EVALUATING UNIVERSITY STUDENTS' COGNITIVE STYLE AS REFLECTED IN THEIR ABILITY TO RECOGNIZE BUSINESS OPPORTUNITIES

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ABSTRACT

The purpose of this study was to investigate whether cognitive style and entrepreneurial alertness are important in identifying university students with the potential to recognize business opportunities. The study also investigated whether these constructs discriminate between individuals studying in business and engineering schools. Data were obtained from students involved in a business school (n=117) and an engineering school (n=75), both at a private university in Mexico. A control group of non-students also formed part of the study, thus providing a comparison between the scores of the target population and the general population (n=51). The results indicate that students were more intuitive than non-students, but it was not possible to identify a significant difference in the entrepreneurial alertness between both groups. Likewise, results show that it was not possible to confirm the difference in the cognitive styles between business and engineering students. Results also show that more intuitive students exhibited higher levels of entrepreneurial alertness and that the students in business school exhibited higher entrepreneurial alertness than the students in engineering school. The findings of this study suggest that cognitive style may be helpful in discerning whether students have the ability to recognize business opportunities, which is an important topic within the field of entrepreneurship.

Keywords: Cognitive Style, Entrepreneurial Alertness, Business Opportunities.

INTRODUCTION

One of the fundamental questions in entrepreneurship research is why only some individuals but not others recognize opportunities for new products or services (Shane & Venkataraman, 2000; Baron, 2006). Much recent research has been devoted to better understanding the opportunity recognition process, and entrepreneurial alertness has been a central concept during the last two decades to examine this topic from a cognitive perspective (Sharma, 2019). According to Allinson & Hayes (2012), cognitive style may also provide a promising advance to better illuminate how individuals process information and consequently recognize opportunities.

Following a review of the previous literature, Grégoire et al. (2011), Armstrong et al. (2012), and Pryor et al. (2016), suggest that one take into account the equally important and concurrent cognitive and behavioral mechanisms to explain opportunity recognition. In essence, they suggested that previous cognitive research in entrepreneurship is built on the premise that individuals who are interested in entrepreneurial activities think differently from other individuals with different interests. However, it is not clear whether this cognitive difference originates from the tasks and environmental conditions that reward individuals with a particular style of thinking or from conditions that encourage the expression or development of such

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thinking (Baron, 1998). Similarly, and according to Grégoire et al. (2010) and Mueller & Shepherd (2016), it is not clear whether this cognitive difference originates from the idiosyncratic factors and events that predate individuals' efforts and actions for recognizing business opportunities or from the acquired knowledge exhibited by these individuals during their professional studies.

Interestingly, previous studies have shown that developing entrepreneurial competencies such as entrepreneurial alertness (e.g., Uy et al. 2015; Obschonka et al. 2017) and cognitive style (Allinson & Hayes, 2012) can provide a basis for identifying individuals who have the potential to become entrepreneurs. The present study compares individuals studying in a business school with those studying in an engineering school in terms of their cognitive style and entrepreneurial alertness.

LITERATURE REVIEW

Cognitive Style

According to Pryor et al. (2016), a cognitive perspective can be invaluable to the field of entrepreneurship, because it can help to illuminate the role of individuals in the entrepreneurial process. In essence, the cognitive perspective emphasizes the mechanisms through which individuals acquire information, enter it into storage, transform it, and use it to accomplish a wide range of tasks (Sternberg, 1999). Within the intersection of cognitive research and entrepreneurship, the cognitive style perspective has been identified as promising in explaining entrepreneurial behavior (Grégoire et al. 2011).

As a concept, cognitive style refers to an individual's preferred and habitual approach to organizing, representing, and processing information (Kickul et al. 2009). Cognitive style influences how people scan their environment; how they gather, structure, and interpret environmental information; and how they augment or change their mental models as a result of guiding their subsequent behavior (Hayes & Allinson, 1998). Previous studies have shown various conceptualizations of cognitive style, with differences in operationalization and measurement approaches (e.g., Armstrong et al. 2012). However, researchers converge on the general view that various cognitive styles can be considered on a spectrum. The proposal by Allinson & Hayes (1996) is based on an intuition-analysis classification following the previous taxonomies of individuals, understanding that there is no dichotomous classification beyond a continuum of cognitive styles. According to Hayes & Allinson (1998), analysts have been found to show high attention to detail; focus on "hard data"; and adopt a sequential, step-by-step approach to learning. In contrast, intuitives are less focused on detail, adopt a more holistic perspective, and use an open-ended approach to problem solving.

The importance of understanding the cognitive style of individuals is based on the understanding that particular cognitive styles are more appropriate than others for the conduct of particular activities (Allinson & Hayes, 1996). Utilizing the framework of cognitive style as described above and considering previous studies that argue the discernible differences between the intuitive and analytic cognitive style groups as they perform different activities or functions (e.g., Armstrong et al. 2012; Grégoire et al. 2011), this study states the following hypothesis:

H1: Students will be more intuitive than non-students.

Because it is reasonable to surmise that any population of students will comprise some individuals with holistic cognitive styles and others with analytic cognitive styles, it would be

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interesting to compare the likely impact these two different forms of cognitive style will have on their performance. Hence, the following hypothesis is stated:

H2: Cognitive style of engineering students will tend to be more analytic than business students.

Entrepreneurial Alertness

In recent years, the concept of entrepreneurial alertness has become a key construct in opportunity research. It has the potential to add substantially to the understanding of how new ideas are initiated and pursued (Tang et al. 2012), which is important in the field of entrepreneurship (Shane & Venkarataman, 2000). Entrepreneurial alertness was conceptualized by Kirzner (1973, 1979), who defined it as an individual's ability to identify business opportunities that are overlooked by others. According to Gaglio & Katz (2001), entrepreneurial alertness indicates that people can rely on their sensitive perceptions to make accurate and timely judgments when faced with entrepreneurial opportunities. In other words, entrepreneurial alertness provides the basic ability upon which individuals successfully identify and evaluate opportunities.

Based on a systematic review of the literature, Sharma (2019) integrated the diverse research findings on entrepreneurial alertness in order to identify its core components and develop an understanding of the concept. One of the core components of the alertness construct is cognitive ability. Baron (2006) argued that what makes an individual alert is the cognitive capacity to recognize that one situation is similar to another in a meaningful way and that, at some abstract level, the two situations both resemble some common cognitive framework. People who have high entrepreneurial alertness tend to search for and notice changes in the environment and to adjust the elements of their existing mental framework that do not match the current information available (Uy et al. 2015). Furthermore, Valliere (2013) argued that alertness involves a proactive stance based on a number of cognitive capacities and processes.

On the basis of the cognitive framework perspective, entrepreneurial alertness has a direct influence on opportunity recognition (Grégoire et al. 2011). In this sense, Ghasemi & Rowshan (2016) analyzed the relationship between different cognitive antecedents on students' entrepreneurial alertness; however, none of the antecedents analyzed was cognitive style. Therefore, and according to the previous arguments, this study suggests that an intuitive cognitive style is an important antecedent of entrepreneurial alertness. More formally, this study states that:

H3: More intuitive students will exhibit higher entrepreneurial alertness.

Throughout university studies, business students receive consistent theoretical support with regard to business markets, technology, and competition. This knowledge may provide business students with the cognitive and mental structures necessary to successfully integrate information and create new casual links for recognizing opportunities (Grégoire et al. 2010). This leads one to suppose that business students would be more prepared than engineering students for entrepreneurial alertness. Hence, the following hypothesis is proposed:

H4: Business students will exhibit a higher level of entrepreneurial alertness than engineering students.

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METHODS

Research Setting and Participants

The research was conducted within two schools of a private university in Mexico. The dean of both schools gave permission to conduct a study concerning the differences in students' cognitive style in their ability for recognizing business opportunities. Students were allowed to participate as long as participation was voluntary. The students in both schools were contacted by e-mail (N = 341); 192 agreed to participate, which represented a response rate of 56%. The average age of the participants was 21.2 years, and 43% were women. For the purpose of data analysis, respondents were classified based on whether they were business students or engineering students. A control group of non-students also formed part of the study; this facilitated comparison between the scores of the target population and the general population. Control group respondents were drawn from a range of employees outside the university. These subjects were asked to respond to the same research instruments. The study produced 51 useable responses.

Measures

Cognitive style was measured on the basis of the intuitive–analytic dimension. Participants completed the Cognitive Style Index (CSI; Allinson & Hayes, 1996), which is a set of 38 items scored on a 3-point scale (true, not sure, or false). On this scale, values of 0, 1, or 2 are assigned to each response, depending on the polarity of the item. The nearer the total score to the theoretical minimum of zero, the more intuitive the respondent, and the nearer to the theoretical maximum of 76, the more analytical the respondent. Entrepreneurial alertness was measured using four items developed by Jiao et al. (2014). Items were rated on a scale that ranged from "strongly disagree" (1) to "strongly agree" (5) and were averaged to form an index for each respondent.

RESULTS

This study followed the proposal developed by Armstrong & Hill (2009) to analyze the data. For this reason, the results of a number of independent samples t-tests are also shown in Table 1. Respondents were distinguished as having a dominant preference for intuitive (low CSI scores) or analytic (high CSI scores) styles of information processing by splitting respondents, according to the median point on the CSI scores (38).

The results in Table 1 show that students are more intuitive ($M=33.7$, $SD=18.1$, $n=192$) than non-students ($M=45.9$, $SD=12.6$, $n=51$), and this difference was significant ($t(213)=1.89$, $p<0.05$). Therefore, H1 is supported. Table 1 also indicates that engineering students are not different ($t(181)=3.55$, $p>0.05$) from those studying business ($M=40.2$, $SD=17.2$, $n=75$) in terms of their cognitive style ($M=35.5$, $SD=13.8$, $n=117$). Hence, H2 is not supported.

Results also revealed that the more intuitive students were, the higher their entrepreneurial alertness was ($M=4.2$, $SD=0.6$, $n=109$), compared with students who tended to be relatively more analytic ($M=2.6$, $SD=1.2$, $n=83$). This difference was significant ($t(181)=4.15$, $p<0.001$). A correlation analysis also revealed a statistically significant relationship between the respondents' cognitive styles and their entrepreneurial alertness ($r=0.35$, $n=192$, $p<0.01$). H3 is therefore supported. Business students display a significantly higher level of entrepreneurial

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alertness (M=4.4, SD=0.4, n=117) than engineering students (M=3.2, SD=1.2, n=75). This difference was significant (t(181)=4.62, p<0.001), and H4 is therefore also supported. Finally, Table 1 shows the result that perhaps were to be expected. There wasn't a significant difference (t(181)=2.01, p>0.05) in the age of business students (M=21.6, SD=1.1, n=117) compared to that of engineering students (M=21.1, SD=1.3, n=75).

The generic intuition-analysis dimension assessed by the CSI suggests that the pure cases of "intuition" and "analysis," respectively, lie at the extremes. In other words, the full exercise of either precludes the adoption of the other. According to Allinson & Hayes (2012), the cognitive style of most people involves elements of both intuition and analysis. This is because they identified five notional styles of the full range in the intuition-analysis dimension. In the middle range, Allinson & Hayes (2012) located the "adaptive" style, which implies a balanced blend of the two cognitive modes. Likewise, at either side of this lie the "quasi-intuitive" and "quasi-analytical" styles, each of which denotes a tendency towards, but not the full adoption of, one of the extreme cognitive modes.

Table 1
DESCRIPTIVE STATISTICS

Variable	n	Mean	SD	Range	df	t
Cognitive style					213	1.89*
Students	192	33.7	18.1	0-70		
Non-students	51	45.9	12.6	22-63		
Cognitive style					181	3.55
Business students	117	35.5	13.8	0-70		
Engineering students	75	40.2	17.2	16-70		
Entrepreneurial alertness					181	4.15***
Intuitive group	109	4.2	0.6	3.3-5		
Analytic group	83	2.6	1.2	2.1-5		
Entrepreneurial alertness					213	2.11
Students	192	3.9	0.9	2.1-5		
Non-Students	51	3.1	0.4	2.6-5		
Entrepreneurial alertness					181	4.62***
Business students	117	4.4	0.4	3.6-5		
Engineering students	75	3.2	1.2	2.8-5		
Age (all)					181	1.93
Intuitive group	109	20.8	1.4	20-23		
Analytic group	83	21.5	0.8	20-24		
Age					181	2.01
Business students	117	21.6	1.1	20-23		
Engineering students	75	21.1	1.3	20-24		

*** p<0.001 (two tailed); ** p<0.01 (two tailed); * p<0.05 (two tailed)

In order to extend the data analysis to consider these five styles, the sample of respondents was divided into five groups on the basis of their cognitive styles. CSI scores were designated as intuitive (0-28), quasi-intuitive (29-38), adaptive (39-45), quasi-analytic (46-52),

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or analytic (53-76). These thresholds were defined as the 20th, 40th, 60th, and 80th percentile scores of the sample, as suggested by Allinson & Hayes (2012). Table 2 shows descriptive statistics and the results of a series of one-way analysis of variance tests for these five groups of students.

Table 2 shows some interesting results with respect to the effects of cognitive style in students. For example, intuitive students from the entire sample demonstrated higher entrepreneurial alertness than those who were more analytic in their cognitive style. In this line of reasoning, engineering students showed a distribution of cases more equitable among the five cognitive styles than business students did. In other words, while the number of cases in business students decreased from the intuitive to the analytic type, the number of engineering students was stable. Finally, there were no significant relationships between students' cognitive style and their age.

Table 2
ONE-WAY ANALYSIS OF VARIANCE FOR FIVE GROUPS WITHIN WHOLE SAMPLE, BUSINESS AND ENGINEERING STUDENTS

Variable	**Intuitive Type (1)**			**Quasi-intuitive Type (2)**			**Adaptive Type (3)**		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Entrepreneurial alertness									
Whole sample	49	4.54,5	0.4	45	4.04,5,	0.5	35	3.4	0.5
Business students	31	4.64,5	0.3	28	4.14,5	0.4	17	3.5	0.5
Engineering students	18	4.14,5	0.4	17	3.85	0.5	18	3.4	0.5
Students´ age									
Whole sample	49	20.5	0.9	45	21.1	0.7	35	21.3	0.5
Business students	31	20.4	0.5	28	21.4	0.5	17	21.5	0.6
Engineering students	18	20.8	0.6	17	20.5	0.7	18	22.2	0.4

(Continued)

Table 2
ONE-WAY ANALYSIS OF VARIANCE FOR FIVE GROUPS

Variable	**Quasi-analytic type (4)**			**Analytic type (5)**			**df**	**F**
	n	Mean	SD	n	Mean	SD		
Entrepreneurial alertness								
Whole sample	32	2.91,2	0.5	31	2.91,2	0.5	2,180	15.8**
Business students	13	2.71,2	0.6	11	2.61,2	0.4	2,114	14.4**
Engineering students	19	3.01,2	0.4	20	3.15	0.6	2,72	11.2**
Students' age								
Whole sample	32	20.6	1.4	31	21.4	1.1	2,180	3.55
Business students	13	21.7	1.3	11	21.5	1.1	2,114	3.71
Engineering students	19	21.1	1.1	20	21.4	0.9	2,72	3.12

Subscript to a mean refers to a group whose mean is significantly different (Duncan multiple range test).

** $p < 0.01$ (two-tailed)

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DISCUSSION

One promising area of research stems from entrepreneurship cognition, which may provide important insights into key aspects of the entrepreneurial process (Pryor et al. 2016). Identification of a business opportunity is an important initial step in the entrepreneurial process. In fact, the research by Shane & Vankataraman (2000) stated that opportunity recognition is a central concept in the field of entrepreneurship. During the last two decades, this topic has been examined from a cognitive perspective (Grégoire et al. 2011). Cognitive style is known to be an important component in the cognitive process (Armstrong et al. 2012), and entrepreneurial alertness is a cognitive framework that assists individuals in being alert to opportunities (Sharma, 2019). Thus, this study answers the call from Grégoire et al. (2011) for more studies on entrepreneurship cognition that can lead to a better understanding of entrepreneurial behavior.

This study demonstrated that students were more intuitive and less analytic than non-students with regard to their usual ways to acquire, transform, and use information. This is perhaps because this style of thought is especially suited to the needs of students. According to Baron (2006), individuals with a more intuitive orientation tend to process information quickly and effortlessly, in accordance with various simple heuristics. Similarly, Allinson & Hayes (2012) argued that intuitive individuals tend to be relatively non-conformist, preferring an open-ended approach to problem solving. This study hypothesized that analytic cognitive styles would be more prevalent in engineering students, but there was no support for this claim. In a similar way, Allinson et al. (2000) found no cognitive differences between entrepreneurs and top managers. This result may be interesting for those who support the assumption that cognitive style becomes stable over time and that it is not shaped by the culture of a work environment (Griffin et al. 2015). In other words, regardless of whether an individual is a business or engineering student, his or her cognitive style is a stable characteristic, in contrast to openness to change.

This study also found that, within the sample of students, the more intuitive students were, the higher their entrepreneurial alertness was. This result improves the current understanding of the antecedents of entrepreneurial alertness, which is an important topic in the opportunity recognition research (Tang et al. 2012). Furthermore, when the sample of students was divided into five types, it was revealed that, among intuitive and quasi-intuitive types, both business and engineering students were more alert than those who were of the analytic or quasi-analytic type. This result can be interesting for scholars who integrate the study of intention and entrepreneurial alertness, because cognitive styles can influence both (e.g., Hu & Ye, 2017; Hu et al. 2018). The results also supported the claim that business students exhibited a higher level of entrepreneurial alertness than engineering students. This result is similar to that obtained by Li et al. (2015), who found that entrepreneurial university students recognized opportunity more readily than did nonentrepreneurial university students. This result might also support the notion that there are certain cognitive qualities and academic attributes that will be beneficial or even necessary in order for a student to achieve a state of higher alertness (Sang & Lin, 2019; Urban, 2019). In addition, the results also support the notion that business students can categorize and, subsequently, frame the same stimuli differently from engineering students. This is perhaps because business students' cognitive style of thought is especially suited to entrepreneurial alertness, through which a student can conclude that an idea for a new product or service does indeed constitute an opportunity worth pursuing. In no way does this mean that an analytic cognitive style is not beneficial to entrepreneurial alertness, but according to Tang et al. (2012),

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this style can be more suited to more mature stages of opportunity recognition process, in which evaluation and judgment prevail.

CONCLUSION

In sum, it appears that several cognitive factors and processes, such as preferred processing style and entrepreneurial alertness, might be useful not only for identifying individuals who have the potential to become successful entrepreneurs, but also for understanding the different styles and behaviors appropriate for the various stages of entrepreneurial process. Clearly, much more work is required in this area, but these findings provide an important method by which a cognitive perspective can contribute to the field of entrepreneurship.

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