

# Differences between Entrepreneurs and Managers in Large Organizations: An Implementation of a Theoretical Multi-Agent Model on Overconfidence Results

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**Abstract.** The well-known research carried out by Busenitz and Barney (1997) exploring differences in the decision-making processes between entrepreneurs and managers in large organizations has been revisited and redesigned as a starting point to create a computational and theoretical Multi Agent Model (MAM) which shows differences in the decision-making processes. In the original study, researchers showed the presence of a different disposition in incurring in biases and in heuristics by entrepreneurs and managers. In particular, two interesting trend curves on the Overconfidence effect have been realized. Authors concluded by stating that the Overconfidence effect is significantly different in entrepreneurs and managers and helps distinguish between these two work categories. Starting from this conclusion and from their results, a computational and theoretical MAM has been designed, where, as suggested by the authors, different decision-maker agents can incur in the Overconfidence effect with different degrees.

**Keywords:** Multi Agent Models, Organizations, Entrepreneurs, Biases, Overconfidence.

## 1 An Introduction to the Individual Differences in Biases and Heuristics

Over the last five years, researchers in psychology and social sciences (Bruine de Bruin, Parker, & Fischhoff, 2007; Sartori & Ceschi, 2011, 2012) have strongly stressed what classical studies by famous Amos Tversky and Daniel Kahneman among the others found long ago: individual differences play an extremely important role in the availability to incur in biases and heuristics.

Individual differences are also reflected in career choices, so it becomes of some interest to study people who take different professional roles, such as entrepreneurs and managers. These studies were conducted by means of several experiments in order to describe the decision-making processes taken by people and to recognize differences between the pure rationality of several economic theories.

In order to better understand the real processes of choice, researchers prefer to test when the rational choice is being violated rather than validating the human ability or

following several theoretical assumptions and axioms. In fact, the violation of rational choices can be measured experimentally, by carrying out the same experiments conducted in order to identify them.

In a sort of way, the degree of using the System 2 rather than the System 1 or the level of rationality (in strict meaning) is measured by analyzing the disposition of individuals in using several heuristics or incurring in cognitive biases. The ability to result in non-normative choices varies from individual to individual because heuristic responses are sometimes overridden by a non-autonomous analytic system of thought (Stanovich & West, 2000).

## **2 The Busenitz and Barney Research, a Summary**

Research on differences between entrepreneurs and managers in large organizations has usually examined psychological and personal/demographic differences (Favretto & Sartori, 2007). After a great deal of research, it is now generally concluded that most of the psychological differences between entrepreneurs and managers in large organizations are small or nonexistent, although some exceptions exist. For example, such individual psychological attributes as locus of control and risk-taking have been shown not to vary significantly between entrepreneurs and managers in large organizations (Begley & Boyd, 1987; Sexton & Bowman, 1984), but some consistent psychological differences have been documented in need for achievement, tolerance for ambiguity and need for conformity (Begley & Boyd, 1987; Miner *et al.*, 1989). Despite the fact that very few studies have shown statistically significant differences between entrepreneurs and managers in large organizations in their risk-taking propensity (Brockhaus, 1980; Low & MacMillan, 1988), this individual psychological difference continues to be discussed as an important variable for understanding entrepreneurial behavior (Stevenson & Gumpert, 1985; Ray, 1994).

The study by Busenitz and Barney (1997) aimed at understanding why entrepreneurs and managers in large organizations may vary in the use of heuristics and biases, by measuring their disposition in incurring in Representativeness and in Overconfidence. Busenitz and Barney (1997) collected a sample from the two populations and, in order to measure the biases, they used two different tasks. To measure the Overconfidence, a task extracted from a study by Fischhoff, Slovic, and Lichtenstein (1977) was used. It was composed of a series of questions based on death rates from various diseases and accidents, such as: "Which cause of death is more frequent in the United States? A. Cancer of all types, B. A shark attack". Respondents had to indicate the level of confidence that they had in their answers on a scale ranging from 50% to 100%. A response of 100% would indicate that they were totally confident that their choice was right.

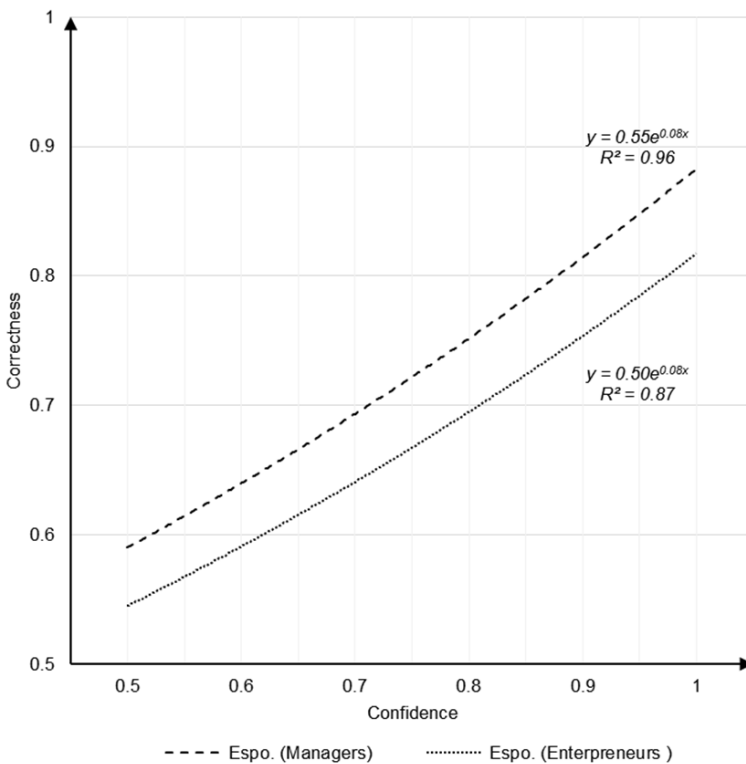
Results confirm the hypothesis that entrepreneurs manifest the Overconfidence effect in decision-making processes more extensively than managers in large organizations. They showed how overconfident entrepreneurs are by drawing summary results and combining the correct percentage of responses given and their general level of overconfidence.

In accordance with the results found, we designed two exponential trend curves (Figure 1). Exponential curves of tendencies in Figure 1 indicate that entrepreneurs are in general more overconfident in their choices compared to the correctness of their responses. Instead, managers are less overconfident in their responses.

### 2.1 Feeling Overconfidence Under Uncertainty

Considering the results presented, it is possible to think about the presence of a different approach in feeling and managing overconfidence by these two categories. As previously showed, managers and entrepreneurs react differently in front of situations featured by different levels of uncertainty. If a low level of correctness is related to a low level of information necessary to individuate the right response, then the contextual level of uncertainty will be high. This brings individuals to respond to the situation with different levels of overconfidence depending on several factors, in part summarized to certain individual differences.

Considering the data here presented, it is possible to deduce that, in front of the same uncertain environment, managers will tend to respond with less overconfidence than entrepreneurs. Results allowed to think of a computational and theoretical Multi Agent Model (MAM) where decision-makers deviate from the strict econometric approach and where they can incur in overconfidence with different degrees (Figure 1).



**Fig. 1.** Exponential trend curves of incurring in Overconfidence effect

### 3 Multi-Agent Models for Designing the Organizational Behavior

One characteristic of Multi-Agent Models (MAMs) is the possibility of creating different agents with unique characteristics capable of producing different behaviors once that a particular behavior has been studied through empirical research that considers individual differences.

In this way, it becomes possible to insert different coefficients into the model capable of simulating different agent behaviors (Ceschi, Hysenbelli, Sartori, & Tacconi, 2013; Ceschi, Hysenbelli, & Slovic, 2013). The next section will propose a computational and theoretical MAM starting from the empirical results presented above.

#### 3.1 Creating Different Agents with MAMs

The results presented from the study by Busenitz and Barney (1997) allow to create agents with different capacity of managing events on the basis of their level of overconfidence. The possibility of simulating in organizations the behavior of entrepreneurs and managers should consider this empirical evidence, where the level of confidence grows logarithmically and differently on the basis of the uncertainty level present into the system, which can be resumed with the following equation:

$$c = \ln\left(\frac{i}{\alpha}\right) \gamma$$

where  $i$  is the level of information present into the environment (or at the opposite, the level of uncertainty)  $\gamma$  the empirical constant equal to 1.25, and  $\alpha$  is the level of overconfidence. These parameters allowed to design two kinds of agents with different levels of confidence ( $c$ ) based on a normal distributed  $\alpha$  (Figure 1).

### 4 Conclusion

The present study has presented a methodological approach to implant empirical theories on MAMs. We think that it could be a good example in order to show how “generative science” works and how to connect experiments which come from the descriptive approach to agent based models. We encourage this way of making science which is more connected and integrated in order to develop relevant interdisciplinary studies.

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