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An axiological measure of entrepreneurial cognition

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Abstract

Purpose – The purpose of this paper is to expand the recent lines of inquiry into entrepreneurial cognition by focusing on the structure of values as an important aspect of cognition. Value theory, or axiology, posits that the capacity to value and to make value judgments is a distinctly human function – one that is a higher order process than is pure cognition alone.

Design/methodology/approach – This study is designed as a quantitative discovery. A well-established assessment instrument from the field of value science is used to measure deep-seated, evaluative thought patterns for a sample of founders of early stage startups and a comparative sample of senior managers. Value structures underlying cognition for individuals across these samples are compared to reveal both similarities and differences between the groups.

Findings – This study identifies a cognitive process underlying opportunity recognition, evaluation and exploitation, known as integration. This study finds that entrepreneurs have stronger capacities for integrative thinking than do managers. In contrast to other published research, this study finds that early stage entrepreneurs are not characterized by hubris, an inflated sense of self-efficacy, nor an exceptional capacity for action.

Originality/value – This paper extends the study of entrepreneurial cognition by applying an empirical measure of the foundational levels of cognition. It reveals heretofore unarticulated differences, as well as similarities, between entrepreneurs and managers.

Keywords Entrepreneurs, Decision making, Cognition, Opportunity recognition

Paper type Research paper

Introduction

Understanding what makes entrepreneurs “tick” has captivated academics and the business press alike for half a century (Ilonen *et al.*, 2018; Markman and Baron, 2003; McClelland, 1961; Sarasvathy and Venkataraman, 2011; Shaver and Scott, 1992). Entrepreneurs, it would seem, must possess some distinguishing combination of skills, talents, passions, personality traits, needs, motivations or thought processes that set them apart from other businesspeople. Why else would they undertake the daunting tasks of starting new businesses? But, what that “something” is remains elusive. The job functions of startup founders are clearly different from those of managers of existing businesses. Entrepreneurs, to a greater extent than managers, must function in unusually ambiguous situations – receiving feedback from multiple sources, in settings where the strong cultures of normative behavior do not yet exist. They must often make decisions fast, with little time for reflection or advice from others. As Blank and Dorf (2012) put it, startups operate in “search” mode; existing businesses operate in “execute” mode. Researchers are united in their quest to find out precisely what it is that sets entrepreneurs apart, but remain divided as to where to look for it. Given the nascent state of inquiry in this field, the current study undertakes a quantitative discovery (Bamberger and Ang, 2016) to seek to discern what insight might be gained from use of an assessment instrument that has frequently been used in other disciplines when it is applied to entrepreneurs and their cognitive patterns.

To date, research into entrepreneurial cognition has generally followed two paths. Either it is survey based, focusing by definition on what entrepreneurs know they know – or at least, think they know – about their own cognitions (e.g. “I consciously focus my attention on important information”). Or else, it is heuristics based, wherein researchers seek to identify the shortcuts in reasoning that entrepreneurs tend to take (e.g. confirmation bias, overconfidence).



Advances have been made in measuring entrepreneurs' cognition using methods based on both of these paths. Researchers using survey methods have identified cognitive patterns characteristic of entrepreneurs to include: metacognitive awareness (Haynie and Shepherd, 2009; Haynie *et al.*, 2010), self-efficacy (Chen *et al.*, 1998), entrepreneurial self-efficacy (Drnovšek *et al.*, 2010; Schjoedt and Craig, 2017), alertness (Tang *et al.*, 2012), entrepreneurial intent (Prabhu *et al.*, 2012), entrepreneurial orientation (Covin and Wales, 2011; Lumpkin *et al.*, 2009; Lumpkin and Dess, 1996), among other patterns. Similarly, building off the pioneering work of Tversky and Kahneman (1974) to identify common heuristics and biases in decision making, entrepreneurship scholars have found such heuristics as the overconfidence bias as well as the representative bias to distinguish entrepreneurs from senior managers (Busenitz and Barney, 1997).

However, survey- and heuristics-based approaches each offer a limited perspective in identifying and understanding cognitive patterns. For example, survey-based instruments cannot measure those parts of a person's cognitive structures that are unconsciously held. Furthermore, survey-based instruments are susceptible to social desirability response bias (Furr, 2018). Heuristics-based research uses as its baseline the assumption that a rational actor would act in such a way that maximizes personal gain, and takes as a premise that, by being less than fully rational, humans use mental shortcuts to make decisions that are less optimal than rationality would dictate. This means that heuristics and biases methods cannot assess those aspects of human behavior that are based on human values and valuations that are beyond the purview of theories of maximum utility. Elements missing from each of these commonly used methods of research – surveys and heuristics and biases – leave a gap in our understanding of how entrepreneurs think. To date, entrepreneurship researchers have been without a way to measure the structure of a person's values – his or her unconsciously held evaluative thought patterns.

Therefore, the purpose of this paper is to measure the unconsciously held, value-based thought patterns of entrepreneurs. In doing so, the paper introduces researchers to a viable approach to measuring the structure of a person's values via an assessment instrument known as the Hartman Value Profile (HVP). The instrument was developed within the field of axiology, or value theory, and is a well-established approach for comparing the cognitive differences between different types of individuals – in this case, a group of entrepreneurs and a group of senior managers. This study begins to answer calls for researchers to investigate the foundational level of entrepreneurial cognition (Baron, 2012), elsewhere referred to as entrepreneurs' "deep cognitive structures" (Krueger, 2007, p. 123), to develop new theoretical perspectives that deepen our understanding of cognitive-emotive processes, and to examine those perspectives empirically (Shepherd, 2015, p. 496).

Literature review

From traits to cognition

The search for what makes entrepreneurs different began half a century ago by researchers who focused their attention on psychological traits. McClelland (1961) identified three primary needs of people at work. These are needs for affiliation, power and achievement. McClelland posited that entrepreneurs are characterized by a high need for achievement. Although subsequent researchers have found only mixed support for McClelland's hypothesis (Baron, 1998), the need for achievement has a better track record in empirical studies than have other psychological traits (Shaver and Scott, 1992), including traits of: locus of control, optimism and propensity toward risk taking. In sum, findings regarding the traits of entrepreneurs are not disproven; rather, they are mixed (Prabhu *et al.*, 2012).

The continued inconclusiveness of trait research in defining the characteristics of entrepreneurs has led some entrepreneurship researchers to shift attention away from traits

and toward cognition. In fact, Mitchell *et al.* (2007) have gone so far as to state that the central question in entrepreneurial cognition research is: "How do entrepreneurs think?" As important as it is to be able to answer this question, the study of entrepreneurial cognition remains a nascent field (Haynie *et al.*, 2010), with researchers not yet having settled into common definitions of the terms we use, or methods by which to measure what is meant by cognition and metacognition.

A related line of inquiry seeks to integrate traits, cognitions and learning styles into one construct known generally as cognitive styles (Curry, 1983; Zhang and Sternberg, 2005). Empirical research using these constructs quickly becomes complicated. Quantitative discovery using Curry's model would require each participant to respond to nine different assessments. The cognitive patterns studied in this paper would fall into Curry's Level II, which she called information processing style. Such patterns are deep-seated, but are not as stable as traits; they can be modified through determined effort and effective learning strategies (Curry, 1983, p. 11).

From conscious to unconscious cognitive patterns

It is generally accepted that cognition refers to what a person knows; metacognition refers to that person's awareness of what he or she knows (Flavell, 1987). In light of these definitions, most researchers either imply or specify that metacognition refers to knowledge that is consciously held (Brown, 1987; Kluwe, 1987). Such knowledge of what one knows is formed through a process known as metacognitive awareness. In line with this reasoning, progress has recently been made at measuring entrepreneurs' cognitions by means of survey-based assessments of their metacognitive awareness (Haynie *et al.*, 2010). This is a good start, but it does not give the whole picture.

The reason that this line of research gives only a partial picture of entrepreneurial cognition is that a portion of one's knowledge is unconsciously held. Like an iceberg, of which only 10 percent is visible above the surface of the water, a substantial portion of cognition resides beneath the level of conscious awareness. There are times when entrepreneur's cognitive responses in the face of uncertainty are made automatically, without conscious awareness of the cognitive habit patterns that determine those responses. Researchers refer to this hidden part of cognition using a wide assortment of terms, including: automatic thought processes (Martinez, 2006), the foundational level of cognition (Baron, 2007), deep cognitive structures or deep beliefs (Krueger, 2007), mental schemas (Kirkley, 2016), habitual evaluative thought patterns (Pomeroy, 2005), habitualities (Peucker, 2008) or abiding habitus (Husserl, 1960) and as value structures (Hartman, 1967). Even though a person may not be aware of the foundations of his or her automatic cognitive processes, those foundations nonetheless influence the person's judgment, decision making and behavior.

Current initiatives that seek to derive insight from automatic cognitive processes typically focus upon the mental shortcuts that entrepreneurs make when faced with ill-defined problems. It is an approach to cognitive research that began with Tversky and Kahneman (1974) and has become known as heuristics and biases. Studies assessing entrepreneurial heuristics usually involve setting up various scenarios or games that deliberately have vague directions or limitations to the amount of knowledge given to make a decision (Burmeister and Schade, 2007; Wickham, 2003). Observing the ways that entrepreneurs solve these ill-defined problems reveals the mental shortcuts that entrepreneurs take in solving them. Since Tversky and Kahneman's initial published findings, dozens of prototypical heuristics have been studied and named. Biases identified as important in entrepreneurial decision making include the overconfidence bias (Busenitz and Barney, 1997), the representativeness bias (Busenitz and Barney, 1997; Wickham, 2003),

the status quo bias (Burmeister and Schade, 2007) and counterfactual thinking, affect infusion, attributional style and the planning fallacy (Baron, 1998).

Heuristics and biases literature is based upon rational actor theory and its derivative, bounded rationality. Rational actor theory defines rationality as acting in such a way as to maximize one's own personal gain. In fact, rational actor theory does not merely purport that the maximization of personal utility is a rational way to act; it defines maximizing of utility as the only rational way to act (Monroe and Maher, 1995). It is strongly evident in the theory of scientific management espoused by Frederick Taylor (1856–1913) and forms the foundation of neoclassical economics. Heuristics and biases researchers, in essence, seek to identify more precisely and in which ways rationality is bounded. Heuristics and biases research has brought to light interesting findings about unconsciously held patterns of making mental shortcuts, but it, too leaves a gap in our understanding of entrepreneurial cognition. This emphasis of heuristics and biases research upon cognitive shortcomings is limited by a conceptual bias of its own. It is a deficit model of human cognition. The heuristics and biases approach leaves out the possibility that human beings are richer, more complex in their cognitive processing than are purely rational actors. The heuristics and biases line of inquiry ignores the role that values and valuations play in human judgment and decision making.

Values and valuations

The study of values enjoyed a heyday in psychological and management literature during the 1960s, 1970s and 1980s (Hall, 1973, 1976; Kohlberg, 1981, 1984; Maslow, 1959, 1971; Rokeach, 1972, 1973, 1979), but since that time, interest in the subject among management researchers has faded. Kirkley (2016) offered a much-needed call to entrepreneurship researchers to resume paying attention to values. Therefore, the current study turns to the discipline of philosophy, specifically the sub-discipline of value theory, to explore more of the below-the-waterline part of the cognitive iceberg.

The nature of evaluative thought patterns

The nature of deep-seated habitual evaluative thought patterns can perhaps best be understood through the phenomenologist Edmund Husserl's (1859–1938) concept of habitualities (Peucker, 2008). Habitualities are those thought patterns that, at first, were consciously attained, but later in life become so habitual that they then sink from conscious awareness. They do not disappear, but are activated automatically, when future judgment calls need to be made.

Gigerenzer (2007) and Krueger (2007) make arguments similar to Husserl's of some 80 years before. Gigerenzer writes that heuristics are not static habits of thought; rather, they are adaptive cognitions, developing over time as experience in living is gained. Krueger exhorts scholars of entrepreneurship to identify ways to identify the deep beliefs that anchor and shape knowledge structures. Krueger goes on to define beliefs as "deeply held strong assumptions that underpin our sensemaking and decision making" (p. 124). A challenge facing contemporary researchers is that there is little guidance to suggest how we can go about measuring such unconscious evaluative thought processes (Baron, 2007; Husserl, 1960; Krueger, 2007).

Value theory of formal axiology

If entrepreneurship researchers had an understanding of the logical nature of these deep thought structures, a language with which to describe them and an instrument by which to measure them, then answers to Baron's and Krueger's calls could be undertaken. Such a

method was found in the sub-discipline of value theory, specifically that value theory known as formal axiology.

Axiology, as a general term, refers to the study of human values and valuing. Formal axiology was coined by Husserl and was later developed into a science of the structure of values by Hartman – a former student of Husserl's. It is known as formal axiology because it is a formal theory, deduced from a small number of axioms (Hartman, 1967; Hurst, 2011). Formal axiology deals not with a person's espoused values, but rather with the cognitive structure underlying those values. This distinguishes formal axiology as a value theory from more popularly known approaches to the measurement of value, as advanced by Rokeach (1972, 1973, 1979) and Schwartz (2011). The fundamental precepts of formal axiology are that there are three types of concepts: synthetic, analytic and singular. A type of value corresponds with each concept. These are: systemic, extrinsic and intrinsic values.

These three types of value are abbreviated by axiologists as I, E and S. They stand, roughly, for people, things and ideas. They form a hierarchy in terms of the richness of value properties that each type of value holds. Thus, $I > E > S$. This is axiological shorthand for saying that people are more important than things or ideas, including ideas about things or people (Edwards, 2010).

Each of these three levels of value can be valued in each of the same three ways. And they can be valued in such a way that increases the richness of properties of the valued object. Doing so is called a composition. Or, each object can be valued in ways that reduce the richness of its properties. This is called a transposition. You can extrinsically enrich your car, which is an extrinsic object, by washing and waxing it. Or, you can diminish its properties by backing it into a dumpster, denting its fender. Compositions are normally written by axiologists in shorthand as a base letter, followed by a superscript. Washing and waxing your car, then, would mean in axiological shorthand: E^E . Backing it into a dumpster would mean: E_E .

Because each of the three types of value objects can be valued in each of the same three ways, and those methods of valuation can be either compositions, or transpositions, we get a hierarchy of values/value combinations that form an axiological order. There are nine possible compositions and nine possible transpositions. That order is:

$$I^I \ E^I \ S^I \ I^E \ I^S \ E^E \ S^E \ E^S \ S^S \ S_S \ E_S \ S_E \ E_E \ I_S \ I_E \ S_I \ E_I \ I_I.$$

The assessment tool known as the HVP is based on this axiological ordering. In responding to this instrument, a respondent stack ranks 18 words or phrases, each of which (unknown to the respondent) is a placeholder for one of these value combinations. Hence, unlike the Rokeach or Schwartz value surveys, it is not the words that matter; rather, it is the underlying value structure represented by those words that give meaning to one's results.

Given the relatively recent appearance in print of most of Hartman's work in English, as well as a recent increase in publication of works by other axiologists about this theory and its application (Forrest, 1994; Acquaviva, 2000; Dicken and Edwards, 2001; Pomeroy, 2005; Gallopin, 2009; Edwards, 1995, 2000, 2010). Hartman's work is belatedly being made known to a larger scholarly audience some 40 years after his death. For the curious reader, accessible explications of the language and logic of formal axiology are offered by Dicken and Edwards (2001), Edwards (2010), Hartman (1994) and Hurst (2012).

The theory of formal axiology is not without its critics (Edwards, 1995). Arguments regarding the mathematical logic underpinning the theory are regularly debated amongst members of the Hartman Institute and in the pages of the *Journal of Formal Axiology: Theory and Practice* (2008, 2009, 2011).

Methods

Applied axiology

The assessment instrument known as the HVP was developed by Hartman in 1967 as a direct outcome of his theory of formal axiology. It is a general measure of human valuing; it is not an instrument specific to entrepreneurs. The purpose of this study is to determine whether this measure of general human valuing can distinguish between the cognitive patterns of entrepreneurs and a group that may seem, on the surface, to be much like them – senior managers.

Where else it is being used

The HVP is increasingly being used by consultants in a variety of management disciplines. It is being used in the areas of leadership development and employee selection (Connor, 2013; Morris, 2014; Van de Water and Toja, 2014; Vogel, 2011; Wolfe, 2009), and more recently as a guide to project management (Biedenbach and Jacobsson, 2016). It has also been widely used in therapeutic settings (Pomeroy, 2005). The HVP has been shown to be effective at identifying differences between groups that one would expect to be quite different. For instance, Pomeroy (2005) used the HVP to distinguish between the thought patterns of clinical psychological outpatients and the doctors who treat them. Acquaviva (2015) identified differences between convicted felons and a sample of the non-convict population.

The HVP has been applied mostly in the context of large organizations, where the use of psychometric assessments as developmental and selection tools is already widely accepted. The HVP has already been subjected to numerous validation studies (www.hartmaninstitute.org), so that the entrepreneurship researcher does not have to develop and validate anew an instrument to be used in empirical studies of entrepreneurial cognition. One axiological/anthropological study of Russian entrepreneurs at the time of perestroika has been written (Galopin, 2009); however, the HVP has not yet been applied empirically/quantitatively to the study of entrepreneurs in the way that the current research begins to do.

Today, more and more axiologists are developing specialized, discipline-specific versions of the HVP, each of which is based on the same underlying structure. The current project makes use of the original wording of the HVP because that is the version which has undergone the most rigorous validation studies (www.hartmaninstitute.org).

How the HVP works

The task of responding to the HVP is similar to that of the better known Rokeach Value Survey, but the similarities end at the surface. What each instrument measures, why and how it reports results are strikingly different (Hurst, 2009). Whereas the Rokeach survey measures a person's espoused values, the Hartman profile measures the cognitive structures underlying a person's values. In responding to the HVP, the respondent is asked to stack rank a series of 18 words or phrases, twice. The first set of words are to be ranked from best to worst, the second set from most true to least true for the respondent. The first set of words and phrases deal with how the respondent sees the world; the second set deal with how the respondent sees himself or herself. In the HVP, the actual words and phrases used are not important in themselves; they are important only in that they stand for the underlying combinations of values and valuational structures that they represent. This is how this instrument largely avoids issues related to social desirability response bias. The respondent does not know what is being measured or how. It is by comparison of the respondents' stack ranking with the theoretical norm of formal axiology in various combinations that yields the 50± different scales of the HVP. The respondent's view of the world is reflected in Part 1 of the results. The respondent's view of self is reflected in Part 2. Parts 1 and 2 are scored in a similar manner. Several of the scores indicate the degree of harmony between Parts 1 and 2.

A complete explanation of how to score the HVP is provided in the Manual of Interpretation (Hartman, 2006). This paper reports results from 33 major scales of the HVP and focuses upon those several scores that turn out to be indicative of surprising similarities and meaningful differences in the habitual evaluative thought patterns between early stage entrepreneurs and senior managers, as those characteristics have been discussed frequently and recently in the entrepreneurship literature.

Samples

The HPV was administered to a sample of early stage entrepreneurs in the USA, mostly in the Silicon Valley of California and in the Silicon Slopes region of Utah. The sample was purposefully selected to include only entrepreneurs who were actively involved in founding new businesses and/or who had been earning revenue for less than two years from the business they had recently started. A sample size of 74 early stage entrepreneurs gives sufficient power for a quantitative discovery.

In defining the sample size needed, the author sought to attain a significance level of $p < 0.05$ with a power of 0.8 (Cohen, 1988). That would yield an 80 percent chance of detecting a medium effect size if significant differences do exist. To achieve this, it was concluded that a sample size of at least 64 entrepreneurs was needed. Given prior experience with HVP results, the author anticipated that many of the results from at least some of the scales may not meet the criteria needed for parametric testing, so following Laerd's (<https://statistics.laerd>) advice, another 15 percent cushion to the minimum sample size was needed, bringing that to a minimum sample size of 74 early stage entrepreneurs. A control sample of HVP scores for 103 senior managers was obtained from a large and fast-growing company in the southwestern part of the USA. These two samples are close enough in size to allow direct comparisons. Effect sizes and confidence intervals are reported along with p -values in Table I, in accordance with best practices for statistical reporting (Schwab, 2015; Schwab *et al.*, 2011).

Analysis

The two samples were compared using both non-parametric and parametric statistics. It was found that for all 33 of the 33 scales used in this research, the results from parametric and non-parametric tests were the same. Hence, reported here are only the results of the parametric tests.

A tabulation of the results of t -tests of Independent Means for each of the 33 scales of the HVP used in this research is provided in Table I. Specific results for each of the scales elaborated upon in the Findings section are duplicated in the text.

Findings

Patterns of similarities and differences, indeed, do exist between early stage entrepreneurs and senior managers. These differences can be seen at a glance of Figure 1. This figure separates the sub-scales of the HVP into two parts – the worldview (Part 1) and the self-view (Part 2). The sub-scales represented in Part 1 measure the ways in which the respondent cognitively views the world whereas the sub-scales in Part 2 measure the ways in which the respondent cognitively views himself or herself.

Of the 33 scales shown in Figure 1, statistically significant differences were found between early stage entrepreneurs and non-entrepreneurial senior managers in 11 of them. Eight of those were found in Part 1 of the instrument; three of them in Part 2. In all eight of the Part 1 World-View differences, entrepreneurs had stronger scores than did senior managers. This means that entrepreneurs have more highly developed cognitive habits that relate to their understanding of, and their focus upon, the outside world compared to

Scale	E		NE		Difference in means		Levene's		CI		df	t	Sig. 2-tailed p	d	Effect size
	Mean	SD	Mean	SD	Lower	Upper	Lower	Upper							
Rho1	0.889	0.061	0.861	0.071	0.028	0.005	0.008	0.048	0.048	f(170)	2.817	0.005	0.4235	Medium	
Rho2	0.846	0.081	0.862	0.068	-0.016	0.442	-0.038	0.006	0.006	f(175)	-1.441	0.151	ns	na	
Dif1	33.73	8.198	37.15	10.185	-3.42	0.006	-6.148	-0.684	-0.684	f(173)	-2.468	0.015	-0.37	Small	
Dim1	10.62	6.121	11.61	6.387	-0.99	0.767	-2.878	0.898	0.898	f(175)	-1.035	0.302	ns	na	
Int1	9.99	6.053	12.73	7.453	-2.74	0.002	-4.749	-0.734	-0.734	f(172)	-2.696	0.008	-0.404	Medium	
Dis1	1.38	1.478	1.28	1.183	0.1	0.009	-0.314	0.507	0.507	f(135)	0.466	0.642	ns	na	
Dif2	39.35	11.285	36.19	9.856	3.16	0.49	0.007	6.308	6.308	f(175)	1.978	0.05	0.298	Small	
Dim2	9.72	6.358	9.91	5.875	-0.19	0.885	-2.025	1.632	1.632	f(175)	-0.212	0.832	ns	na	
Int2	14.86	8.173	13.05	6.854	1.81	0.377	-0.418	4.05	4.05	f(175)	1.605	0.11	ns	na	
Dis2	0.7	1.459	0.45	0.926	0.25	0.004	-0.125	0.638	0.638	f(114)	1.33	0.186	ns	na	
Dim11	10.45	4.743	10.25	4.565	0.2	0.905	-1.202	1.589	1.589	f(175)	0.274	0.785	ns	na	
DimE1	10.34	3.746	12.46	5.031	-2.12	0.001	-3.421	-0.816	-0.816	f(175)	-3.211	0.002	-0.478	Medium	
DimS1	12.95	3.899	14.44	4.449	-1.49	0.37	-2.763	-0.219	-0.219	f(175)	-2.314	0.022	-0.356	Small	
DimI2	12.57	4.262	10.56	4.031	2.01	0.879	0.763	3.246	3.246	f(175)	3.186	0.002	0.485	Medium	
DimE2	13.54	4.769	12.32	4.431	1.22	0.332	-0.156	2.596	2.596	f(175)	1.75	0.082	ns	na	
DimS2	13.51	5.277	13.31	4.808	0.2	0.905	-1.304	1.709	1.709	f(175)	0.266	0.791	ns	na	
IntI1	3.11	3.398	2.75	3.086	0.36	0.429	-0.608	1.329	1.329	f(175)	0.735	0.463	ns	na	
IntE1	2.43	2.522	4.45	3.738	-2.02	0	-2.943	-1.085	-1.085	f(174)	-4.279	0	-0.633	Large	
IntS1	4.45	2.751	5.53	3.271	-1.08	0.378	-2.01	-0.166	-0.166	f(175)	-2.33	0.021	-0.357	Small	
IntI2	4.69	3.38	3.5	2.693	1.19	0.501	0.292	2.096	2.096	f(175)	2.613	0.01	0.389	Small	
IntE2	4.74	3.657	4.24	3.243	0.5	0.216	-0.529	1.53	1.53	f(175)	0.96	0.338	ns	na	
IntS2	5.43	4.152	5.31	3.384	0.12	0.536	-0.998	1.242	1.242	f(175)	0.215	0.83	ns	na	
Dim%1	32.23	18.378	32.99	19.474	-0.76	0.527	-6.482	4.961	4.961	f(175)	-0.262	0.793	ns	na	
Int%1	27.43	10.792	31.5	11.566	-4.07	0.18	-7.456	-0.689	-0.689	f(175)	-2.375	0.019	-0.364	Small	
DI1	7.24	4.661	8	5.041	-0.76	0.471	-2.226	0.713	0.713	f(175)	-1.016	0.311	ns	na	
AI%1	55.96	6.931	55.7	6.721	0.26	0.374	-1.788	2.308	2.308	f(175)	0.251	0.802	ns	na	
Dim%2	25	14.324	27.94	15.133	-2.94	0.409	-7.393	1.51	1.51	f(175)	-1.304	0.194	ns	na	
Int%2	35.11	10.158	33.88	10.214	1.23	0.87	-1.84	4.29	4.29	f(175)	-1.304	0.194	ns	na	
DI2	7.43	6.059	6.93	4.724	0.5	0.299	-1.1	2.101	2.101	f(175)	0.617	0.538	ns	na	
AI%2	52.62	5.965	52	4.617	0.62	0.181	-0.949	2.192	2.192	f(175)	0.781	0.622	ns	na	
FQ1	32.98	9.43	35.07	9.415	-2.09	0.766	-4.922	0.74524	0.74524	f(175)	-1.455	0.148	ns	na	
FQ2	32.18	8.75	32.07	8.499	0.11	0.839	-2.481	2.696	2.696	f(175)	0.082	0.935	ns	na	
CapAct	26.11	7.31	22.88	7.05	3.23	0.767	1.072	5.378	5.378	f(175)	2.956	0.004	0.449	Medium	

Notes: For a data set comprised of entrepreneurs (n = 74) and non-entrepreneurial senior managers (n = 103). From data set named ECH_plus_NECCSL_06222015.sav

Table I.
A comparison of
t-tests of independent
means using 33 scales
of the HVP

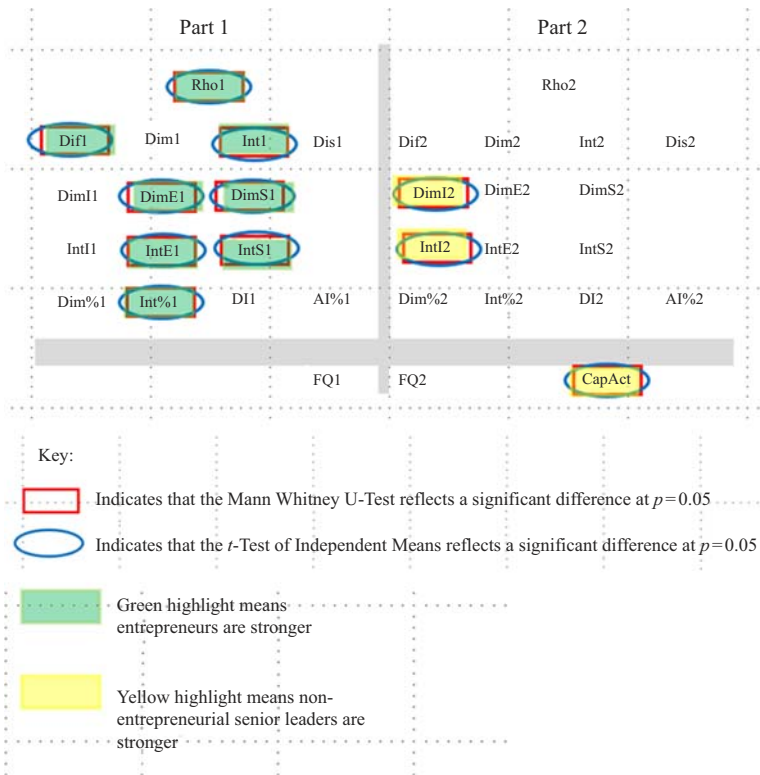


Figure 1. A visual display of similarities and differences between entrepreneurs ($n = 74$) and non-entrepreneurial senior managers ($n = 103$) using 33 scales of the HVP

senior managers. Turning to the sub-scales for Part 2, senior managers had stronger scores than did entrepreneurs in their-Self-View in each of the three scales where significant differences were found. This means that senior managers are more adept at understanding their inner selves compared to entrepreneurs. Further, these sub-scales reveal that senior managers, when looking in the mirror, are more pre-disposed to accept themselves and their own uniqueness than are entrepreneurs. They are, so to speak, more at home in their own skin.

The following paragraphs report in detail about those scales with the most pertinent findings to the question of entrepreneurial cognition, as it has been discussed in recent academic literature.

Cognitive patterns engaging with external world

One sub-scale within the worldview portion of the HVP measures “the development of the capacity to discern practical values, both in the outside world and in one’s role in the world” (Hartman, 2006, p. 55). This sub-scale, referred to as DimE1, can be thought of as a measure of an individual’s capacity to focus attention on practical results in the external world (e.g. marketing operations, developing products and everyday practical managerial decisions).

In this study, entrepreneurs manifested a keener focus of attention on this practical dimension of the outside world than did non-entrepreneurial senior managers. These results of *t*-tests are reported in Table I showing that entrepreneurs had stronger (i.e. lower) DimE1 scores ($M = 10.34$, $SD = 3.746$), than did non-entrepreneurial senior managers ($M = 12.46$, $SD = 5.031$), a statistically significant difference of -2.12 , $p = 0.002$, $d = -0.478$.

These findings are consistent with general expectations in the academic literature and business press – that is, that entrepreneurs are highly focused on getting things done in the practical world (Baron, 2012) and they support Morales and Holtschlag's (2013) findings that people with materialist values are more likely to become entrepreneurs than are those with post-materialist values.

Systems in external world

The systemic sub-scale within Part 1 of this instrument assesses “the development of the capacity to discern system and order in the world” (Hartman, 2006). This dimension of thought refers to the conceptual abilities needed of a businessperson or entrepreneur, i.e. strategic thinking, or what Drucker (1999) referred to as the theory of the business. In this study, entrepreneurs manifested a keener focus of attention on this conceptual dimension of the outside world than did non-entrepreneurial senior managers. These results of *t*-tests are reported in Table I showing that entrepreneurs had stronger (i.e. lower) DimS1 scores ($M = 12.95$, $SD = 3.899$), than did non-entrepreneurial senior managers ($M = 14.44$, $SD = 4.449$), a statistically significant difference of -1.49 , $p = 0.022$, $d = -0.356$.

Taken together, these findings (DimE1) from the first section and (DimS1) from this section indicate that entrepreneurs have a more highly developed capacity to focus attention both on achieving practical results in the world and in bringing order and systemization to that world than do non-entrepreneurial senior managers.

Cognitive patterns integrating information in complex situations

Another sub-scale within the worldview measures how close together are a person's Dimension I, E and S scores, i.e. how well integrated they are. This sub-scale, referred to as Integration or Int1, can be thought of as a person's capacity for seeing the relevant in complex situations (Hartman, 2006). Byrum (2011) considered the Integration scale to be the most important one in Part 1 of the HVP, writing:

Integration means the ability to see connections and interrelationships. Einstein felt that the true mark of “genius” was the ability to see connections [...] Integration abilities include three elements: the ability to keenly observe what is taking place around an event; the ability to prioritize and put together what has been observed; and, most importantly, the ability to focus on concrete applications to real-life situations.

This capacity for Integration, as measured by the Integration, Part 1 Scale of the HVP, captures much of the essence of Shane and Venkataraman's (2000) three-part definition of entrepreneurship as being a process of opportunity recognition, evaluation and exploitation. This capacity for integrative thinking related to the outside world was found to be the critical indicator in this study that answers the question that researchers have long pursued: “What makes entrepreneurs different?”

A *t*-test (see Table I) revealed that entrepreneurs had stronger (i.e. lower) Integration Part 1 (Int1) scores ($M = 9.99$, $SD = 6.053$), than did non-entrepreneurial senior managers ($M = 12.73$, $SD = 7.453$), a statistically significant difference of -2.74 , $p = 0.008$, $d = -0.403$. This suggests that entrepreneurs are more skilled than their managerial counterparts at integrating the three key cognitive functions of opportunity recognition, evaluation and exploitation.

Cognitive patterns for capacity for action

Most researchers can agree on one supposition as to what makes entrepreneurs different. Baron (2007) contended that, “If they are nothing else, entrepreneurs are persons who take action – they engage in vigorous, persistent efforts to convert their ideas and visions into profitable, operating companies (p. 167).

To assess the veracity of Baron's supposition, this study investigated empirically the ramifications of a statement made by Hartman in the Manual of Interpretation of the HVP. Hartman (2006) writes:

The test measures [...] the capacity for value judgment, not for value action. Yet, as a general rule, the lower the DimI2 and DimE2 indices, the easier is the transformation of judgment in to action (p. 127).

This is an index not frequently found on computerized version of the HVP, including the Byrum Method used here. Therefore, the author developed a scale called "Capacity for Action" and analyzed the results. This is abbreviated as CapAct in Table I and Figure 1. Capacity for Action is the sum of the Intrinsic Dimension in Part 2 (DimI2) and the Extrinsic Dimension (DimE2) indices.

A *t*-test of independent means revealed that entrepreneurs had significantly weaker (i.e. higher) Capacity for Action scores ($M=26.11$, $SD=7.31$) than did non-entrepreneurial senior managers ($M=22.88$, $SD=7.05$), a significant difference of $+3.23$, $p=0.004$, $d=0.449$. It would appear, from these results, that early stage entrepreneurs experience more difficulty transforming judgment into action than do non-entrepreneurial senior managers. This is so in spite of entrepreneurs' strong DimE and DimS scores in Part 1 of the instrument. An explanation of the potential cause for this apparent anomaly is offered in the Discussion section.

Cognitive patterns of self-efficacy

Writing 10 years before, Bandura (1977) espoused his theory of self-efficacy, Hartman identified what he called the Faith Quotient, which is essentially a measure of self-efficacy. The Faith Quotient is calculated by taking the mean of two of the major scales in the HVP, the Differentiation (Dif) and the Dimension percent (DIM%) scales. The Dif and Dim% scales each measure, in different ways, the sense of proportion among the three dimensions of value that are at the core of formal axiology. Hartman explains:

The importance of this index lies in the following. If the knowledge of the three dimensions is proportionate, that is, if I know all three equally well or badly, I will be consistent not only in my knowledge but also in my view about it. This will give me a certain security or faith in it, even though the general level of my knowledge (Dif) may not be high [...] If, however, my knowledge of the dimensions is disproportionate, that is, if I do not know all three equally well or badly, I will be inconsistent in my knowledge but also in my view about it. This will give me a certain insecurity or lack of faith in it, even though the level of my knowledge (Dif) may be high [...] (2006, p. 22).

A *t*-test of independent means revealed no statistically significant difference between entrepreneurs' Faith Quotient Part 1 scores ($M=32.98$, $SD=9.43$) and non-entrepreneurial senior managers ($M=35.07$, $SD=9.415$), a non-significant difference of $+2.09$, $p=0.148$, ns. This suggests that there are no differences between entrepreneurs and senior managers in their self-efficacy related to the perception of their ability to accomplish their work.

A *t*-test of independent means also revealed no statistically significant difference between entrepreneurs' Faith Quotient Part 2 scores ($M=32.18$, $SD=8.75$) and non-entrepreneurial senior managers ($M=32.07$, $SD=8.499$), a non-significant difference of 0.11 , 95% CI $[-2.481, 2.696]$, $t(175)=0.082$, $p=0.935$, ns. This suggests no differences between entrepreneurs and senior managers related to their self-efficacy of themselves, as individuals.

Thus, this finding from the current research contradicts the frequently espoused finding by other researchers (Cardon and Kirk, 2015; Cassar and Friedman, 2009; Chen *et al.*, 1998; Markman and Baron, 2003) that entrepreneurs can be distinguished by especially high levels of self-efficacy. The current findings argue against the conclusion of Hayward *et al.* (2006) that hubris, defined as an exaggerated sense of self-efficacy, is a defining characteristic of entrepreneurs' thinking.

Discussion

Entrepreneurship scholars are exhorted to expand the range of research questions, theories, methods and tools used in entrepreneurship research (Shepherd, 2015). The theories we use to guide quantitative discoveries are shaped, in large part, by the tools available for measuring elements of those theories (Baron and Ward, 2004). Therefore, the aim of this project has been to introduce into the study of entrepreneurial cognition a theory from the discipline of philosophy, known as formal axiology, which is measured by an instrument known as the HVP. In combination, this theory and this instrument allow a researcher to measure the heretofore unmeasurable – that part of the iceberg of entrepreneurial cognition that lies beneath conscious awareness. In short, the principal aim of this study was to answer the question: can the HVP, by assessing those unconsciously held thought patterns, augment emerging research within the entrepreneurship literature that assesses the consciously held cognitive patterns of entrepreneurs (Haynie and Shepherd, 2009; Haynie *et al.*, 2010)? Yes, it can.

A second, subordinate question evolved from the first. Given that other axiological researchers have established the ability of the HVP to distinguish the habitual thought patterns of groups that one would expect to be quite different, i.e., clinical psychological outpatients vs the doctors who treat them (Pomeroy, 2005) and convicted felons vs a sample of the non-convict population at large (Acquaviva, 2015), this project sought to determine whether the HVP can also detect differences between groups who may be expected to be similar in many ways – i.e., entrepreneurs and senior managers. As shown in the Findings, the answer again is, yes it can.

A glance at the verbal descriptors of the scales used in various HVP indices and a comparison of the scores of entrepreneurs with those of non-entrepreneurial senior managers (Table I and Figure 1) reveal how generally well-developed are the evaluative thought patterns of both groups and yet, in spite of their similarities, the HVP can distinguish in meaningful ways among the thought patterns of the two groups.

This use of the HVP may give some clues as to why, after much intellectual effort, cognitive researchers have yet to settle definitively upon a common understanding of what makes entrepreneurs different. Some of those differences lie beneath the conscious level of cognition. The HVP may, in time, open the gates to more research answering calls to investigate the foundational level of entrepreneurial cognition (Baron, 2007), or what Krueger (2007) called entrepreneurs' deep cognitive structures. Furthermore, being based on the deductive theory of formal axiology, the scales represented by the instrument have meaning that is less subject to definitional squabbles based on verbal categories than do inductive theories based on surveys or questionnaires. In addition, because the HVP measures the structure of a person's values, as represented by selected words or phrases given by the instrument, it is not easy for a respondent to second-guess what the instrument is looking for. Thus, use of the HVP reduces the likelihood of social desirability response bias in seeking to understand entrepreneurial cognition via an assessment instrument.

Integration as a key measure of entrepreneurial thinking

Since the publication of Shane and Venkataraman's (2000) now-classic piece that defined entrepreneurship as a process of opportunity recognition, evaluation and exploitation, many other researchers (Alvarez and Barney, 2007; Baron, 1998, 2006, 2007; Grégoire *et al.*, 2010; Kuckertz *et al.*, 2017; Tang *et al.*, 2012) have elaborated upon their concept and have established the preeminence of opportunity recognition as an important cognitive habit for entrepreneurs to possess. It is important to remember that opportunity recognition was only one-third of Shane and Venkataraman's definition. Their definition also included evaluation and exploitation of those opportunities once discovered. Yet, the cognitive patterns required to evaluate and exploit opportunities have been less studied. The instrument used in this

study explicitly assesses those cognitive patterns conducive to evaluating and exploiting opportunities. The Systemic Dimension Part 1 score (DimS1) measures a person's capacity to evaluate opportunities; the Extrinsic Dimension Part 1 score (DME1) measures the capacity to exploit opportunities. The Integration Score is a composite of how closely well-developed are the Intrinsic, Extrinsic and Systemic sub-dimension scales. While there were no significant differences in the Intrinsic Part 1 scores of entrepreneurs and senior managers, the strengths of entrepreneurs' extrinsic and systemic scores compared to senior managers were enough to result in meaningful and significant differences in Integration scores between the two groups. Therefore, this study concludes that the axiological construct of Integration encompasses Shane and Venkataraman's three-part definition of entrepreneurship more fully than do narrower constructs that focus solely on the recognition portion of their definition. This measure of Integration is a more precisely measured construct than what other researchers have previously published regarding this aspect of entrepreneurial cognition. It is not the singular strength of any of these I, E or S dimension sub-scales that, alone, account for the most meaningful differences in evaluative though patterns between entrepreneurs and senior managers. Rather, it is the more evenly balanced development in all three dimensions that pinpoint what makes entrepreneurs' cognition different.

Capacity for action

Entrepreneurs are generally characterized as people who, above all, take action (Baron, 2007). However, the current project finds that entrepreneurs scored significantly weaker (higher) than senior managers on the HVP's capacity for action scale. Interestingly, entrepreneurs do reflect a keenly developed cognitive focus on the outside world in both its practical and conceptual dimensions. Thus, this work suggests that even though early stage entrepreneurs have a strong proclivity to focus their attention on practical results in the outside world, they do struggle somewhat to act upon those proclivities. This finding was a surprise. A considered explanation for this unexpected finding follows.

For the current study, only early stage founders were chosen for the sample. To participate in this study, entrepreneurs needed to be seriously endeavoring to start a new enterprise, even if it was pre-revenue, or if they had launched, they needed to have less than two years' revenue in their current startup. This means that entrepreneurs in this sample were all largely in discovery mode (Blank and Dorf, 2012), which is characterized by extremely high levels of uncertainty. They may be like deer in the headlights – capable of running fast, but momentarily frozen due to the uncertainties they face. As their startups move into customer development and growth stages, these founders may develop a stronger capacity for action (with some survivor bias). More research needs to be done, including longitudinal studies of whether and if so, in what ways, entrepreneurs' cognitive patterns change as they progress through the various stages from startup to successful enterprise.

Entrepreneurial self-efficacy

Entrepreneurs are also generally characterized as individuals with high levels of self-efficacy (Cardon and Kirk, 2015; Cassar and Friedman, 2009; Chen *et al.*, 1998; Markman and Baron, 2003). Some have even gone so far as to even put forth a hubris theory of entrepreneurship, arguing that hubris – an exaggerated form of self-efficacy – is the distinguishing characteristic of entrepreneurs (Hayward *et al.*, 2006). The current study does not support those authors' conclusions. The scale of the HVP that Hartman referred to as the Faith Quotient revealed no statistically significant differences between the self-efficacy of entrepreneurs and non-entrepreneurial senior managers. This may be for either of two reasons, or both.

The first reason may be the same as described in the previous paragraph that discussed entrepreneurs' capacity for action. Entrepreneurs who took part in this study are in the discovery stage of their businesses. In contrast, Chen *et al.* (1998), for example, used two samples in their study, each of which was noticeably different from the sample used here. One of their samples was comprised of 140 college students; the other was comprised of business owners whose firms averaged 28 years in business. The difference in these findings reveals the importance of defining the stage of entrepreneurship one is addressing before generalizing about characteristics that may not relate to all entrepreneurs. Unlike personality traits, cognitive patterns can be learned; they shift and evolve over time (Kirkley, 2016). Self-efficacy is a thought pattern, not a personality trait. It may be that entrepreneurial self-efficacy is high when a person, such as a college student, first considers becoming an entrepreneur, that it predictably slumps during the discovery stage, and then regains strength after some period of success, measured in years.

Limitations and future directions

Since the sample of entrepreneurs recruited for this study was all early stage startups, it is not known which startups will succeed and which will not. Therefore, this sample is indicative of the habitual thought patterns of early stage founders; it cannot and does not indicate which habitual thought patterns founders ought to possess. It is descriptive, not prescriptive. A follow-up study five or seven years in the future, that investigates which startup founders made it and which did not, may shed additional light on the thought patterns that tend to lead to startup success and how those patterns tend to evolve over time.

This study did not investigate what Baron *et al.* (2011) called "hot cognition," even though the HVP does include scales that measure what psychologists call valence, or emotional balance – which is the "hot" portion of entrepreneurial cognition. A study of the emotional aspects of entrepreneurial cognition, as measured by the HVP, warrants a separate study.

Conclusion

This project endeavors to join the chorus of those who seek to understand what makes entrepreneurs "tick." What makes entrepreneurs different from others? Researchers seeking to find answers to this question have recently shifted attention from personality traits to cognition. Concurrently, a return to the study of entrepreneurial values has begun. This project joins together these two strands of research with its focus on the structure of values.

Most current research into entrepreneurial cognition is survey based, which by definition, can investigate only what entrepreneurs consciously know that they know about their own cognitions. Yet, like an iceberg, of which only 10 percent is visible above the water, much of a person's cognitive patterns reside beneath the waterline. Therefore, some entrepreneurial researchers have begun to explore these depths of cognition by using methods based on heuristics and biases. While helpful, methods using heuristics and biases as their form of inquiry omit those thought patterns that are values based. Therefore, the goal of the current project was to discover whether a measure of the seemingly unmeasurable – the portion of cognition that is based upon the structure of a person's values – revealed insights that cannot otherwise be obtained from surveys or from methods of inquiry based on heuristics and biases.

For that purpose, this project imported from a sub-discipline of philosophy a value theory known as formal axiology. It used an assessment instrument based on that theory, the HVP, to seek a quantitative discovery of how entrepreneurs think.

What was discovered was that using the HVP as a method for measuring entrepreneurial cognition and metacognition adds to the literature in two meaningful ways. First, it offers a fine-grained set of numerical scales with which to report findings of deep-seated habitual

evaluative thought patterns. The scales of the HVP did, indeed, identify similarities as well as meaningful and statistically significant differences between entrepreneurs and non-entrepreneurial senior managers in those scales that measure integration, self-efficacy and capacity for action.

Analysis of the results in this study indicates that entrepreneurs have a more keenly developed ability to focus attention on practical accomplishments than do non-entrepreneurial senior managers, as might be expected. These findings support other researchers' conclusions about the keenness of opportunity recognition, evaluation and exploitation found amongst entrepreneurs (Shane and Venkataraman, 2000) and it reinforces the importance of the three-part nature of Shane and Venkataraman's definition of entrepreneurship. In particular, this study concludes that a measurable construct known as Integration is an important marker of entrepreneurial cognition.

This study also indicated that there is no statistically significant difference in the self-efficacy of entrepreneurs and that of non-entrepreneurial senior managers. Therefore, the current research contradicts other researchers' conclusions that entrepreneurs are characterized by overconfidence (Busenitz and Barney, 1997) high degrees of self-efficacy (Markman and Baron, 2003) or excessive hubris (Hayward *et al.*, 2006).

Implications for entrepreneurship education

Krueger (2007), in discussing the constructivist nature of human learning, said that the first task is to surface those deep-seated beliefs that are normally unconsciously held. The very act of surfacing them results in increased metacognitive awareness. The HVP is used purposefully in this way today by a growing number of organizational development consultants and executive coaches. Its application to entrepreneurship education simply requires further exploration of which thought patterns are most conducive to entrepreneurial success. By providing entrepreneurs with a logic with which to understand their deep-seated evaluative patterns and a language with which to express that logic, then their deep-seated patterns can be brought into conscious awareness. Once an entrepreneur is metacognitively aware of these patterns, he or she can then learn new ways of thinking, as called for, to increase those cognitive skills. This will, in turn, provide a "roadmap for growing entrepreneurial thinkers" (Krueger, 2007, p. 127).

Implications for axiological researchers

So far, this paper has discussed the implications of these findings for entrepreneurship researchers. The current study also has importance for other axiological researchers working in the domain of managerial and organizational cognition. First, this study demonstrates the efficacy of the HVP in identifying hard-to-identify, but statistically significant, differences between populations that may be expected to be quite similar. Second, the protocol followed in this study to determine when and whether to report non-parametric or parametric results may serve as a guide to other axiological researchers wrestling with the same issue. Third, the current study's findings from the Faith Quotient and Capacity for Action scales may prompt further axiological studies using these two scales.

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