained in (or self-improve) their level of Judgment, they become the best candidates for the adaptive behaviour.

Having shed light on the cognitive styles behind the DDM problem solving behaviours is pivotal in the old, but also the current, debate on the understanding of the *person-organization fit* (e.g. Cable and Judge, 1996; Chan, 1996; Yu, 2014); in fact, through the knowledge of the cognitive styles at the base of DDM behaviours, a little step forward for building the so-called 'psychological architecture of the firm' (Powell et al., 2011), could be considered as having been taken as a result of this work; managers who know that the types of decision that collaborators usually have to deal with have a high grade of dynamicity, may train those collaborators in different ways, depending on the final behaviour that needs to be expressed in those decisions.

However, some limitations affected this work, such as the fact that it looked only at the taking action step of DDM, which limited the study in being implicitly comprehensive of the interpreting steps of DDM, but without measuring their effect. Moreover, the fixed set of aspects to investigate during the resolution of the dynamic multi-step business case

excluded, *de facto*, the proactivity of decision makers in cultivating new alternatives to test.

Notwithstanding, future researches could deepen the understanding of how to successfully improve iNtuition and the Judgment cognitive style in order to become adaptive decision makers, if they 'were not born' that way. For example, other laboratory experiments could measure the level of those features and DDM parameters first and then give specific training to participants, and the results compared with those who did not receive the 'treatment'.

The interesting conclusions on some cognitive styles that had been considered as not pivotal by several scholars are here re-emerged from the dust; Furnham and Stringfield (1993) stated that: "the search for personality correlates and determinants of organizational behaviour has a lot in common with the search for the Holy Grail" (pp. 827-828). Despite that, scholars should not be discouraged from following its traces until its non-existence is proved.

Appendix A. Formulas of DDM Measures

Eq. (A.1) T_D = lapse of time to make the decision

Eq. (A.2) Average Time for Decision (ATD) = $(T_{D1} + T_{D2} + T_{D3} \ldots + T_{DN})/DN$

Eq. (A.3) Total Time (TT) = $T_{D1} + T_{D2} + T_{D3} \ldots + T_{DN}$

Eq. (A.4) Tendency to Make Quick Decisions (TMQD) = TREND $(T_1:T_N; D_1:D_N)$ − ATD

Eq. (A.5) Decision for Participant (DP) = DN × No. of competitors investigated

CHAPTER 4: Objectification, Facial Attractiveness, and Core Self-Evaluation Trait: A Moderated Mediation Model.

Outline

Since 1970s, scholars of the implicit personality theory have tried to understand the biasing role of candidates' beauty in personnel selection looking at their facial attractiveness. However, recruiters in today's organizations, through the use of social networks for screening, have the opportunity to look at the overall body of a candidate and gain a first idea of their personalities; those phenomena actually give a bias to their decisions. This work investigates the biasing role of candidates' body attractiveness (objectification) on the perceived main personality features (Core Self-Evaluation trait) in personnel selection. An experimental study which involved professional recruiters (N=100) was conducted. Participants rated objectification, perceived Core Self-Evaluation (CSE) trait, facial attractiveness, and willingness to hire of six candidates for an administrative position; then, a moderated mediation model was tested. This study found that CSE trait mediated the relationship between objectification and hiring score. Candidates had greater chances to be hired if their body was more attractive because it conveyed a greater personality, and this mediation was stronger when the candidate was highly ranked in terms of facial attractiveness.

Keywords: Objectification; Attractiveness; Personality; Core Self-Evaluation; Decision Making; Bias; Personnel Selection.

4.1 Introduction

Social networks are nowadays the largest repository of personal information that are accumulated along the time, and their entries can be searched at any moment (Viegas, 2005). Moreover, according to a widely cited work (Gross and Acquisti, 2005), people, especially young people, provide personal data without never limiting their privacy settings (standardly set to maximize users' visibility). Along those data, a great amount is composed of personal pictures, indeed about 1.8 billion are uploaded on social networks in less than a week (KPCB, 2016).

In today's organizations, is not unusual for recruiters to use those new media (e.g., Facebook, Linkedin, etc.), to collect information about candidates they are screening (e.g., Brandenburg, 2008; Kluemper & Rosen, 2009). Furthermore, social media experts and career organizations state that in 2008 about 45% of recruiters used social networks to find candidates (Grasz, 2009); this figure, considering all the human resource specialists, has been growing and it reached 70% in 2012 (Jobvite, 2010). On those occasions, they gaze at participants' bodies and have a first consideration of their *objectification*, thus, the phenomenon through which people assign to others (or to themselves incorporating the third-person point of view) a greater value on observable body parts than non-observable characteristics (Fredrickson and Roberts, 1997). This sexually implicit mechanism affects also their first impression on candidates' personalities, because beauty, somehow, affects inferences regarding personality traits (e.g., Dipboye & Colella, 2014); in total, those *unconscious influences* affect their judgment, biasing their personnel selection.

Indeed, since the late 1960s, scholars of the *implicit personality theory* have been trying to identify why some people are selected or perceived as best performers in a selection decision making process (e.g., Johnson et al., 2014; Lee et al., 2015; Solnick & Schweitzer, 1999), and the variables that have steadily received the most attention from them have been candidates' attractiveness and perceived personality (e.g., Chiu & Babcock, 2002; Dipboye et al., 1975; Heilman & Stopeck, 1985; Luxen & Van De Vijver, 2006; Paustian-Underdahl & Slattery Walker, 2015; Solnick & Schweitzer, 1999). Those studies, despite stating that attractiveness affects general attributions of personality, have not found any link with this; but, this difficulty mainly emanates from the fact the optimal theoretical lenses have not been applied and, as a consequence, the methodologies. Indeed, the study of candidates' attractiveness has been done always through the investigation of facial attractiveness (Dipboye et al., 1975; Heilman & Stopeck, 1985; Luxen & Van De Vijver, 2006; Lee et al., 2015). Consequently, results of those studies seem incomplete because not looking at either the distortional effect of gazing at the entire body nor being comprehensive of the new emerging personality variables, which are critical for personnel selection, such as the Core Self-Evaluation (CSE hereafter) which is the bottom-line evaluation that people have about themselves, the world and others (Bono & Judge, 2003; Judge et al., 1997; 2000), and that has been found to be a significant driver of success in personnel selection (Judge et al., 2009).

On this premise, no-one – to the best of the author's knowledge – has tried to focus attention on the key role of body attractiveness (not only facial) in terms of objectification and its effect on perceived personality (i.e., in this case CSE) in this meaningful phenomenon; from that the following research question emerges: '*Does the objectification of candidates bias the perception of core self-evaluation and the related hiring decisions?*'

Answering this question is pivotal in order to understand the role played in those decisions by the entire body figure due to the fact that in other fields it has been proved that the different perception of others' body affect the perception of others' abilities as well as the potential work relationship with them (Brown, 2006; Puhl *et al*., 2013). This is a very important topic in today's society in which about 1.9 billion adults, 18 years and older, are overweight (WHO, 2016), which is a main driver of objectification (Fredrickson and Roberts, 1997) as well as of evaluating people as suitable for a job (Borak, 2011). Indeed, even if attention has been given more and more to the role of the entire body in personnel selection (mainly concerned with the overweight problem) (Hunte and Williams, 2009; Pan et al., 2013), no evidence exists of its effects on the perceived personality characteristics of candidates in job selection.

Addressing the aforementioned research question is also significant, apart from filling the main gap highlighted above, for: 1) bridging some gaps in the implicit personality theory – i.e., conceptualization, operationalization, and the inclusion of average level of attractiveness – that have featured in this literature (Ashmore et al., 1991; Langlois et al., 2000; Morrow, 1990); 2) attempting to unveil both the behavioural effects – in social sciences – of the Objectification Theory (e.g., Zurbriggen, 2013), and to study – in general – the unknown interplay of the objectification trait and personality measures (Oehlhof et al., 2009; Szymanski et al., 2011).

The above outlined, meaningful question was approached through two studies. The first (N=110) involved graduate students, while the second involved 100 professional recruiters and was conducted in order to examine the generalizability of the first study, as undertaken in previous literature (Luxen and Van de Vijver, 2006; Lee et al., 2015).

In summary, this work attempts to reinforce the study of personnel selection and related biases through the adoption of two new theoretical lenses and methodologies in order to help in facing new challenges deriving from the evolution of the practical context. It is specifically aimed at scholars and professionals interested in learning more about the way that psychological and physical aspects may influence personnel selection decisions, as well as the methods to investigate this phenomenon.

4.2 Theoretical Framework

The Implicit Personality Theory

Stemming from the fact that interviewers always sketch a first impression of the candidates, also confirmed in the debriefing (e.g., Mayfield & Carlson, 1966), scholars over time have tried to identify the variables that play an important role in personnel selection decisions (see the extensive literature reviews by Ashmore et al., 1991; Langlois et al., 2000; Morrow, 1990).

This has been done to avoid unfair discrimination (i.e., not based on the scholastic standing and/or competences), especially with regard to attractiveness, which plays the most important role in employment decisions (e.g., Gilmore et al., 1986; Morrow, 1990), and is the main factor of selection when candidates have similar qualifications or job performance records (Hosoda et al., 2003).

In this regard, studies detected that some jobs, such as managerial positions, have been considered as masculine occupations rather than feminine ones[4], engendering that more

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[4] The terms masculinity and femininity mean the grade to which people perceive themselves as masculine or feminine, given their images in society.

attractive people are perceived as the best candidates for those positions (e.g., Dipboye et al., 1975; Schein et al., 1996). Indeed, attractive candidates have been considered from time to time as the best people to employ and, as a consequence, in previous research, they have been assigned the highest hiring scores (Dipboye et al., 1975; Jackson, 1983) or as the most successful and compensated with a higher income (e.g., Cann et al., 1981; Hosoda et al., 2003; Raza & Carpenter, 1987). On the other hand, attractive women have the advantage when applying for non-managerial positions because these are considered suitable for vacancies requiring feminine characteristics (e.g., Heilman & Saruwatari, 1979; Heilman & Stopeck, 1985).

Therefore, even if attractive people are perceived as more successful and with more desirable attributes (e.g., Solnick & Schweitzer, 1999), following the stereotype 'what is beautiful is good' (Dion et al., 1972), the characteristics of the job play an important role; this has been explained as the so-called 'beauty is beastly effect' (e.g., Heilman & Saruwatari, 1979; Heilman & Stopeck, 1985; Johnson et al., 2010, 2014; Paustian-Underdahl & Slattery Walker, 2015) for which attractive women are considered (by raters) as not suitable for some vacancies because of the lack of masculine characteristics needed for the job.

From a methodological point of view, attractiveness has been studied from time to time by only asking raters to rate facial attractiveness of candidates on different Likert scales (e.g., Beehr & Gilmore, 1982; Cann et al., 1981; Chiu and Babcock, 2002; Heilman and Saruwatari, 1979; Johnson et al., 2010); this operationalization has not been ever based on a specific conceptualization of beauty; indeed, candidates were always considered as attractive or unattractive without using specific validated scales and related constructs, thus

creating either a conceptualization or operationalization gap (Langlois et al., 2000; Morrow, 1990).

On a different point, but always debating methodological problems encountered in this field, some previous studies tried to investigate if, in jobs for which attractiveness may be an advantage, the physical attractiveness is related to some positive personality attributions. In this regard, Beehr and Gilmore (1982) investigated, through 13 bipolar adjectives related to general personality attributions, if the personality of candidates are, somehow, positively related to appearance, but results were not supportive. Other studies, on the contrary, found a link between the attractiveness of candidates with their personality because raters considered them as having specific suitable attributions for those jobs (Gilmore et al., 1986). Those results were different from what was stated in the previous literature; indeed physical attractiveness was thought of as closely linked to candidates' general personality characteristics (Berscheid & Walster, 1974; Dion et al., 1972). In particular, it is worth mentioning that Judge et al. (2009) found that facial attractiveness has a direct and indirect effect on income and this is partially mediated by core self-evaluation, thus the consideration of a rater of the main personality characteristics of a candidate is influenced by his/her facial attractiveness.

On the other hand, apart from the results of Judge et al. (2009) on the positive influence of facial attractiveness on the assigned income, previous scholars had tested this relationship and strongly affirmed that facial beauty brings higher assigned salaries (e.g., Dipboye et al., 1975; Jackson, 1983); thus, the greater the facial attractiveness, the higher the salary assigned to that candidate.

Objectification Theory

According to Morrow (1990), scholars following the implicit personality theory have been always focused on facial attractiveness of candidates but, however well studied in his literature review, a more holistic evaluation of attractiveness may be useful and only a few contributions have tried to follow this holistic view looking at other elements composing attractiveness, such as weight (Larkin and Pines, 1979). Who for first introduced this concept, from the feminist theory, was Bartky (1990) who define objectification as an event occurring when "[woman] sexual parts or sexual functions are separated out from the rest of her personality and reduced to the status of mere instruments or else regarded as if they were capable of representing her" (pp. 26).

In their seminal work, Fredrickson and Roberts (1997) proposed a theoretical framework on the so-called concept of objectification of girls and women based on the perception of their bodies, thus pushing the boundaries of the sociocultural effects of the female body. This theory is mainly based upon past considerations that females and males look at theirs and other bodies according to two dimensional views: observable and non-observable physical characteristics (Noll & Fredrickson, 1998). The person that looks at his/her own or another body tends to evaluate it upon both five appearance-based attributes (e.g., physical attractiveness, weight, etc.) and five competence-based attributes (e.g., muscular strength, physical coordination, etc.); the difference in the weight assigned to those two sets of characteristics determines the grade of objectification; the greater the weight given to appearance-based attributes rather than competence-based attributes, the greater the degree of objectification.

The process outlined above happens in contexts in which people are able to gaze at others, and for this reason are very difficult to be avoided. Divergently from the facial

attractiveness construct, objectification has its basis in looking at the whole body; this procedure lets people have a complete evaluation of the attractiveness of others, thus avoiding basing evaluations only on the facial attractiveness, which is only one part of the total.

In this regard, although the theory predicts that objectification occurs more in females than in males (Fredrickson et al., 1998), the objectification is enhanced in men because they also undergo it (e.g., Fredrickson et al., 1998; Fredrickson & Roberts, 1997). However, studies on men may carry less polarized results than for women because the latter are more likely to be objectified on a daily basis and, for this reason, have more evident psychological consequences (Swim et al., 2001). In practical terms, objectification of women (or men) occurs by other women (or men); it affects all the people (especially women) without regard to the social context in which it may happen, determining their social experience (e.g., Szymanski et al., 2011).

Through this permanent objectification, people derive some consideration of others' general personality characteristics. In this regard, Crandall (1994) discovered that overweight people make observers perceive them as lacking in discipline and self-control, thus not the best candidates for whichever job position; this is also confirmed by Finkelstein et al. (2010) who found that obese people are perceived as a higher cost for the organization rather than non-obese people. Moreover, body size seems to have an inverted U-shaped effect on the probability of being employed, showing the presence of "body size discrimination" which is mainly driven by the aesthetic appearance of the candidate's body (Pan et al., 2013).

Core Evaluation Traits

According to Judge et al. (1997), CSE is the bottom-line evaluation that people have about themselves, the world and others. Judge et al. (1997), in particular, identified that some traits have been the most studied (in isolation) in industrial psychology since the 1960s, and discovered how those traits are significantly interrelated (average correlation was found to be .64; Judge et al., 2002) and all of them load on to a common factor called the CSE trait (Judge et al., 1997). On this premise, the four traits at the base of this theory are: 1) Self-Esteem, the overall value that a person has with regard to himself/herself, 2) generalized Self-Efficacy, the self-estimation of being successful, 3) Locus of Control, the belief in controlling life's factors, and 4) Emotional Stability, the capacity to maintain a low level of neuroticism.

As demonstrated by Bono and Judge (2003), the CSE construct, formed by all the four items, is more suitable for investigating job performance than other previously used methods (i.e., the Big Five, and in particular the Emotional Stability measure). On the same point, some general personality features – i.e., Self-Esteem and Locus of Control - were also found to be critical in the implicit personality theory because of having huge effects in personnel selection decisions due to predictors of job performance (Hollenbeck et al., 1989).

In particular, this new construct substantially affects both the perception of job satisfaction and job performance (Judge et al., 2001); indeed, it has been demonstrated that the CSE trait predict better human behaviour in terms of motivation and performance, rather than using the isolated sub-constructs. This insight was studied linking those traits to job satisfaction, and this led to find a positive correlation mediated by job characteristics

(Judge et al., 2001); for instance, when a person has a positive CSE, then he/she likes his/her job and, subsequently, the satisfaction is positive.

Later, some developments were made to this model. In one of the recent studies by Judge et al. (2009), it was discovered – and is significant for this work – that attractiveness has a positive effect, through the mediation of the CSE trait, on income. Those identified relationships are embedded in a more comprehensive model proposed by Judge et al. (2009) that (unfortunately) neither explains if those relationships work differently by gender (although it was considered as a control variable), nor if highest scores in CSE trait reflect high hiring scores.

The Core Self-Evaluation Traits construct is useful due to its interconnection with important aspects of human behaviour and attitude at work (e.g., Bono and Judge, 2003), and it has been suggested that it should be included in measures of personality in the personnel selection decisions, although it has been identified as having a slight moderate aversion to women (Judge et al., 1997). This construct is crucial not only in determining self-evaluation on personality constructs, but also for the evaluation of others' personality variables. Indeed, as is well reported by Bono and Judge (2003): "situation specific appraisals (for example the evaluation of one's work or one's colleagues) are affected by these deeper and more fundamental self-appraisals, even though most people are not aware of the influence their self-evaluations have on their perceptions or behaviour as they occur" (p. S6).

4.3 Hypothesis Development

From what has been explained in the theoretical section, when masculinity or femininity characteristics for a vacancy are not specifically requested (e.g., Dipboye et al., 1975; Schein et al., 1996), the facial attractiveness of candidates has a positive effect on income (Dipboye et al., 1975; Jackson, 1983) and on hiring scores (e.g., Cann et al., 1981; Hosoda et al., 2003; Raza & Carpenter, 1987), and this relationship is mediated by the CSE trait (Judge et al., 2009).

On the other hand, the perception of candidates' bodies is considered as a more important predictor of employability than facial attractiveness, because it has been proved to be the principal factor that drives employers' decisions when other conditions are equal (Finkelstein et al., 2010; Pan et al., 2013). Objectification should work in the same manner as facial attractiveness with regard to the effect on CSE; indeed, according to Crandall (1994), overweight people that are usually low objectified (Fredrickson and Roberts, 1997) are perceived as lacking in discipline and self-control, two features that can be related to those underlined by the CSE trait such as, respectively, self-efficacy (Bandura, 2006) and emotional stability (Friese and Wanke, 2014). Accordingly:

Hypothesis 1: The CSE trait partially mediates the relationship between objectification and hiring score.

In this vein, facial attractiveness amplifies or reduces the effect of body perception and its general influence on the outcome variable. This moderation comes from the fact that physical attractiveness is one of the items considered in the objectification questionnaire (Fredrickson et al., 1998) that has the power to increase or decrease the objectification value; because of that, facial attractiveness is supposed to work as an external item (to the objectification questionnaire) that can amplify or reduce the objectification power. Indeed, it has been widely demonstrated that people with greater facial attractiveness have greater value of CSE trait (Judge et al., 2009) as well as being more employable candidates (Cann et al., 1981; Hosoda et al., 2003; Raza & Carpenter, 1987); from that, facial attractiveness should have a reinforcing effect on objectification when both the values are positive. Accordingly:

Hypothesis 2: Facial attractiveness moderates the relationship between objectification and the CSE trait such that the relationship is stronger for candidates with higher facial attractiveness.

Figure 4.1 Hypothesized model
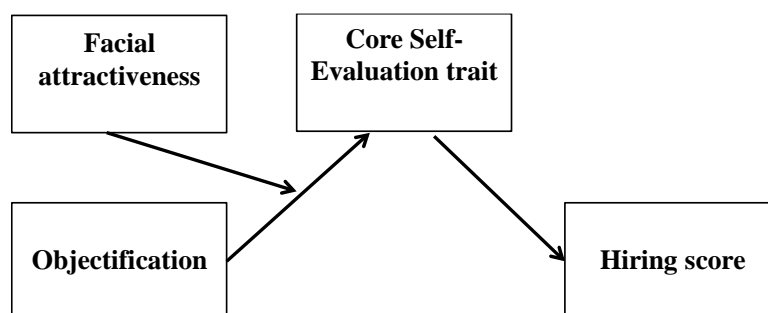
4.4 Method

Participants. One hundred professionals in personnel selection (50 male, 50 female, M_{Age}= 33.8, SD= 9.22) were recruited from Amazon's Mechanical Turk (see also Lee et al., 2015) and were compensated ($3 each); participants were English mother tongue and Caucasian.

Experimental Design and Procedure. At the beginning of the experiment, the researcher explained the interest in studying personnel selection decisions, how done by previous experimenters (e.g., Heilman and Saruwatari, 1979). Participants were aware from the beginning that they were going to select candidates for a vacancy and that the aim of the research was to try to identify if their perception of Objectification, facial attractiveness and CSE trait of candidates may have some influence on their personnel selection decisions. The participants were provided with the Trait Objectification Questionnaire (TOQ) and four bipolar adjectives which are at the base of the CSE theory, in order to rate their perception of objectification and CSE of six candidates (three men and three women). Subsequently, the rest of the material was provided and participants were asked to define the grade of employability of the candidates.

Participants were made aware that all the candidates had all the requirements for the position (namely: 26 years old, a Master's degree in Business Administration, one year's experience in the same position, and fluency in English), thus there is already a match between candidates' *task-related* characteristics and task requirements for the position. At the end, the participants were debriefed, any questions were dealt with, and they were thanked for their participation. It is worth noticing that this experimental protocol has been

well-established by scholars over the years (Dipboye et al., 1975; Heilman and Saruwatari, 1979; Jackson, 1983; Johnson et al., 2010).

Stimulus material. Six candidates (three men and three women) for an administrative position in a company were proposed to respondents, who were assured that the candidates satisfied all the job characteristics: i.e., being 26 years old, had graduated in Business Administration, with one year's experience in a similar position and being fluent in English.

A whole picture for each candidate, firstly chosen by the researcher from an online database[5], was provided; in the pre-test phase, 36 pictures (18 men and 18 women) had been selected and later they were rated through the Trait Objectification Questionnaire by a sample of 24 graduates in business administration.

All the candidates were Caucasian people, standing up and positioned against a white background, as well as being business-casual dressed and with no particular facial expressions, gestures or wearing accessories (i.e., glasses). In order not to bias the study because of other variables, the people in the photos were also assessed on their perceived: i) intelligence, ii) education, and iii) age, in order to make sure that the candidates shown in the pictures were almost similar (except for objectification); those were assessed through a Likert scale (ranging from 1= low to 7= high). Among the more and the less Objectified men and women, no significant difference in mean was encountered ($M_{intelligence}$= 3.5, SD= 1.1; $M_{education}$= 3.3, SD= 0.75; M_{age}= 3.9 SD= 1.25; $p > 0.05$) on each of these variables.

Six pictures (three women and three men) identifying people with the highest (M_{woman}= 10.22, SD= 6.07; M_{man}= 11.36, SD= 6.40), lowest (M_{woman}= -3.86, SD= 9.75; M_{man}= -5.00,

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[5] All the rights of the pictures were purchased from a photobank website. Purchased pictures that include people are allowed to be inserted in publications because all the module releases are signed by the people in those pictures.

SD= 7.40) and 'normal' (M_{woman}= 3.41, SD=7.13; M_{man}= 2.72, SD=7.98) value of objectification were selected; the last one was calculated as the closest value to the midpoint of a line segment in which the extremes are the highest and the lowest ones. The addition of the neutral group with average level of objectification was made in order to fill the gap highlighted by Morrow (1990) for which no groups, with average level of attractiveness, had been considered in previous research.

Job description. In the pre-test phase, following Beehr and Gilmore (1982), a sample of graduates in business administration (N=24) were asked to read the job description for an administrative position and rate on a 7-point Likert scale (1= strongly disagree, 2= disagree, 3= slightly disagree, 4= neither agree nor disagree, 5= slightly agree, 6= agree, 7= strongly agree) how much they agree with the following proposition: 'attractive employees do this job better than unattractive ones'. Moreover, the same sample was asked, after having been instructed on the meaning of masculinity and femininity job characteristics, to rate (on the same 7-point scale as above) an administrative job as a position more suitable for people with masculine or feminine job characteristics (two different questions).

The results showed no agreement with the first proposition (M= 1.43, SD= 0.63) as well as identifying this job as *neutral* ($M_{masculinity}$= 1.30, SD= 0.54; $M_{femininity}$= 1.33, SD= 0.71), which was considered to be useful in this case in order to isolate the variables being investigated without being influenced by the job description.

4.5 Measures

Objectification. With regard to assessing objectification, the Trait Objectification Questionnaire (TOQ) was administered (Strelan & Hargreaves, 2005). In this questionnaire, respondents were asked to rank in order from 1 (the least impact) to 10 (the most impact), the physical attributes of 10 candidates – five on physical appearance (physical attractiveness, weight, sex appeal, measurement, muscle tone) and five on physical competence (muscular strength, physical coordination, stamina, physical fitness, physical energy level) – by how important they are while looking at them. Scores were computed by the sum of the ranks for the appearance and competence attributes separately, and then by computing a difference score. Scores ranged from +25 (highest) to -25 (lowest); those results were obtained by computing the difference between the sum of the scores on physical appearance and physical competence attributes. This questionnaire is the Strelan and Hargreaves (2005) slightly modified version of the Trait Objectification Questionnaire (i.e., questions are posed in an active way rather than in a passive way) that has proved to be consistent (i.e., Cronbach's alphas ranging from .87 to .91; Fredrickson et al., 1998), and valid (Noll & Fredrickson, 1998).

Facial Attractiveness. In order to study the moderating role played by facial attractiveness, respondents were asked to rank the attractiveness of the six candidates on a separate sheet in which all the portrait photographs were shown. As for previous works in this field (Cann et al., 1981; Hosoda et al., 2003; Judge et al., 2009; Raza & Carpenter, 1987), this ranking was based on a 7-point Likert scale (1= extremely low attractiveness, 2= very low attractiveness, 3= low attractiveness, 4= moderate attractiveness, 5= high attractiveness, 6= very high attractiveness, 7= extremely high attractiveness).

Core Self-Evaluation Trait. In this study, a series of four bipolar adjectives (i.e., semantic differential scales) measured through a nine-point rating scale have been used in order to identify the perception of raters about candidates: i) Esteem, ii) Efficacy, iii) Locus of Control, and iv) Emotional Stability. This method of measuring variables related to self-concept (in this case measuring the perception of the self-concept of others) is in line with previous studies (e.g., Friborg et al., 2006); indeed, bipolar adjectives have been massively applied by scholars in the implicit personality theory for discovering the perception of raters on candidates' attributions (e.g., Heilman & Saruwatari, 1979; Heilman & Stopeck, 1985).

The variables at the base of the four bipolar adjectives are the pillars of the assessment of CSE, (Judge et al., 2003) which is investigated by the Core-Self Evaluation Scale questionnaire (CSES) that has proved to be reliable – looking both at internal consistency (Cronbach's alphas are, on average, .84) and test-retest reliability ($r = .81$ over a 3-month period) – and valid (Judge et al., 2004).

In this work, the nine-point rating scale ranges from -4 (lowest value) to +4 (highest value) with 0 representing the centre of the scale; the four bipolar adjectives at the base of it are the following: "confident-unconfident", "effective-ineffective", "controlling-controlled", and "balanced-neurotic". These adjectives were verbally introduced before starting the laboratory experiment, through a brief explanation of their meaning according to the definition of Judge and Bono (2001).

A Principal Component Analysis was then conducted on the results of the pre-test in order to reduce those variables on to the measurement of the CSE Trait latent construct; this is a procedure followed by other scholars (e.g., Friborg et al., 2006) that also

demonstrated that sometimes, as in the case of self-sentiments, it produces better results than performing the same analysis on Likert scale values.

Firstly, it was observed that some factors (confident-unconfident and controlling-controlled) correlated at 0.55, suggesting a possible factorability. Secondly, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.68, in line with the commonly accepted value of 0.60 (Shadish, et al., 2002), and Bartlett's test of sphericity was significant ($p <$ .05). The diagonals of the anti-image correlation matrix were also all over 0.6. Finally, three communalities out of four were all around .60, confirming that those two items shared some common variance. Initial eigenvalues indicated that the four factors explained about 52%, 24%, 13%, and 11% of the variance, respectively. The four factors solution was preferred because of its theoretical support (i.e., consistent with the Core Evaluation Traits theory). The four items had the following primary loadings: .83 for "confident-unconfident", .82 for "effective-ineffective", .76 for "controlling-controlled", and .37 for "neurotic-balanced"; while, the internal consistency for those factors was examined using Cronbach's alpha that resulted in being moderate at .61.

A composite score for the outlined factor was built based on the mean of the items which had their primary loadings on the factor (i.e., regression-weighted) with higher scores indicating a higher CSE of the candidate perceived by the participant.

Hiring score. Following previous literature (Dipboye et al., 1975; Jackson, 1983; Cann et al., 1981; Hosoda et al., 2003; Raza & Carpenter, 1987), participants rated candidates on the hiring scores through a 7-point Likert scale (ranging from 1= extremely low intention to hire that candidate to 7= extremely high intention to hire that candidate).

4.6 Findings

Preliminary analysis

In Table 3.1 are shown data about means, standard deviations and intercorrelations among the three variables; the Pearson's correlation analysis that took into account the values of the objectification of candidates and their facial attractiveness demonstrated a significant but moderate positive correlation between those two items (r= .41, n= 100, p= .00). This provided an initial support for the moderation relationship that has been hypothesized. Moreover, also objectification and CSE were moderately correlated (r= .44, n= 100, p= .00), while the latter and hiring score were slightly correlated (r= .25, n= 100, p= .00).

Table 4.1 Means, standard deviations and intercorrelations of the measured variables

	Mean	SD	1	2	3	4
Objectification	2.62	12.05	1	.410**	.443**	.232**
Facial attractiveness	3.01	4.02	.410**	1	.338**	.135**
CSE	4.94	4.61	.443**	.338**	1	.248**
Hiring score	5.23	4.39	.232**	.135**	.248**	1
Sample size: 100. **Correlation is significant at 0.01 level (2-tailed).						

Mediation analysis

Hypothesis 1 stated that CSE works as a mediator between objectification and hiring scores; first a mediation analysis was conducted according to the procedure highlighted by Aiken and West (1991); following those authors, all the variables that were categorized as continuous were centred in order to avoid multicollinearity. To test hypothesis 1 the SPSS macro by Preacher et al. (2007) was used, as already done in other works concerned with

moderated mediation tests (Baron and Kenny, 1986; Zhao et al., 2014), as it helps in estimating the indirect effects though the Sobel test and bootstrap approach. In Tables 3.2 and 3.3 the results of this test are shown.

Table 4.2 Direct and total effects of objectification on hiring score through CSE

Variable	B	SE	t	p
Hiring score regressed on objectification	.134	.02	-2.05	.00
CSE regressed on objectification	.27	.04	-4.38	.00
Hiring score regressed on CSE, controlling for objectification	.14	.01	2.34	.00
Hiring score regressed on objectification, controlling for CSE	.08	.03	-.89	.35
Sample size: 100.				
Model summary: R^2= .25; Adjust R^2= .20; F (4, 95)= 13.22 (*p*=.00)				

Table 4.3 Regression summary for the moderating role of facial attractiveness on the relationship between objectification and the CSE trait.

Sobel for the indirect effect						Bootstrap for the indirect effect				
Effect size	*SE*	LL95 % CI	UL95 % CI	Z	*p*	Point estimate	*SE*	LL95 % CI	UL95 % CI	*p*
-.06	.01	-.09	-.02	-2.83	.00	-.06	.01	-.10	-.03	.00
Sample size: 100. Bias-corrected CI is reported.										
Bootstrap sample size = 5,000.										

In Table 3.2 it is shown that objectification was positively associated with CSE (B= .27, p = .00), and CSE was positively associated with the hiring score (B = .14, p = .00), yielding an indirect effect on hiring score (.06). Also the Sobel test, shown in Table 3.3, supported the significance of the indirect effect (Effect size = –.06, z = –2.83 with 95% CI did not contain zero), as did bootstrap results showing that a 95% bias corrected CI (–.10, –.02) did not contain zero; both the Sobel test and the bootstrap test verified Hypothesis 1, which can be considered as fully supported.

Moderated mediation

Hypothesis 2 stated that facial attractiveness works as a moderator in the mediation process outlined above. Table 3.4 points out that the interaction terms for objectification and facial attractiveness were significantly related to the CSE trait ($\beta = .20$, $p < .01$). Moreover, according to Aiken and West (1991), the interaction effect at different levels of the CSE trait (i.e., one standard deviation above or below the mean of facial attractiveness) is further depicted in a plot.

Table 4.4 Indirect effect of objectification on hiring score through the CSE trait.

	CSE as dependent variable					
	Step 1		Step 2		Step 3	
	Beta	*t values*	**Beta**	*t values*	**Beta**	*t values*
Independent variable						
Hiring score			.13	1.98**	.16	1.96
Moderate variable						
CSE			.11	1.86	.14	1.44*
Hiring score × CSE					.27	2.85**
R^2	.02		.05		.09	
Adjusted R^2	.03		.04		.08	
F	3.22**		4.45**		5.99**	
dfs	3, 106		5, 104		6, 103	
*p<.05.						
** p<0.1.						

In this regard, Figure 3.2 shows that the interaction patterns were as expected, indeed the relationship between objectification and the CSE trait was stronger for high scores in facial attractiveness than for low scores. From what has been said, Hypothesis 2 can be considered as successfully supported.

Figure 4.2 Interaction of objectification and facial attractivenes on the CSE trait.
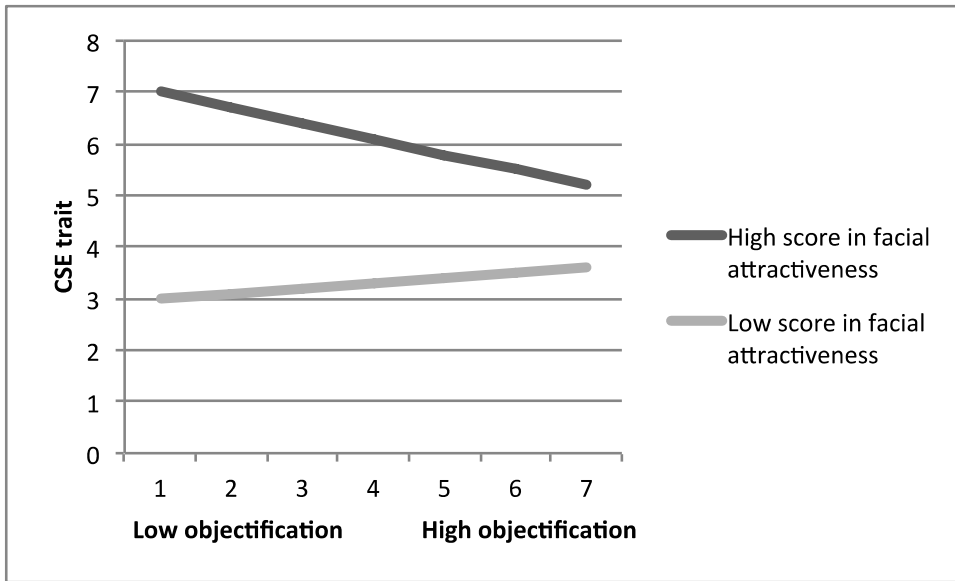
4.7 Theoretical Implications

This work has tried to shed light on the role of objectification and the CSE trait in personnel selection decisions and their novel contribution – in theoretical and methodological terms – in the new debate about the distortional effect of physical attractiveness of bodies and its causative effect on the perceived personality of candidates. This contribution answers the call of other scholars in defining in a better way the role played by attractiveness and its operationalization (Ashmore et al., 1991; Langlois et al., 2000; Morrow, 1990) as well as defining the influence of the entire body figure on the perceived personal characteristics (Borak, 2011; Crandal, 1994; Hunte and Williams, 2009; Pan et al., 2013) in order to explain why some people are rated more highly as efficient, confident or emotionally stable, thus being more employable.

Firstly, as expected, the CSE trait worked as a mediator between the objectification trait and the hiring score assigned to candidates, confirming the previous assumptions based on the already identified connections between facial attractiveness and the CSE trait (Judge et al., 2009). This result sheds light on the reasons behind the choice of not hiring overweight or obese people, that are as a consequence less objectified than thin candidates (Hunte and Williams, 2009; Pan et al., 2013). The results from the experiment leave no space for doubts on the importance played by the variable introduced, *id est* objectification. On the one hand, the more a candidate is objectified the highest assigned scores in terms of CSE trait and, as a consequence, willingness to hire. This first result, supporting H1, led the objectification theory to reach the same conclusions as the implicit personality theory, thus, that the most attractive candidates (in this case the most objectified ones) have greater chances of being employed (e.g., Cann et al., 1981; Hosoda et al., 2003; Raza & Carpenter, 1987), because of their more desirable personality features (Judge et al., 2009).

Secondly, a moderated mediation model has been developed in order to advance our understanding of the influence of attractiveness, in terms of objectification, on hiring scores. It was hypothesized and subsequently proved that the facial attractiveness of candidates works as a moderator in the relationship between objectification and hiring score via the CSE trait; in particular, this relationship is stronger when the candidate was highly ranked in terms of facial attractiveness. This result reinforces older assumptions that the beauty of people, in terms of facial attractiveness, gives them greater possibilities of being hired (e.g., Dipboye et al., 1975; Jackson, 1983). The two findings show that the model of choice, according to the attractiveness of the candidates (when other conditions are equal), is more complex than the previous ones, but at the same time it is more complete; indeed, with this model we can now understand the relationship between facial

and body attractiveness and their role in job selection, that were merely hypothesized in the past.

Those results have led the researchers to state that raters decide on candidates by taking the candidates' objectification into consideration, when the quality of their curricula is the same (a similar effect was detected with physical attractiveness; see Hosoda et al., 2003); this may be called 'the objectified is better effect' for which beauty, seen through the lens of objectification, and moderated by the older implicit personality theory focused on facial attractiveness, works as a currency for success (e.g., Miner-Rubino et al., 2002).

Through the adoption of the Objectification Theory lens, the two main problems of the attractiveness construct have now been overcome, thus, its operationalization and conceptualization (Morrow, 1990); indeed, in the previous literature, attractiveness has always been studied through different and not psychological validated scales with a different meaning given to beauty (e.g., Heilman and Saruwatari, 1979; Heilman and Stopeck, 1985; Johnson et al., 2010, 2014; Paustian-Underdahl and Slattery Walker, 2015). This construct has the competitive edge of being at the base of a psychological theory for which effects have been studied in different contexts carrying on to a consolidated and validated methodology.

On the other hand, the Core Evaluation Traits Theory has widened its advantage of considering the four traits at the base of CSE. This construct is regarded as critical in investigating the perception of job satisfaction and job performance (Judge & Bono, 2001; Judge et al., 1997), attitude at work (e.g., Bono & Judge, 2003), and for this paper, it has been indispensable for discovering the key role of perceived CSE and objectification. Moreover, this is the first work – to the best of the author's knowledge – in which the Core

Self-Evaluation construct is applied in an active way, thus from people to other people, implementing the recommendation by Bono and Judge (2003).

Practical Implications

From a practical point of view, some suggestions that may be taken from this work are the following: in order to avoid biases derived by the objectification effect (falling for candidates that are the most objectified), recruiters should increase the amount of information about candidates (i.e., through looking at CVs, biographies, scores on personality tests, etc.), which has been demonstrated as being a deterrent for those distortions (e.g., Bull et al., 1988). For candidates, setting a higher level of privacy on their social network profiles could be useful but, at the same time, may be perceived as a wish to hide something; in either case, the most efficient strategy is to increase the quality of the CV (i.e., greater experience, greater academic record, etc.), as demonstrated by Watkins and Johnston (2000); this is in line with the literature regarding cognitive bias for which enhancing the information base reduces the occurrence of bias (e.g., Kahneman, 2011). Finally, showing a great level of CSE would be an advantage in personnel selection; from that, highlighting confidence, and effective, controlled, and balanced personality features are perceived as having high motivation and being inclined to great job performance.

Limitations and Future Directions

Future research can enhance the objectification and CSE trait relations through the inclusion of the study of the similar-to-me effect among ratees and raters (Kanter, 1977); this would unveil whether some connection exists between what a recruiter thinks about

himself/herself in terms of objectification and CSE trait and what is perceived from the raters about the same characteristics.

Following the suggestion given in the practical implication sub-section regarding the work by Watkins and Johnston (2000), it also may be interesting to study the differences of the moments in which recruiters enhance their first impressions about the objectification of the candidate and the perceived the CSE trait with other pieces of information derived from their CV, experiences, and interests, in order to study if this new information really changes their first thoughts.

Finally, due to the simplicity of reproducing the choice environment mediated by social media platforms, it would be more and more fruitful and also easier to carry out field experiments in the near future, where recruiters - in a more real context - may actually experience a daily situation and behave as they really do; this would also solve the generalizability problem highlighted by Morrow (1990) for which the enhancement of results is conditional on the use of 'paper people' instead of more realistic contexts.

Conclusions

This thesis is aimed at giving answers to some of the new challenges that have emerged from the redefinition of the bounded rationality concept at the base of all managerial decision making processes. This research gap was filled through a first understanding of what has changed in the study of managerial decision making by looking at the evolution of the bounded rationality concept, then the new challenges that arose in the last decade were faced through the application, in general, of methodologies directly coming from the behavioural studies in management and, in particular, from the implementation of the psychological research practice that is at the base of the study of the human mind.

In this regard, in Chapter 1 the historical evolution of the bounded rationality pillar concept in management research was traced, taking into account all the other domains connected to it that gave different and important insights to the development of the original idea. Through this historical review it was possible to highlight the new challenges that are coming from new-born cross-fertilized fields, such as behavioural strategy and neurostrategy, which are increasingly attracting the interest of management scholars. Even if the mix of methodologies and different assumptions, deriving from interconnected fields, seem to be the new avenues of research in bounded rationality, scholars have to be aware of the difficulties in applying insights that are principally medical and not useful for dealing with the managerial challenges. It is critical to understand that the challenges arising from those mixed fields are sometimes dissimilar to those in the management field; for example, neurostrategy is not concerned with group decision making and the underlying decision making processes, while behavioural strategy is mainly focused on the scaling of the understanding from an individual level to a collective one.

This first chapter mainly helped to identify the bounded rationality concept in the light of all the adjustments and discoveries that were focused on it in management and related fields, thus to redefine 'what' bounded rationality is and its importance in today's management research and practice.

In Chapter 2 the main results are supportive of the initial assumption that quality control mechanisms applied to the main decision making processes are fruitful for the advancement of decisions' success. Indeed, through the in-depth investigation of the decision making processes at the base of three new business initiatives of a not for profit organization, it was possible to deduce that even if cognitive and procedural biases are probably driven by the personality of the decision makers in charge of those decisions, the structure of the decision path and the implementation of some decision quality control mechanisms can enhance the success of a specific decision because of the reduction (or elimination) of the distortional effects behind them. Those results and related conclusions are very practical oriented and addressed to practitioners who want to know 'why' distortions in managerial decision making happen and give a first insight on 'how' to reduce or eliminate them.

In Chapter 3, the improvement of the understanding of 'why' a decision flow had that specific path, as raidsed by Nutt (2011) as a new frontier of the studies in managerial decision making, was the main challenge faced. This contribution shed light on the cognitive styles at the base of different Dynamic Decision Making behavior, but, at the same time, it highlighted the need to continue investigating the role of all cognitive styles in decision making. Indeed, although previous studies demonstrated that some cognitive styles are not significant for managerial decision making (Gardner and Martinko, 1996; Hough and Ogilvie, 2005), in terms of differences, this contribution dusted the importance

of that features when facing dynamic decisions. The implications of this work are pivotal for all the executives that are concerned with the right cognitive styles to have in order to pursue an adaptive behavior, as well as for the researchers that are involved in the study of human dynamic decisions.

Finally, the results of Chapter 4 demonstrated that even if our understanding of the underlying mechanisms of a cognitive distortion seems to be accurate after decades of research on a specific theme, the advancements made in other scientific domains, in this case psychology in general and feminist theory in particular, can add value and new insights to an already established construct. Indeed, thanks to the implementation of the psychological variable of the objectification, scientifically born in the 1990s, it was possible to redefine a well-established mechanism, such as the attractiveness bias in personnel selection, transforming it into a moderated mediation model with more interconnections and powerful explanations of the phenomenon, shedding light on 'how' it occurs. This is more proof that the bounded rationality concept benefits increasingly from the discoveries made in other scientific fields and that already confirmed concepts can also be read in a new light if applying other theoretical lenses.

This final chapter had the main value of explaining 'how' well-defined distortional mechanisms work in the light of the new challenges that have emerged from some changes in the work environment and management practice; in particular, the new methods for recruiting people raised the importance of having more complete models for understanding the psychological factors never considered before in managerial practice that are conversely quite well-established in the psychological domain.

A redefinition of the bounded rationality concept and, as a consequence, of the managerial decision making research and practice, has to start from the inclusion of other

discoveries in different domains that face the same issue. Only through this implementation is it possible to advance the understanding of 'how' people make decisions in organizations and 'why' they do that in their specific ways; as taught by Herbert Simon through his scientific life, shedding light on the human mind cannot go without the application of different theoretical lenses and methodologies that come from various domains, especially when we are investigating decisions that are taken in socio-technical environments such as *organizations*.

The study of the decision making processes in organizations has the same assumptions, challenges, and hidden traps of the study of human decision making in general. However, investigating how to ameliorate decision making processes in socio-technical environments has the advantage (or fault) of conditioning the life of a larger number of people in society that are with those systems interconnected because of the related chain of reactions. A single (not stand-alone) decision in an organization always produces a domino effect that may involve an indefinite number of people and choices; from that, tending towards the understanding of 'what' is at the base of the managerial decision making processes, 'why' the managerial decision making processes are not always successful and 'how' those distortions work, has a growing importance for the entire society. However, even if the difficulties in opening the human black box appear to be insurmountable because of several factors that may take part in the processes of the human mind, always conditioned by the particular environment in which people are embedded, scholars do not have to be discouraged from looking for the right *key* – usually hidden in the partially investigated shared areas of social science.

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