

# **Entrepreneurial Profiling**

**- stimuli, reaction, action**

**A COGNITIVE APPROACH TO ENTREPRENEURSHIP**

**ANNA LEVANDER  
ISABELLA RACCUIA**

STOCKHOLM SCHOOL OF ENTREPRENEURSHIP  
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## 1 ABSTRACT

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"It is the road that make the goal worthwhile" is a familiar saying among entrepreneurs. Why can so many entrepreneurs relate to this expression? The purpose of this thesis has been to discern why some individuals choose to become entrepreneurs, and presumably also succeed as such. By testing whether there are any pre-dispositional cognitive abilities that are characteristic for entrepreneurs and differentiate them from non-entrepreneurs, this thesis can contribute to the explanation of what determines entrepreneurial behavior.

Utilizing a new test battery, including test variables little studied, gave us the possibility to examine not merely cognitive differences, but also differences in executive ability. The necessary data was obtained by testing entrepreneurs with a computerized aptitude test (APT). Furthermore, a North American study has concluded that entrepreneurs to a larger extent than non-entrepreneurs suffer from ADHD, or hyperactivity. Since an ADHD-diagnose often affect individuals' cognitive abilities, an additional questionnaire assessing ADHD was used. 32 entrepreneurs participated in the study and their results have been compared to three control groups, one representing the population norm, one group of executives and one group of academics.

Our analysis of the APT-results indicates that there are significant differences between the cognitive profiles of entrepreneurs and non-entrepreneurs. The most apparent difference is the entrepreneurs' extraordinary performances regarding focused attention, something that has led us to the conclusion that the entrepreneurs' ability to focus completely and wholeheartedly on a task can be a reason for their choice of becoming entrepreneurs and also for succeeding as such. Since so extremely focused, they have the ability to maintain a high concentration even if tired or in an environment where there are many potential distractions. The results of the ADHD-questionnaires also display a highly significant overrepresentation of ADHD-individuals among the entrepreneurs, indicating that entrepreneurs can be characterized as stimuli-driven (a distinctive attribute for ADHD-individuals). Environmental stimuli are probably what the entrepreneur reacts to and what motivates her/him to work hard. The reward must not be economic gain, but might as well be a sense of personal satisfaction from having engaged in tasks perceived as interesting and stimulating.

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## 2 INTRODUCTION

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*"The problem of explaining why some succeed while others fail is crucial to the study of economic development"* (Casson, 1981, p.10).

Despite the fact that cognition, executive ability and personality are the main psychological factors that affect behavior,<sup>i</sup> cognitive psychology was long neglected as an explanatory variable of entrepreneurial behavior. It is only lately that this perspective has gained recognition, which suggests that valuable insights into the questions of what determines entrepreneurial behaviour may be obtained through careful comparison of the cognitive abilities of entrepreneurs and non-entrepreneurs (Baron, 1998; Delmar, 1996). Entrepreneurial research on cognition has generally yielded disappointing results, partly due to small or poorly chosen samples but also to vague definitions of entrepreneurial performance. Furthermore, test batteries of high statistical power and objectivity have been hard to find.

By testing thirty-two (32)<sup>ii</sup> successful entrepreneurs with a computerized aptitude test battery (APT<sup>iii</sup>), this study aims at discerning not merely cognitive differences, but also differences in executive ability between entrepreneurs and non-entrepreneurs. We propose that if discovering or creating opportunities and deciding to capitalize on a business opportunity is, at least to some extent, a function of cognitive abilities, then perhaps these abilities can help us discern entrepreneurs from non-entrepreneurs and predict who will presumably succeed as an entrepreneur. The three control groups consist of; (1) academics, (2) executives and (3) a normative scale based on a large sample of Swedes with varying characteristics.

Furthermore, a North American study has concluded that entrepreneurs to a larger extent than non-entrepreneurs suffer from ADHD, or hyperactivity. Since an ADHD-diagnose often affect individuals' cognitive abilities, an additional self-report screening instrument for ADHD (Attention Deficit Hyperactivity Disorder), developed at the Department of Psychiatry at Lund University, has also been administered on 32 entrepreneurs.

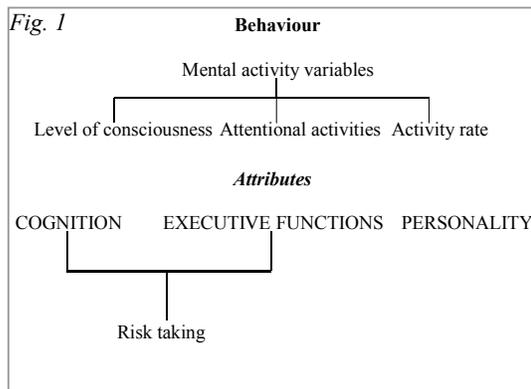
After this brief introduction we are ready to formulate hypotheses based on the following questions: Do entrepreneurs possess cognitive- and executive abilities that differ from those of non-entrepreneurs? If yes, which are those specific abilities and to what extent can they explain why a person becomes an entrepreneur? And; Can entrepreneurs to a larger extent than the normal population be diagnosed with ADHD? The following hypotheses will be tested:

$H_1$ : There are differences in cognitive- and executive abilities between entrepreneurs and non-entrepreneurs.

$H_2$ : Entrepreneurs with ADHD out of the sample group >4%, the average for an unselected population.

### 3 THEORETICAL FRAMEWORK

#### 3.1 BEHAVIOR AND ENTREPRENEURSHIP



In neuro psychology, *behavior* is to a large extent influenced by cognition, executive functions and personality (fig.1). When choosing to further investigate entrepreneurial behavior through cognitive and executive abilities it therefore becomes logical to focus on theories of cognitive psychology.

##### 3.1.1 Mental Activity Variables and Entrepreneurship

The differences between individuals depend partly on the efficiency of the mental processes that are intimately involved in cognitive operations but do

not, on their own, have a unique behavioral end product.

**Consciousness** may be defined as the general level of activity of the brain, e.g. being awake and receptive to stimulation. The level of consciousness ranges over a continuum from coma, via full alertness to disorganization and panic. The inverted relation between level of arousal and performance has repeatedly been demonstrated in general psychology, that is, for each task complexity there is a corresponding optimal level of arousal. It is possible that one aspect of entrepreneurial skill is the ability to modulate arousal effectively, i.e. to be able to work for extended periods of time on a task-adjusted optimal level of arousal.

**Attention** involves several processes that are related aspects of how an individual becomes receptive to stimuli and how she or he process incoming information. Attention varies not only between individuals, but also within individuals under different conditions. Focused attention involves being aware of and dealing with information, while at the same time suppressing competing distractions (i.e. the ability to concentrate and focus). An entrepreneur, since constantly subjected to large flows of information and in never-ending need for flexibility and change of strategy, might have more developed attentional abilities than non-entrepreneurs.

**Activity rate** refers to the speed at which mental activities are being performed. The most common way of measuring the mental activity rate is by testing the reaction time of an individual while performing a specific task. Entrepreneurs can be assumed to have a relatively high mental activity rate.

##### 3.1.2 Cognition and Entrepreneurship

Lezak (1995) has defined four cognitive classes that are considered to affect and influence an individual's behavior. Normally, all functions are integrated into a complex pattern that is partly shared and partly unique for each individual.

**Receptive functions** include entering information, coded in a meaningful way, into the central processing system. They also comprise *information processing*, which has shown to be vital in decision-making tactics - tactics that differ between individuals and between situations. Baron & Markman

(1999) suggest that entrepreneurial success is closely related to the way entrepreneurs perceive information and process knowledge.

Central to all cognitive abilities is the capacity for **memory and learning**. There are at least three long-term storage memory systems and one short-term (*working memory*) of interest in cognitive theory. In this study only the short-term memory is tested. The working memory requires continuous attention, otherwise the memory traces disappear within a few minutes. The amount of information that can be kept active and manipulated over longer periods of time varies markedly among individuals.

**Thinking** is an umbrella term, which includes a large number of cognitive abilities such as computation, reasoning, judgment, concept formation, organizing and problem solving. The ability to shift comparatively rapidly between different concepts and to adopt different perspectives on a concept is a prerequisite for carrying out the operations necessary for most problem solving (McCarthy & Warrington, 1990). That is, one must be able to change and to modify one's responses in a flexible way.

Baron and Markman (1999) speculate that entrepreneurs create opportunities rather than discover them. This implies that venture creation is based on opportunities generated by complex thinking. If business opportunities were just lying around, noticeable to all, a lot more people would become entrepreneurs. Why? Because receptive functions, i.e. reacting to stimuli and processing information are quite basal abilities of all individuals. Thinking, on the other hand, (i.e. *the activity of the frontal lobe*) is unique and varies among individuals. If we want to find salient differences among human beings we should also look at the functions of the frontal lobes, i.e., at *executive functions*. The APT battery was specifically designed to assess such functions, and is unique among psychological tests in the way this is done.

### **3.1.3            *Executive Functions and Entrepreneurship***

Regardless of whether a person discerns an opportunity or not, it takes executive functions and great determination to transform the vision into reality. Executive ability is considered to include the below following variables;

**Volition** refers to the capacity for intentional behavior. It requires the capability to formulate a goal or an intention. Intentions can be well formulated by most individuals, but very few manage to transform these visions into reality. Entrepreneurs do, and the reason might be explained partly by motivation, including the ability to initiate activity, which is a necessary precondition for volitional behavior.

**Planning** refers to the identification and organization of the steps and elements needed to carry out an intention. The planner must be able to conceive alternatives, weigh them, make choices and entertain ideas necessary for the development of a conceptual framework or structure that will give direction to the carrying out of a plan. The results of planning also demand memory skills and the capacity for sustained attention. The flexibility and ability of entrepreneurs to process large amounts of information found in earlier research may indicate that the planning procedure and the ability to conceptualize changes in the environment is a significant ability of an entrepreneur. The APT test will give us an indication of the entrepreneurs' planning capacities.

**Purposive action** describes the translation of an intention or plan into a productive, self-serving activity, which requires the actor (in this case the entrepreneur) to initiate, maintain, switch and stop sequences of complex behavior in an orderly and integrated fashion. Disturbances in this programming activity seldom arise when routine or simple tasks are being executed. But when it involves more complex activities, where there are no known ways of doing things, the lack of or the possession of an excellent programming ability becomes more obvious. In the APT test, the respondent has to make deliberate choices and hence give proof of purposive action.

A **performance** is as **effective** as the performer's ability to monitor, self-correct and regulate the intensity, tempo and other qualitative aspects of delivery. It involves choices of strategy (for example speed vs. correctness), choices that are essential to an entrepreneur in an ever-changing environment. In prior studies it has been stated that entrepreneurs are too forward-looking and optimistic (Palich & Bagby, 1995), neglecting mistakes made earlier, while others show that entrepreneurs have an ability to respond positively to challenges and learn from mistakes (Timmons, 1999). The APT test will give

insight to entrepreneurs' choices of strategy and their flexibility when facing change in a task that should be met with a different strategy.

### **3.1.4 Risk Taking and Entrepreneurship**

It has since long been acknowledged that risky decisions are not based solely on rationality. Confronted with uncertainty in general equilibrium conditions, it is an individual's predisposition toward risk that affects the decision to pursue an entrepreneurial career (Bird, 1989). The risk propensity studies are predicated in support of risk taking being pre-dispositional rather than simply situational. Accordingly, risk taking should be treated as a cognitive characteristic.

Surprisingly, efforts to reveal differences between entrepreneurs and others with respect to risk-taking and other aspects of personality have met with only modest success (Bird, 1989). Still, considerations of risk and potential losses are crucial elements in the decision to start a new venture. Entrepreneurial theory has long viewed entrepreneurs as bold risk-takers, willing to put both their own fortune and others' at stake. Conversely, executives in many well-established firms are thought to be risk averse, preferring safer ventures with lower potential return. Both of these views have been challenged. Some argue that there are no differences in risk-propensity between entrepreneurs and non-entrepreneurs (Brockhaus, 1980), while others have found evidence that risk-prudence of entrepreneurs is a necessity for efficient risk-management and thus vital for the survival of the venture (Timmons, 1999). The APT-battery does not contain a specific variable that measures risk-taking, but does give a fair estimate if an individual acts impulsively (uncalculated risk-taking). Other variables within the test that can give an indication of risk-taking propensity are flexibility in choices of strategies and consistency in problem-solving strategies.

### **3.1.5 ADHD - Attention Deficit Hyperactivity Disorder**

Attention Deficit Hyperactivity Disorder (ADHD) is a common childhood neurobehavioral disorder occurring in 3-7% of children and mainly in males (Vassileva et al, 2000). Recent studies indicate that ADHD continues into adulthood in 30-60% of cases. Many entrepreneurs are school dropouts, having failed to complete their studies at a higher level than high school (Levander, 1999). The syndrome of ADHD offers an explanation to why these seemingly talented individuals are unable to pass higher studies. Individuals diagnosed with ADHD have difficulties concentrating for longer periods of time, unless they are genuinely interested in the task at hand. They also have a hard time accepting failures (Dock, 2000). But generally, ADHD also results in high levels of creativity, turning the individual into an energetic person and idea-generator who gets thoroughly involved in tasks she or he finds interesting.

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## **4 ANALYSIS**

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### **4.1 DATA ANALYSIS**

This section shortly summarizes the study's main findings. For more elaborate explanations of the test sessions and the statistical data analyzed by SPSS we refer to the longer version of this thesis.

Analysis of the test results shows that entrepreneurs differ cognitively from the general population, and to some extent from a group with similar background and professional experience, the executive group. The most striking difference is a remarkable capacity to focus attention on a single task. Focused attention was significantly higher for entrepreneurs than for norm data. It is noteworthy that four out of 29 entrepreneurs performed 3 SD above norms. It is obvious that this is a highly significant finding.

A speculative hypothesis might be that ADHD among entrepreneurs is associated with the ability to hyper focus.<sup>iv</sup> This hypothesis was supported by our study in which ADHD-individuals were found to be highly over represented among the entrepreneurs. 12 individuals from the sample group of 32 participants showed signs of ADHD (37.5%), which should be compared to the population mean of 4%. Interestingly, out of these twelve only seven (7) indicated signs of childhood ADHD, and thus (5) show strong signs of having present ADHD, without having had ADHD as children. Only one (1) had recovered from childhood ADHD.

We have hereby gained support for our main hypotheses;  
*There are differences in cognitive- and executive abilities between successful entrepreneurs and non-entrepreneurs.*

*Entrepreneurs with ADHD out of the sample group > 4%, mean for an unselected population.*

Other interesting findings also came out of the study. For example, we found that the entrepreneurs showed an overall higher tendency to having an impulsive character, meaning that speed was preferred to accuracy and that the speediness, to some extent, was not calculated but a result of carelessness. This was particularly clear when confronted with the more complex tasks, where the entrepreneurs lost in speed as well as in accuracy while scores reflecting impulsive errors increased. This indicates that entrepreneurs are more likely to take risks since the lessened accuracy was not offset by an equal increase in speed, thus a risk of lower performance was taken.

Furthermore, the entrepreneurs showed an inability to change problem solving strategies. Their flexibility was significantly lower than for the norm group. Moreover, in contrast to the executives, the entrepreneurs did not have a very homogenous IQ profile. Entrepreneurs more often displayed either a high IQ 2 (practical) or IQ 3 (academic), while there was a higher correlation between the two IQ scores among executives.

What surprised us was that the entrepreneurs had deficient executive abilities, or at least lower than expected. A possible explanation to this is elaborated under section 4.2.2.

## 4.2 EMPIRICAL ANALYSIS

### 4.2.1 *Focused Attention as a Result of Environmental Stimuli*

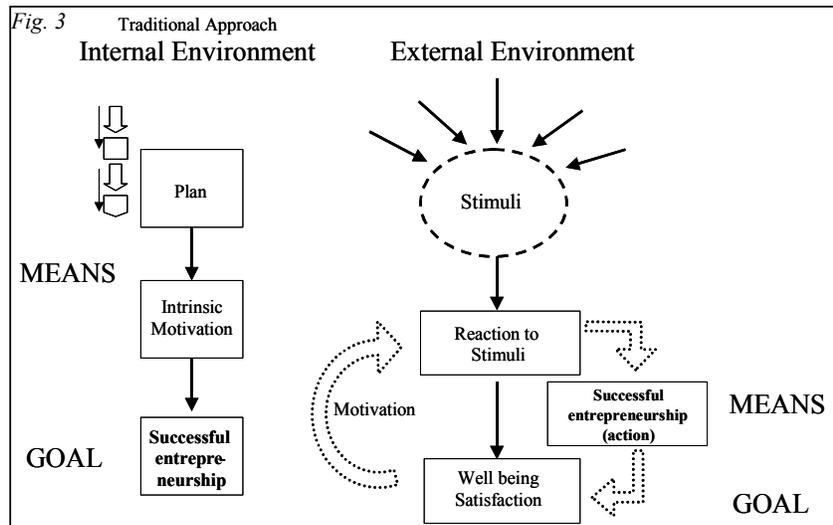
The entrepreneurs' superior ability to focus can be a reason for their choice of becoming entrepreneurs. It is possible that this aptitude makes them immune or less susceptible to tiredness or environments that contain many potential distractions. Being able to select the relevant information, and at the same time not being disturbed by other irrelevant information is likely to be a necessity in venture creation.

The entrepreneurs were able to maintain both a high accuracy level and a high-speed level as long as the tasks presented to them were simple and guidelines were clear. As the tasks became more complex the entrepreneurs approached the demarcation line where the maintenance of speed compromises accuracy disproportionately. The level of flexibility was normal during the simple tasks but decreased significantly during the more complex tasks. This might indicate that entrepreneurs, when faced with new, complex problems, have a tendency to stick to their usual way of doing things, no matter if it is the most efficient one. Possibly, this phenomenon can be related to the often-observed behavior among entrepreneurs, namely that they keep going no matter what the obstacles are until they reach their goals.

Individuals with ADHD tend to be stimuli driven. Environmental stimuli that are novel, varied and challenging increases the arousal level of the central nervous system, which is often sub-optimal for ADHD individuals, thereby inducing improved performance and subjective well-being. Once an individual experiences the first "kick" of something that share attributes with venture creation, it is likely that the individual will try to re-experience the kick – a learning loop is created, which will enforce the link between venture creation and well-being. Motivation is built by the expectation of well-being linked to the pleasure-generating environments and activities. This model suggests that an entrepreneur is not necessarily someone who has a well-specified purpose or goal when involving in venture creation. Rather, as many entrepreneurs state it themselves: "It is the road that makes the goal worthwhile". To apply the theory of stimuli-driven action on entrepreneurs seems logical in light of our results of a high frequency of ADHD among the test participants. The entrepreneurs seem to look forward, motivated by different stimuli, and when acting upon these stimuli they can focus since they are motivated to do so. They may have an added advantage in such situations – their superior focused attention capacity. Obstacles are perceived as small, the increase in well-being is significant, the entrepreneurs keep going on, and on and on, where others would have failed or given up before long.

The motivational theory (Delmar, 1996 and Isachsen, 1996) elaborates the concept that entrepreneurs act on intrinsic motivation, i.e. work hard and succeed because they find a task interesting and enjoyable. Our findings support this theory but from a different angle. The motivation is not necessarily a means to obtain successful entrepreneurship, but rather a factor resulting from responding to the need of being stimulated and feeling well. The reaction to stimuli can vary, and the successful creation of a company or project can be considered as means of handling the never-ending need to respond to stimuli. Being a

successful entrepreneur is considered the goal in the motivational theory of entrepreneurship, while we suggest that the goal is expected well-being via learning. The creation of a company demands continuous attention and engagement, and motivation is the driving force to further reactions to stimuli. In figure 3 we reformulate the motivational model and draw up a new model of entrepreneurship including cognitive factors that are characteristic for entrepreneurs.



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#### 4.2.2 *Uncalculated risk taking and lack of executive ability*

It might even be because of poor self-efficacy that the entrepreneurs choose to become entrepreneurs, not recognizing their own limits.<sup>v</sup> It is possible that the entrepreneurs' inability to evaluate their current performance critically is one explanation for their lack of flexibility. Thus, uncalculated risks were taken because they overestimated their performance. Furthermore, the test revealed that the entrepreneurs were significantly lower in consistency than the norm, meaning that the test participants were not learning from mistakes. The low consistency can be derived from poor planning or working memory problems, but can also reflect a habitual and pervasive problem-solving style, in which analytical rationality has a lower priority than instinct. All these explanations are well-known clinical characteristics of the ADHD disorder.

Obviously, many successful entrepreneurs are able to look upon obstacles as non-problems, thus dealing with the situation at hand without planning in advance. This ability in combination with the extreme ability of focused attention, and possibly in many cases additional kinds of abilities that makes the entrepreneurs able to concentrate and act efficiently. Thus, some results on executive ability obtained within the test were significantly higher than average. These are probably a result of the entrepreneurs' speediness and perseverance. The planning deficit is probably the factor decreasing executive performance for more complex tasks to a moderate level, lower than what was expected. These findings of entrepreneurs being less skilled in planning, resulting in a lower executive ability, are also supported by research conducted by Vassileva et al (2000).

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## 5 CONCLUSIONS

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### 5.1 IMPLICATIONS

#### 5.1.1 *Lack of certain cognitive abilities demand complementary talents*

Prior research (Baron & Brush, 1998) has claimed that one single entrepreneur can never be ascribed to have created business success. Instead, a prospering company is often the outcome of an efficient teamwork generated by people who each possess distinctive skills that complement each other. Our

findings support these assertions: Since the test participants proved to lack planning skills, the entrepreneurs need to be aware of the fact that they should attract skillful people to be a part of their closest network at an early phase. Thereby, the entrepreneurs can concentrate on being innovators and stimulators while others care for the planning and execution. Venture capitalists should also be aware of this, making sure that the new ventures they invest in consist of efficient teams instead of focusing on the single entrepreneur.

### ***5.1.2 Sole focusing on social skills/capital is not recommendable***

A comprehensive investigation of entrepreneurs' cognitive abilities will give venture capitalists/ established firms more efficient tools for evaluating entrepreneurs in order to guarantee a sufficient level of abilities necessary for success. This study has verified that entrepreneurs do have extraordinary abilities to focus wholeheartedly and solely on one task, meaning that they might become successful entrepreneurs even though they lack other abilities.

Researchers (Hisrich & Jancowicz, 1990) have proven that social skill and personal chemistry is of importance for entrepreneurs' possibilities to raise money from venture capitalists.<sup>vi</sup> This indicates that many of the individuals given money for their business ideas might only be good "talkers" with likable personalities, but without any real knowledge or ability to become a successful entrepreneur. Since very few venture capitalists in Sweden test the entrepreneurs to whom they give substantial financing, but instead trust their "gut feeling", there is really no guarantee that the entrepreneurs have the necessary abilities in terms of cognition, intelligence and executive ability to become successful. Baron (1998) shows in a study that social skills, social adaptability and social capital seem to play a very significant role for entrepreneurs' chances of getting seed money, wherefore entrepreneurs with less social skills should be given lessons in how to better build their social capital. Another reasonable implication of this research, not mentioned by Baron, is to make venture capitalists aware of the fact that they make decisions on how well they "like" an entrepreneur, rather than on relevant information, such as cognitive abilities.

### ***5.1.3 Change of leadership as companies grow and markets mature***

The entrepreneur might not be the most suitable person to lead a former start-up company when moving into a more mature phase with less market uncertainty and a larger organization. As the environment becomes more predictable and secure, environmental stimuli will decrease resulting in a less motivated entrepreneur. There is thereby a risk that the entrepreneurial leader will become bored and unfocused since no longer exposed to challenging stimuli. As a result, she or he is probably no longer the most suitable person to manage the company. This implies that venture capitalists and entrepreneurs at an early stage should agree on an appropriate exit or transfer for the entrepreneurs into performing other tasks, such as product development, a source of ideas or a specialist/expert/consultant.

### ***5.1.4 Organizational aspects worth considering***

If the entrepreneur's success in venture creation is dependent on a challenging environment providing rich and varied stimuli, organizations should be organized accordingly. It is often said that an organization should be ad hoc structured and flat in order to generate new creative ideas, not to suffocate them. This might be true to some extent. On the other hand, if the stimuli-driven entrepreneur has to engage in all tasks concerning the company or project, as is the case in anarchy-like organizations, she or he is not likely to perceive this environment as stimulating. By consequence, her or his ability to focus decreases. This implies that ad hoc structures must be combined with some structure as to who does what, else the entrepreneur will have to engage in non-stimulating activities, which is inefficient.

By further studying and mapping the factors that can be considered as positive stimuli factors for entrepreneurs, companies can create suitable working environments where entrepreneurial behavior can flourish, thus reducing the risk of valuable intrapreneurs leaving their organizations. Some individuals with ADHD are perceived as a disturbing element in organizations. By directing the creativity in the right direction, these individuals can instead become a valuable source of innovation.

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<sup>i</sup> Cognitive abilities are innate and refer to capabilities such as perception, attention, memory and learning, problem solving, thinking, self-efficacy and ability to express oneself.

<sup>ii</sup> Only 29 of the respondent's testing scores were complete, and therefore three are excluded from the analysis.

<sup>iii</sup> Automated Psychological Test.

<sup>iv</sup> This is a well known but anecdotal phenomenon observed by clinicians working with ADHD patients.

<sup>v</sup> The APT test showed that entrepreneurs have lower self efficacy than the norm.

<sup>vi</sup> See Baron & Brush (1998).