

## **AC 2008-1094: A HOLISTIC PERFORMANCE MEASUREMENT SYSTEM FOR ENTREPRENEURSHIP EDUCATION**

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# **A Holistic Performance Measurement System for Entrepreneurship Education**

## **Abstract**

While the Hinman CEOs Program at the University of Maryland, College Park is committed to preparing students for entry into the entrepreneurial community by developing their entrepreneurial mindsets and functional skill sets is a definitive objective, measuring performance in these areas is a significant challenge.

To meet this challenge, the Hinman CEOs Program has developed and implemented a performance measurement system that assesses its entrepreneurship students' progress in courses and programs. Our performance measurement model is a picture of how the organization does its work and links both short- and long-term outcomes with program activities and the theoretical principles in play. The courses and activities managed by the University align with the teaching outcomes suggested by the National Content Standards for Entrepreneurship Education<sup>14</sup>. Collectively, a mixed-methods longitudinal study has been developed by us and is the basis of the design process. Therefore, data collection occurs at multiple stages over students' time at the University and insights can be gathered on progress towards the key hypotheses.

This paper explores the process used to develop the unique performance measurement system. By discussing this process, and sharing details of the system, measurement instruments, and analysis methods, it is our hope that entrepreneurship educators can better serve their mission through effective performance measurement.

## **Introduction**

The approach to program evaluation for the Hinman CEOs Program is based on measuring short- and long-term outcomes with program activities and the theoretical principles of the program. The funding and assets of the Hinman CEOs Program support experiential education to include the living, learning, and launching activities. These activities align with the teaching outcomes suggested by the National Content Standards for Entrepreneurship Education<sup>14</sup>.

As illustrated in Figure 1, our performance measurement system is based on a four-dimensional evaluation model. Assessment of all four areas ensures that the Program employs a holistic approach to entrepreneurial education progress through both short-term measures (entrepreneurial mindset and functional skill sets) as well as long-term measures of new venture creation. Student satisfaction is also measured to identify areas for improvement and development in the Program, its courses, and related activities.

Figure 1  
The Four-Dimension Performance Measurement System Model

<i>Entrepreneurial Mindset</i>	<i>Functional Skill Sets</i>
This assessment is a function of entrepreneurial processes, entrepreneurial attitudes, and communications and interpersonal skills.	This assessment is a function of financial management, teamwork, marketing management, operations management, risk management, and strategic management.
<i>Launching &amp; Career Activities</i>	<i>Student Satisfaction</i>
Long-term outcomes associated with new venture creation are measured, and include number of companies launched, revenues, profitability, employees, etc. Career activities of students to include graduate school and employment are also measured.	Customer (student) satisfaction and career activities are also measured to ensure holistic program evaluation and quality assurance.

### **Developing the Performance Measurement System for the Hinman CEOs Program**

A six-stage process was used to develop the performance measurement system.

1. Mission: To foster an entrepreneurial spirit, create a sense of community and cooperation, and develop ethical leaders.
2. Vision: To unify and invigorate campus entrepreneurial efforts by creating a multidisciplinary environment where students can develop into the business leaders of tomorrow who will infuse the economy through thriving new ventures
3. Goals: To prepare select University of Maryland undergraduates for entry into the entrepreneurial community by developing their entrepreneurial mindsets and functional skill sets to succeed as leaders.
4. Activities: (1) Living – Residence within the Program and community building activities (social & philanthropic) to connect and engage students with one another. (2) Learning – Courses, internships, competitions, workshops, and related experiential educational activities. (3) Launching – Starting and managing new ventures.
5. Resources: Personnel, facilities, funding, and references.
6. Performance Measures for Program Evaluation: Focus on program processes and outcomes to support goals-based judgments by decision makers

The details of how each of the four dimensions of the performance measurement system were developed in provided in the subsequent four sections of this paper.

## **Entrepreneurial Mindset**

Before developing the specific measures to assess entrepreneurial mindset, we conducted a research study aimed at determining which psychosocial factors were most important to undergraduate entrepreneurial opportunity discovery.

While theories on the ability of psychological and sociological characteristics and attitudes to be predictive of entrepreneurship have existed since the early days of entrepreneurship research, researchers' beliefs in the predictive power of these variables have fluctuated from highly pessimistic to highly optimistic.<sup>17, 35, 36, 39</sup> With criticisms ranging from concerns that the research methodologies used were not developed for measuring entrepreneurship to issues of reverse causation, research that answers the effect of psychosocial characteristics and attitudes on new venturing is limited at best.<sup>24, 39</sup>

This paper has two purposes. The first is to present psychosocial development theory as a viable approach to studying entrepreneurs. Through empirical testing, we believe that we have developed and applied a methodology for testing that mitigates prior concerns in psychological and sociological characteristics and attitudes as related to reverse causation and comparisons of entrepreneurs to non-entrepreneurs<sup>24, 43</sup>. We also provide insights not only into which psychosocial factors are predictive of new venturing, but to what relative level of influence each psychosocial factor has versus the others tested. Our second purpose is to explore the effects of psychosocial development on new-venturing activities of college students. We believe that developing aspiring and active entrepreneurs' psychological and sociological characteristics and attitudes is as, if not more, important than teaching traditional business disciplines of strategy, marketing, and finance.

### *Theoretical Development and Hypotheses*

Shane and Venkataraman state that one of the fundamental entrepreneurship research questions is "why, when and how some people, and not others, discover and exploit opportunities"<sup>47</sup>. Ardichville, Cardozo and Ray contend that opportunity discovery is one of the most important abilities of successful entrepreneurs<sup>3</sup>. Yet, while there is the call for entrepreneurship students to practice effective opportunity discovery in the classroom, few researchers have studied how and why opportunity discovery by 18 to 22 year-old college students differs from adult nascent entrepreneurs.<sup>30, 32, 52, 57</sup>

In parallel with Casson's definition of entrepreneurial opportunities, Shane and Venkataraman's definition of entrepreneurial opportunities is "those situations in which new goods, services, raw materials, and organizing methods can be introduced and sold at greater than their cost of production."<sup>10, 47</sup> Drucker classified entrepreneurial opportunities into three categories: (1) the creation of new information, as occurs in the invention of new technologies; (2) the exploitations of market inefficiencies that result from information asymmetry, as occurs across time and geography; and (3) the reaction to shifts in the relative costs and benefits of alternative uses for

resources, as occurs with political, regulatory, or demographic changes.<sup>16</sup> Entrepreneurial opportunities therefore differ from the larger set of general opportunities for profit because the former require the discovery of new means-ends frameworks characterized by uncertain, non-optimized factors and conditions.<sup>8, 29</sup> The existence of entrepreneurial opportunities therefore depends on asymmetries of information and beliefs of individuals that only a subset of the population will discover.<sup>22, 28</sup>

DeTienne and Chandler proposed a pedagogical approach to training college students in the skills of securing, expanding, exposing, and challenging ideas in an effort to improve opportunity discovery.<sup>15</sup> While their results evidence that students can learn processes for opportunity discovery and improve both the number of ideas generated and the innovativeness of those ideas, we propose that understanding how the opportunity discovery of 18 to 22 year-old nascent entrepreneurs differs from adult nascent entrepreneurs is critical to fostering a climate of receptivity and fertility for such entrepreneurial discovery training and support to effectively occur.

The incorporation of psychological and sociological factors of 18 to 22 year-old students in the classroom as an element of the entrepreneurship education experience is a challenging task for educators. Kourilsky's assertion that "current entrepreneurship education tends to migrate towards its natural focus of 'least resistance' – the traditional business management process areas"<sup>32</sup> is thankfully expanding to include growth in curricula and programs.<sup>34</sup> However, with the offerings serving 18 to 22 year-old students so similar to MBA-level activities to include business plan writing, case studies, and guest speakers, one must ask if undergraduates are being educated in a way that aligns with their unique needs and interests.

If the opportunity discovery experience by traditional undergraduates differs from adult nascent entrepreneurs (to include MBA students), the questions become "how" and what are the pedagogical methods that will increase students' abilities to discover entrepreneurial opportunities.

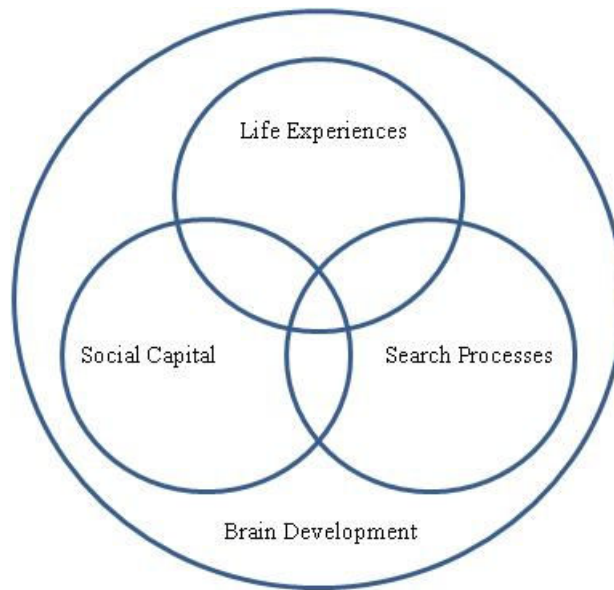
Our objective here is to address the above questions by examining leading thought in entrepreneurial opportunity discovery and college students' psychosocial development. We first explore the key sources of difference that uniquely influence one's discovery and recognition of entrepreneurial opportunity. We focus on the issues associated with access to information. Second, we examine developmental theories of student change during their undergraduate college experience. Third, we derive key relationships that overlap in the areas important to entrepreneurial opportunity discovery as related to college students' psychosocial development. This includes discussion on the psychosocial development that occurs for these students as they relate to factors influencing opportunity-discovery and access to information. Finally, we suggest next steps for entrepreneurship-education researchers and offer concluding comments.

## *Key Influencers of an Individual's Opportunity-Discovery Abilities*

Without any specific consideration of the nascent entrepreneur's age, research to date attributes enhanced discovery and recognition of entrepreneurial opportunity to two causes.<sup>47</sup> First, better *access to information* about the potential existence of a given opportunity improves discovery. Second, select individuals are better at recognizing opportunity because of superior "cognitive capabilities" in opportunity recognition. With opportunity recognition described as "the cognitive processes through which individuals conclude that they have identified an opportunity"<sup>6</sup>, the act of opportunity discovery is the first stage of the opportunity recognition process. Therefore, based on our focus on opportunity discovery, our emphasis is on the first element of "access to information."

As summarized by Shane<sup>47</sup>, some individuals are more likely to discover opportunities than others based on their access to information as influenced by life experiences<sup>56</sup>, social capital<sup>2</sup>, and search processes.<sup>19, 23</sup> We introduce a fourth element for consideration, brain development, which we argue is particularly important to educating 18 to 22 year-olds. Each of these areas, as illustrated in figure 2, are discussed next with attention to 18 to 22 year-old college students' entrepreneurial opportunity discovery.

Figure 2  
Key Influencers of an Individual's Opportunity-Discovery Abilities



### *Life Experiences*

Research indicates that job function and variation in life experiences increase the probability that people will discover entrepreneurial opportunities<sup>47</sup>. Life experiences give preferential access to the knowledge necessary for opportunity discovery as well as the relative risks and rewards.<sup>50</sup>

A person's job function is a primary influence on their likelihood of opportunity discovery. Roberts<sup>42</sup> found that people exposed to novel and valuable technical knowledge in particular are

more likely to discover entrepreneurial opportunities. Particularly in job functions highly correlated with access to information that may lead to entrepreneurial activities, to include research and development<sup>1</sup> and marketing<sup>27, 58</sup>, typical 18 to 22 year-old students at best experience surface exposure and limited relationships through summer internships or part-time jobs. Individuals without the experience of research and development and lacking the exposure to the applied area of development are limited in their access to information and are restricted in their entrepreneurial opportunity discovery ability versus those with such experiences.

Variation in life experience provides exposure to new information that contributes to discovering opportunities. Variation in experience increases the likelihood that a person will receive new information that can provide links and ideas to discovering opportunities in solving society's problems and increasing individuals' satisfactions.<sup>44</sup> At 18 to 22 years old, the life experiences of undergraduates are naturally shorter in span than older adults and are typically less varied as a result of the limited lifespan. The variation of experiences is scarce with internships and part-time jobs not typically yielding the exposure to diverse information valuable for discovery of entrepreneurial opportunity when compared to adult nascent entrepreneurs.<sup>11</sup>

Within the aspects of job function and variation in experiences, the typical 18 to 22 year-old students' experiences are therefore limited when compared to adults. These students may therefore be at a disadvantage for discovering opportunities based on their limited life experiences when compared to nascent adult entrepreneurs.

### *Social Capital*

The quantity and quality of social networks influence individuals' ability to access information that facilitates discovery of opportunity.<sup>2, 7</sup> Diverse social ties improve information access to a variety of knowledge sources including information about markets, sources of capital, employees and experts, and customer needs and wants.<sup>26</sup>

Whether in small colleges or large universities, students have the opportunity to experience a wide range of interactions with peers, faculty, and staff.<sup>59</sup> This network is increasingly extending through online social networks including Facebook and MySpace, where students can stay in touch with high school friends, connect with friends from their earliest years of college, and develop new college friends that are friends of their friends. However, the opportunity to build and manage social capital does not guarantee that students are taking advantage of their position. A level of education and encouragement to build social capital may serve students well in their future entrepreneurial endeavors.

For the college students that extend their social capital to faculty and staff, the students' ability to discover entrepreneurial opportunity improves based on improved access to information.<sup>33</sup> Particularly for students working within university laboratories or serving as research assistants for faculty, students' information access to innovative science-based concepts should improve their access to information and therefore improve their abilities in entrepreneurial opportunity discovery.

### *Search Processes*

Empirical evidence suggests that those searching for information on entrepreneurial opportunities are more likely to discover opportunities.<sup>19</sup> While these searches can be based on publicly available information, non-public information discovered through personal contacts is a particularly valuable resource for entrepreneurs to discover unexploited opportunities.<sup>23</sup> It is in this way that social capital plays a pivotal role in assisting with entrepreneurial opportunity search processes.

Based on limited exposure to influential individuals with unique and opportunistic knowledge, 18 to 22 year-old students may experience limited awareness and scarce access to individuals and pools of non-public information when compared to adults.

For the 18 to 22 year-old college students that develop and leverage their social networks with peers, faculty and staff, and use their social networks to access non-public information for improved search, students can potentially enhance their access to information and therefore improve their abilities in entrepreneurial opportunity discovery.

### *Brain Development*

While research into adolescent decision-making and biological readiness is typically oriented towards questions of juvenile delinquency and criminally charging minors as adults, the relationship of decision-making to brain functions is highly relevant to entrepreneurial decision-making.

Based on collaborative research within the last eight years at Harvard Medical School, the National Institute of Mental Health, UCLA, and others, the adolescent brain is far less developed than previously believed.<sup>37</sup> Among the surprising discoveries is that the teenage brain undergoes an intense overproduction of gray matter (the brain tissue that does the *thinking*), then experiences a *pruning* period during which the brain discards gray matter at a rapid rate.<sup>53</sup> These researchers compare this process to pruning a tree: cutting back branches to stimulate health and growth of the overall tree's development.

Of particular interest to our study of 18 to 22 year-old nascent entrepreneurs, the researchers have new findings with respect to the pace and severity of the brain's developmental changes. They have learned that the brain continues to develop into a person's early 20s. Dr. Elizabeth Sowell and her colleagues found that the frontal lobe is still undergoing changes during these post-adolescent years.<sup>53</sup> The frontal lobe is the last part of the brain to develop, which means that even as people become fully capable in other areas, 18 to 22 year-olds cannot reason as well as older adults since maturation, particularly in the frontal lobes, has been shown to correlate with measures of cognitive functioning.<sup>54</sup>

Jay Giedd of the National Institute of Mental Health explains that during adolescence the part of the brain that is helping organization, planning and strategizing is still being built. Giedd argues that it is unrealistic to expect adolescents to have adult levels of organizational skills or decision making before their brain is finished being built.<sup>54</sup>



Dr. Deborah Yurgelun-Todd of Harvard Medical School concludes that adolescents often rely on emotional parts of the brain, rather than the frontal lobe, explaining that, “one of the things that teenagers seem to do is to respond more strongly with gut response than they do with evaluating the consequences of what they’re doing. Just because they’re physically mature, they may not appreciate the consequences or weigh information the same way as adults do. So we may be mistaken if we think that [although] somebody looks physically mature, their brain may in fact not be mature”.<sup>37</sup>

Based on research by Gur<sup>20</sup>, neuropsychologist and Director of the Brain Behavior Laboratory at the University of Pennsylvania, “perhaps most relevant is the involvement of these brain regions in the control of aggression and other impulses.... If the neural substrates of these behaviors have not reached maturity before adulthood, it is unreasonable to expect the behaviors themselves to reflect mature thought processes. The evidence now is strong that the brain does not cease to mature until the early 20s in those relevant parts that govern impulsivity, judgment, planning for the future, foresight of consequences, and other characteristics that make people morally culpable.... Indeed, age 21 or 22 would be closer to the ‘biological’ age of maturity”.<sup>37</sup>

It is important that entrepreneurship educators and researchers understand the biological development of their students’ brains, as well as the developmental stages and needs as discussed here, in order to offer effective, complimentary curriculum and programming for nascent 18 to 22 year-old entrepreneurs.

### *Examining the Psychosocial Factors of Opportunity Discovery*

With college students as the subjects of our study, we explore the effects of psychosocial development on new-venturing activities by undergraduate entrepreneurship students. The university environment is one of a confluence of trends and changes as identified by Pascarella and Terenzini.<sup>38</sup> Within the campus environment, developmental theories of student change cluster into psychosocial development, cognitive-structural theories, typological models, and person-environment interaction theories and models.<sup>38</sup> Our focus at this time is the first of these, that of the psychosocial development. Each of the other developmental theories may be explored in future research.

Changes in the areas of psychosocial development occur in the self system and the relational system.<sup>25</sup> The self system involves the sense of self, personal identity, academic and social self-concepts, and self-esteem. Relational systems involve students’ interactions with one another and with institutions.<sup>38</sup> The core components comprising psychosocial development that we will examine are self-efficacy, need for achievement, identity development, locus of control, self-esteem, and interpersonal relationships. Each are explored in turn, then empirically tested to predict new venturing by students.

The operational definition of new venturing used here was the active involvement of a student, individually or with a team, in (1) founding a company; (2) developing and submitting a business plan to a competition with the intent of founding a company; (3) developing and submitting a business plan to a grant program with the intent of founding a company; or (4) working in an internship position with a start-up company. Based on the relative youth of traditional

undergraduate students, often 18 to 22 years old, and the desire to capture a nearer term measure of new-venturing activities than the founding of a company alone, these additional three measures of competitions, grants, and internships were included in the new venturing measure.

### *Self-Efficacy*

Self-efficacy is concerned with one's own judgment of their personal capability to perform a task effectively.<sup>5</sup> Adult entrepreneurs show significantly higher levels of self-efficacy, both in self confidence about themselves as well as confidence in their teams, than non-entrepreneurs.<sup>60</sup> Positive self-efficacy among adults increases the likelihood that they will discover entrepreneurial opportunities because this psychological factor increases the individual's confidence in their subjective judgment about uncertain events.<sup>47</sup> This makes sense in that nascent entrepreneurs, young and old alike, must have confidence in their own judgments, particularly when these decisions are different that popular opinion and perhaps differing from trusted friends and family members.

Based on this relatively universal assertion on the importance of self-efficacy to entrepreneurship in adults, our first psychosocial factor-based hypothesis is to examine the relative influence of this factor to the other five factors examined.

*Hypothesis 1: Late adolescent undergraduates who exhibit high self-efficacy will engage in more new- venturing activities than undergraduates who exhibit low self-efficacy.*

### *Need for Achievement*

The need for achievement is the need to advance for measurable personal accomplishment.<sup>35</sup> Entrepreneurship researchers have examined the influence of need for achievement, also called achievement orientation, on entrepreneurial success since the earliest entrepreneurship research studies.<sup>35</sup> Schumpeter incorporated concepts of need for achievement into his early theories of entrepreneurship and economic development<sup>45</sup>. During the 1980s, "achievement motivation became the personality theory most frequently studied" according to Rauch and Frese.<sup>39</sup> Need for achievement fell among the personality theories that were largely discarded based on inconsistent and conflicting empirical results in the 1980s and early 1990s.<sup>39</sup> While the findings have been inconclusive<sup>51</sup>, recent researchers have called into question the adequacy of the methods used for the research, and suggested that the methods need to be improved to fully assess the influence of need for achievement on entrepreneurial success that they believe to exist.<sup>39</sup>

With recent meta-analytical evidence challenging the views that discarded need for achievement as a valuable indicator of entrepreneurial success, this once popular theory will be tested within this study via a method that we believe to mitigate prior concerns.<sup>39, 55</sup> Achievement is the focus of our second hypothesis.

*Hypothesis 2: Late adolescent undergraduates who exhibit high need for achievement will engage in more new- venturing activities than undergraduates who exhibit low need for achievement.*

### *Identity Development*

Identity development involves concepts relating to physical characteristics and personal appearance, and extends to an understanding of, and a comfort level with, self-conceptions relating to gender, ethnicity and self.<sup>38</sup> Identity formation also involves developing sense of self in a context influenced by historical events and social and cultural conditions and by issues emanating from society, family and heritage.<sup>12</sup>

As identity development is a pre-cursor to developing self-concept, self-esteem and self-efficacy, a strong sense of identity may contribute to improved levels of entrepreneurial opportunity discovery. When an individual is uncomfortable with their sense of self, there is limited confidence in their own judgment and a discomfort at the prospect of being wrong or at odds with the questioning majority.<sup>11,41</sup> Under these conditions, the level of entrepreneurial opportunity discovery may therefore be constrained.

The influence of identity development on new venturing is examined as our third hypothesis.

*Hypothesis 3: Late adolescent undergraduates who exhibit high identity development will engage in more new-venturing activities than undergraduates who exhibit low identity development.*

### *Locus of Control*

Another segment of research of psychosocial changes during the late adolescents' college years examines changes in students' autonomy and locus of control. In this context, autonomy includes an individual's belief about their level of freedom from the influence of others. Locus of control is an individual's belief that they can influence the environment in which they are found. The locus of control may be internally-oriented, with one believing that they are in control and are able to influence their environment and outcomes, or externally-oriented, meaning that they are subject to other people and events.

Adults with higher levels of autonomy and an internal locus on control are more likely to discover and exploit an entrepreneurial opportunity than those with low levels of autonomy and an external locus of control.<sup>9,48</sup> The beliefs of an entrepreneur about the value of entrepreneurial opportunities are influenced by their self-evaluation of their ability to exploit these opportunities. This self-evaluation thus depends on the degree to which the nascent entrepreneurs believe that they can influence the environment and their circumstances.<sup>21</sup>

While studies point to a degree of student independence from parents during the college years, the evidence is not strong. The degree of freedom from peer influence is also unclear. Studies of locus of control do consistently point to increases in internality during the undergraduate years,

suggesting that students increasingly believe in their ability to create change and manage their futures.<sup>4, 31, 40</sup>

The level of an internal locus of control that exists in students active in new venturing is examined as hypothesis four.

*Hypothesis 4: Late adolescent undergraduates who exhibit an internal locus of control will engage in more new-venturing activities than undergraduates who exhibit an external locus of control.*

### *Self-Esteem*

Self-esteem is internal and “expresses an attitude of approval or disapproval, and indicates the extent to which the individual believes himself to be capable, significant, successful, and worthy”.<sup>13</sup> Positive self-esteem increases the likelihood that an adult will discover entrepreneurial opportunities because this psychological factor increases the individual’s confidence in their subjective judgment about uncertain events.<sup>47</sup> The ability to learn from failure, without negatively impacting self-esteem long-term, is another aspect of successful entrepreneurial development.<sup>49</sup>

The differences in self-esteem that exists in students active in new venturing versus those that are not active in new venturing are examined as hypothesis five.

*Hypothesis 5: Late adolescent undergraduates who exhibit high self-esteem will engage in more new-venturing activities than undergraduates who exhibit low self-esteem.*

### *Interpersonal Relationships*

Interpersonal relationships directly contribute to the quantity and quality of social networks of an individual. Interpersonal relationships, as a cornerstone of social capital, influence an adult’s abilities to access information that facilitates discovery of entrepreneurial opportunities.<sup>2, 7</sup> Diverse social ties can also improve information access to a variety of knowledge sources including information about markets, sources of capital, employees and experts, and customer needs and wants.<sup>26</sup>

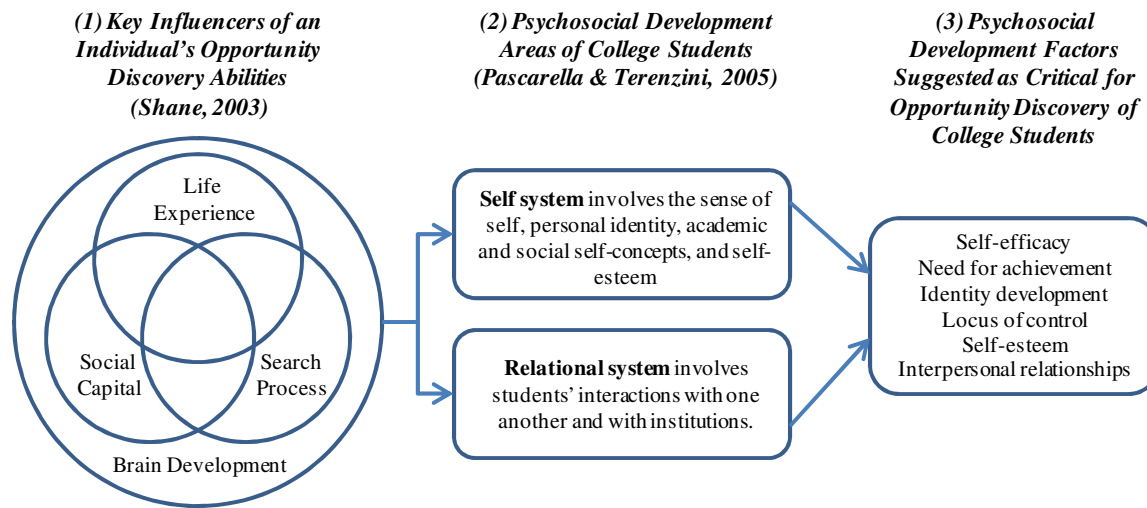
Communications and interpersonal relationships skills as self-diagnosed by late adolescents are explored as the sixth and final hypothesis of our study.

*Hypothesis 6: Late adolescent undergraduates who exhibit strong interpersonal relationship skills will engage in more new-venturing activities than undergraduates who exhibit weak interpersonal relationship skills.*

### *Resulting Model*

The resulting model that is tested in the study is illustrated as Figure 3.

Figure 3  
 Psychosocial Factors Tested for Driving Students' Entrepreneurial Opportunity Discovery



### Survey Sample

To determine if these six psychosocial factors are predictive of students' new-venturing activities, our study was accomplished by a survey administered to 175 late adolescent college students enrolled in entrepreneurship courses at the University of Maryland, College Park. The students represented a mix of majors and academic years, with 30% of the population being female.

### Measurements

Existing survey questions examining the presence of the six psychosocial factors were sourced from Robinson<sup>43</sup> and Queendom.com, a subsidiary of PsychTests AIM Inc., a psychometric company that develops a suite of products and services centered around its extensive battery of psychological assessments. A regression model was developed with the six psychosocial factors as independent variables tested against the dependent variable of students' new-venturing activity.

Binary logistic regression was used for assessing what psychosocial factors are most supportive of students' entrepreneurial opportunity discovery and new-venturing activities. Logistic regression is appropriate because the survival of new ventures are interpreted as dichotomous values (measuring 0 for those who have not started a venture and 1 for those who have started a venture). These dichotomous values are non-linear, which means that the independent variable does not have to be constant with the dependent variable, which doesn't be normally distributed.

### *The Timing of Cause and Effects*

It is important to note that all surveys of students were done before they embarked on their new-venturing activities. Our method therefore solves the problem of reverse causation that is voiced by Hisrich, Langan-Fox, and Grant.<sup>24</sup> Reverse causation is methodological concern in past studies comparing entrepreneurs to non-entrepreneurs. As we are measuring these factors prior to new-venturing activities, we can evaluate whether the attitudes and characteristics of students are a predisposing factor, and not simply learned from the new venture role itself. In other words, we know if the high self-efficacy existed prior to an individual's new venture successes or not.

### *Results*

Using forward likelihood binary logistic regression analysis, three of the independent variables (from the six tested from each of the six hypotheses) were able to adequately predict new-venturing activities among the study participants: self-efficacy ( $\beta=0.196$ ,  $p=0.003$ ,  $p<.01$ ), internal locus of control ( $\beta=.090$ ,  $p=.006$ ,  $p<.01$ ) and interpersonal relationship skills ( $\beta=0.075$ ,  $p=0.019$ ,  $p<.05$ ). The -2Log likelihood of the sample is 94.743. The omnibus test reported a chi squared value for the model of 52.33 (df =3  $p<.001$ ) for the model. In evaluating the standard error value of all three variables in the model in Table 1, we can see that all three are significant with self-efficacy and internal locus of control reporting significance at the .01 level, and interpersonal relationship skills significant at the .05 level. Identity development, need for achievement, and self-esteem reported non-significant values and were removed from the final model.

The Wald statistic is used to examine the individual significance of each variable in the model. The order in which the variables appear in the model is indicative of their level of influence on the dependent variable. Self-efficacy has the highest Wald statistic of 8.77, with internal locus of control reporting a Wald of 7.613 and interpersonal relationship skills with a Wald of 5.486. This information supported by the experiential betas or Exp ( $\beta$ ) values, in the last column of Table 1 highlight the indicated change in the odds of the dependent variable (new-venturing activities) with the addition of each new variable. In this case self-efficacy with an Exp ( $\beta$ )=1.126 explains 20% of the likelihood to engage in new-venturing activities. The addition of internal locus of control with an Exp ( $\beta$ )=1.095 explains an additional 9% of the predicted likelihood, while interpersonal relationship skills with an Exp ( $\beta$ )=1.078 adds an additional 8% explanation in the choice to engage in new-venturing activities among late adolescents in the study.

Table 1  
Report of Variables in the Equation

<b>Variable</b>	<b><math>\beta</math></b>	<b>Standard Error</b>	<b>Wald Statistic</b>	<b>Significance</b>	<b>Exp (<math>\beta</math>)</b>
Self-efficacy	0.196	0.066	8.773	.003	1.216
Internal Locus of Control	0.090	0.033	7.613	.006	1.095
Interpersonal Relationship Skills	0.075	0.032	5.486	.019	1.078
Constant	-20.212	4.201	23.153	.000	.000

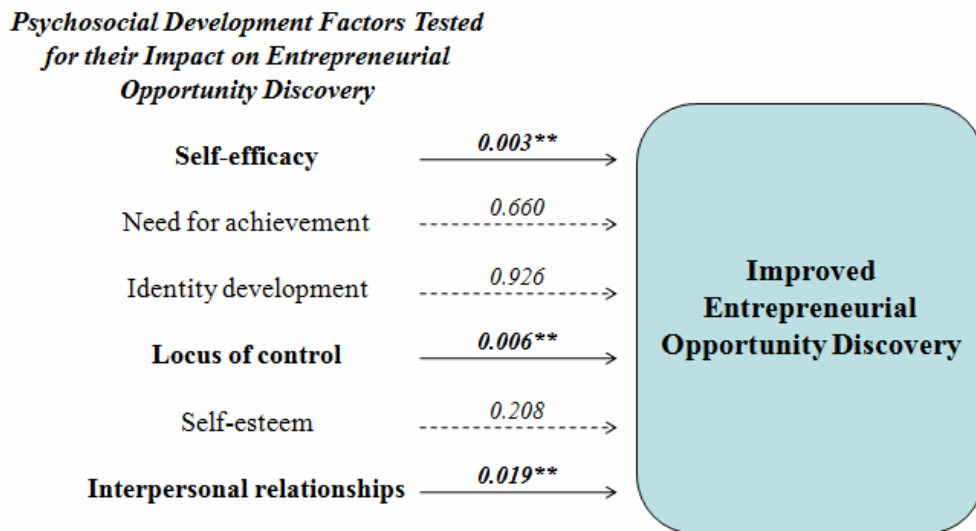
The classification table listed as Table 2 indicates the number of predictions on the dependent variable of “new venture activities.” Involvement in new venture activities was coded as 1.00 and .00, 1.00 indicating involvement and .00 indicating persons who had no new venture activity involvement. The overall model was able to adequately predict 88% of students’ decision whether or not to engage in new-venturing activities. With respect to person’s who did not engage in new-venturing activities, the survey was able to predict 96.6% correctly. For those engaged in new venturing, the model adequately predicted 38.5% of the 26 respondents who had engaged in new-venturing activities. This indicates the possibility that other factors may influence the decision to engage in new venturing. Further investigations that examine the process of opportunity discovery may be needed to further explain this phenomenon.

Table 2  
Classification of Venture Creation Among the Students as Predicted by the Logistic Regression Model

Classification	Correct Predictions	Incorrect Predictions	Percentage
.00	144	5	96.6
1.0	10	16	38.5
Total	154	21	88.0

The analysis yielded three significant factors from the six tested, as illustrated in figure 4. Specifically, high *self-efficacy*, an internal *locus of control*, & strong *interpersonal relationship skills* are important for aspiring late adolescent entrepreneurs. Factors not found to be significant to entrepreneurial opportunity discovery are *identity-development*, *need for achievement*, & *self-esteem*

Figure 4  
Psychosocial Factors Positively Impacting Entrepreneurial Opportunity Discovery



### *Testing Entrepreneurial Mindset of Program Members*

To test Hypothesis 1, “The Hinman CEOs Program improves its students’ entrepreneurial mindsets”, the six aforementioned factors are assessed. Specific attention is given to the levels of change in *self-efficacy*, an internal *locus of control*, and *interpersonal relationship skills*.

A 20-minute, 100-question self-assessment is first administered upon the entry of students in the Program. This survey is included herein as Appendix 1. A longitudinal analysis is conducted over the two later data-collection efforts to assess the level of change. This may be conducted in a computer lab on campus that can accommodate all students’ access to a PC to complete an online form with these questions. Alternatively, a written survey may be administered and later coded into the system manually by staff. The level of improvement in a student’s mindset is evaluated by scoring each of these factors.

A mixed-methods longitudinal study is the basis of the design process. Data collection occurs at multiple stages over a two-year period for Program members.

1. Application
2. Entrance
3. End of Semester 1
4. End of Semester 2
5. End of Semester 3
6. Graduation
7. Alumni

For stage 1, applicants to the program share their entrepreneurial mindsets and these are evaluated by staff during the application reviews and interviews. For accepted applicants, baselining of functional knowledge is conducted in stage 2. For stages 3-5, students are assessed in courses and by interview and survey. Alumni may also be tracked and measured.

Additionally, semi-annual one-to-one interviews of students are performed by staff. These open-ended interviews capture further details on the living-learning experience. Emerging themes of these interviews may be included in the assessment and as part of the program evaluation activity. These inputs support Program evaluation and improvement.

### **Functional Knowledge**

To test Hypothesis 2, “The Hinman CEOs Program improves its students’ *functional skill sets* in entrepreneurship”, the financial management, teamwork, marketing management, operations management, risk management, and strategic management knowledge are assessed via classroom activities (as detailed in table 3). Within the entrepreneurship courses, a variety of techniques and deliverables are employed to measure functional skill sets. Deliverables used with the Program’s courses include:



- **Concept Submission:** As a team, develop the candidate concept(s) with attention to:
  - Defining the concept.
  - What is unique about the concept compared to current and expected competitors?
  - What is the current and expected state of the market (customers)?
  - How do your personal interests, ambitions, and relationships align with the opportunity?
  
- **Competitive Analysis:** As a team, develop a three-page competitive analysis for your venture. Focus on:
  - Defining each of the Five Forces impacting your venture
  - Assessing the relative force (low, medium, high) on your venture for each force
  - Discussing potential strategies to position your venture successfully given the forces
  
- **Marketing Plan:** As a team, develop a five-page marketing plan in MS Word for your venture. The outline for the marketing plan is:
  - Marketing objectives
  - Target customer segment: With consideration of how you will Cross the Chasm
  - Marketing mix: Product, price, promotion, & placement
  - Sales methods to include personal selling and/or sales channels, etc.
  
- **Financial Statements:** As a team, develop financial statements to include the:
  - Income Statement
  - Cash Flows Statement
  - Balance Sheet
  
- **Business Plan:** Using the outline provided in the text, develop a business plan including cover page, tables of contents, executive summary, financials, tables, charts, etc.
  
- **Investor Presentation:** Develop and present a presentation to share your concept.
  
- **Investor Feedback:** Placing yourself in the role of an angel investor, discuss where you would invest a fictional \$100,000 angel investment and why. Include ideas and constructive criticism for a total of three-pages.
  
- **Peer Evaluation:** Complete the Peer Evaluation available by template for your team.

Table 3. Functional Knowledge: Overview of the Approach

FUNCTIONAL KNOWLEDGE		Resources	Activities	Outputs	Short- & Long-Term Outcomes
A. Financial Management					
1. Accounting	Personnel & References	Courses, Workshops, Internships, Competitions, Coaching	• Prepare financial statements • Develop funding strategies	Ability to develop and manage sound accounting and financing strategies and practices	
2. Finance					
B. Teamwork					
1. Organizing	Personnel & References	Courses, Workshops, Internships, Competitions, Coaching	• Develop org. structure • Determine hiring needs • Prepare performance appraisals	Ability to organize, hire, and lead high-performance teams	
2. Staffing & Training					
3. Motivation & Assessment					
C. Marketing Management					
1. Product Development	Personnel & References	Courses, Workshops, Internships, Competitions, Coaching	• Generate product ideas • Design pricing strategies • Develop promotional strategies • Prepare sales strategies	Ability to develop and execute on the marketing mix to achieve superior results	
2. Pricing					
3. Promotion					
4. Selling					
D. Operations Management					
1. Systems Thinking	Personnel & References	Courses, Workshops, Internships, Competitions, Coaching	• Demonstrate systems thinking • Develop project plans	Ability to design and manage an efficient, effective organization	
2. Daily Operations					
E. Risk Management					
1. Business Risks	Personnel & References	Courses, Workshops, Internships, Competitions, Coaching	• Establish risk mgt. controls • Identify legal issues	Ability to manage risk and be proactive with legal decisions	
2. Legal Considerations					
F. Strategic Management					
1. Competencies & Capabilities	Personnel & References	Courses, Workshops, Internships, Competitions, Coaching	• Develop comp. & caps. • Develop competitive strategies	Ability to develop and manage sustainable competitive advantage	
2. Competitive Analysis					

## Customer Satisfaction

Student satisfaction is measured through a survey that addresses personal goals, the living community, activities and programming, as well as the residential facilities where all Program members live. Measuring these elements, in addition to the entrepreneurial mindset and functional skill sets, is important to monitoring the total entrepreneurship education experience that students are living within the Program.

For each of the sub-categories measured, as illustrated in table 4, the specific questions and format of response is listed. The survey is conducted annually in a formal means, and more frequently through informal conversations with students.

Table 4  
Customer Satisfaction Survey

CUSTOMER SATISFACTION	Format
A. Personal Goals	
Personal goals realization	Likert (1-5) & Essay
B. Living Community	
I discuss entrepreneurial topics including new venture ideas with my roommates.	Likert (1-5)
I discuss entrepreneurial topics including new venture ideas with other Program students beyond my roommates.	Likert (1-5)
Living alongside fellow Program students a critical element of the program.	Likert (1-5)
My social activities outside of the Program, such as movies and sports, include other Program students .	Likert (1-5)
I expect lifelong friendships with fellow Program students .	Likert (1-5)
There is a high level of interaction across ethnically & religiously diverse students in the Program.	Likert (1-5) & Essay
If I were to count the number of Program students that I know by name and major, the total for me would be:	%
C. Courses, Activities, and Programming	
Rank the guest speakers and provide comments on pros and cons	Rank
Rank the activities and programming	Rank
What activities and programming did you most enjoy and why?	Essay
What activities and programming did you least enjoy and why?	Essay
Number of new venture coaching sessions with staff	Total, Avg, & Std. Dev.
Quality of new venture coaching that you received from staff	Likert (1-5)
What can be done to improve the quality of new venture coaching that you received from staff?	Essay
Number of personal mentoring sessions with staff	Total, Avg, & Std. Dev.
Quality of personal mentoring that you received from staff	Likert (1-5)
What can be done to improve the quality of personal mentoring that you received from staff?	Essay
Program-managed social hours committed per semester	Total, Avg, & Std. Dev.
Program-managed philanthropy hours committed per semester	Total, Avg, & Std. Dev.
D. South Campus Commons Two	
How satisfied are you with the Program residences?	Likert (1-5)
Please share any criticisms (with suggested improvements) &/or praises regarding the Program residences, facilities, maintenance and administrative staff, etc.	Essay

## Launching and Career Activities

The assessment of launching and career activities capture traditional measures associated with new venture creation and career development.

For current students, graduating students, and alumni, the Program actively works to track the launching activities associated with new venture creation. The measures align with typical company growth and economic development measures. These measures are captured through an online system that include personal profiles of student members including resume-style information, with a separate category of data collected for student and alumni ventures. Email requests are sent periodically to students and alumni requesting that they update both their personal data as well as any new venture data.

Employer and graduate school information is also captured through the online personal and company profile system. This data provides insight into the level of corporate entrepreneurship that may be occurring as well as graduate school activities of former students.

Table 5  
Launching and Career Activities

<b>LAUNCHING AND CAREER ACTIVITIES</b>	<b>Format</b>
<b>A. Launching Activities</b>	
Number of Program students entering business plan competitions	Number & %
Number of Program students placing in competitions	Number & %
Number of Program students' founding companies	Number & %
Number of Program students' companies founded	Number & %
Number of Program students applying for grants and awards	Number & %
Grants and awards to Program students' companies	Total & Avg.
Revenues of Program students' companies	Total & Avg.
Number of Program students' pursuing their personal new venture full-time upon graduation	Number
<b>B. Employer/Graduate School Information</b>	
Employers	Company Names
Average starting salary (of students seeking employment)	Number
Graduate schools	School Names
Number of students attending graduate school	Number

## Discussion

The performance measurement system outlined herein has proved to be an effective and efficient means of assessing the Hinman CEOs Program's entrepreneurship students' progress in courses and programs. It has provided a balanced approach of measuring short-term and long-term outcomes that align with the mission of our organization.

Particularly within the area of entrepreneurial mindset, we are pleased with our ability to breakdown this rather ethereal topic into measureable items. It has been argued that psychosocial development theory is a viable approach to studying entrepreneurs. Based on our methodology for empirical testing that mitigates prior concerns in psychological and sociological characteristics and attitudes as related to reverse causation and comparisons of entrepreneurs to non-entrepreneurs, we have provided insights not only into which psychosocial factors are predictive of new venturing, but to what relative level of influence each psychosocial factor has versus the others tested.

This research also fulfills our purpose of exploring the effects of psychosocial development on new-venturing activities of college students. We stand true to our belief that developing aspiring and active entrepreneurs' psychological and sociological characteristics and attitudes is as important, if not more important, than teaching traditional business disciplines of strategy, marketing, and finance.

With an appreciation of how students' psychosocial development progresses through college, the first steps to the question of how to cultivate this development while in college to enhance their entrepreneurial mindsets can be better considered. And with the relative influence of six psychosocial factors suggested herein, the development of programs and curriculum can be considered by future researchers and educators, with an appreciation for the need to focus on effectively and efficiently fostering self-efficacy, locus of control, and interpersonal relationships skills amongst aspiring and active entrepreneurs.

Entrepreneurship educators and program managers interested in increasing the level of students' new-venturing are well-served to help students develop high self-efficacy, an internal locus of control, and strong interpersonal relationship skills. Curriculum and programs should be developed and implemented to assist in these areas, as well as to impact the broader areas of functional skill set building, new venture creation, and general student satisfaction. It is our hope that the approach and measures outlined herein help our fellow educators in this pursuit.

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## **Appendix 1**

### **Survey of Students' Entrepreneurial Opportunity Discovery Factors**

1. My life experiences (to include industry, functional, and entrepreneurial experiences) have positioned me well for discovering new entrepreneurial opportunities. (self-efficacy)
2. My social networks and ability to connect with faculty, staff and alumni have positioned me well for discovering new entrepreneurial opportunities. (self-efficacy)
3. My ability to recognize entrepreneurial opportunities in information based on my experiences and knowledge is well-developed. (self-efficacy)
4. In situations that I encounter, I believe that I have the ability to influence the individuals and processes involved. (self-efficacy)
5. When I see a good opportunity, I know the next steps for acting on it. (self-efficacy)
6. I often see new business opportunities. (self-efficacy)
7. I get my biggest thrills when my work is among the best there is. (achievement- affect)
8. I seldom follow instructions unless the task I am working on is too complex. (identity development-behavior)
9. I never put important matters off until a more convenient time. (achievement- behavior)
10. I have always worked hard in order to be among the best in my field. (personal control-behavior)
11. I feel like a total failure when my business plans don't turn out the way I think they should.(self-esteem-affect, scored as reverse measure)
12. I feel very energetic working with innovative colleagues in a dynamic business climate.(identity development- affect)
13. I believe that concrete results are necessary in order to judge business success.(achievement-cognition)
14. I create the future business opportunities I take advantage of. (personal control- behavior)
15. I spend a considerable amount of time making any organization I belong to function better.(achievement-behavior)
16. I know that socioeconomic conditions will not affect my success in business. (personal control- cognition)
17. I believe it is important to analyze your own weaknesses in business dealings. (achievement-cognition)
18. I usually perform very well on my part of any project I am involved with. (self esteem-behavior)
19. I get excited when I am able to approach tasks in unusual ways. (identity development-affect)
20. I feel very self-conscious when making presentations or proposals. (self esteem-affect, scored as reverse measure)
21. I believe that in the business world the work of competent people will always be recognized. (personal control-cognition)
22. I believe successful people handle themselves well at business gatherings. (self esteem-cognition)
23. I enjoy being able to use old concepts in new ways. (identity development-affect)



24. I seem to spend a lot of time looking for someone who can tell me how to solve all my business problems or problems with school projects.) (self esteem-behavior, scored as reverse measure)
25. I feel terribly restricted being tied down to tightly organized business activities, even when I am in control. (identity development-affect)
26. I often sacrifice personal comfort in order to take advantage of professional opportunities. (achievement-behavior)
27. I feel self-conscious when I am with very successful people. (self- concept/esteem-affect, scored as reverse measure)
28. I believe that to succeed in business it is important to get along with the people you work with. (self esteem-cognition)
29. I do every job as thoroughly as possible. (achievement-behavior)
30. To be successful I believe it is important to use your time wisely. (achievement-cognition)
31. I believe that the authority I have, or will gain, in business is due mainly to my expertise in certain areas. (self-esteem-cognition)
32. I believe that to be successful a businessperson must spend time planning the future of their business (achievement-cognition)
33. I make a conscientious effort to get the most out of my resources. (achievement-behavior)
34. I feel uncomfortable when I'm unsure of what my peers or business associates think of me. (self esteem-affect, scored as reverse measure)
35. I often put on a show to impress the people I work with. (self esteem-behavior, scored as reverse measure)
36. I believe that one key to success in business is to not procrastinate. (achievement-cognition)
37. I get a sense of pride when I do a good job on my projects. (achievement-affect)
38. I believe that organizations which don't experience radical changes now and then tend to get stuck in a rut. (identity development-cognition)
39. I feel inferior to most people I work with. (self esteem-affect, scored as reverse measure)
40. I think that to succeed in business these days you must eliminate inefficiencies. (achievement-cognition)
41. I feel proud when I look at the results I have achieved. (achievement-affect)
42. I feel resentful when I get bossed around. (personal control-affect)
43. Even though I spend some time trying to influence events around me every day, I have had very little success. (personal control-behavior, scored as reverse measure)
44. I feel best about my work when I know I have followed accepted procedures. (identity development-behavior, scored as reverse measure, scored as reverse measure)
45. Most of my free time is spent working on business ideas. (identity development-behavior)
46. I believe it is more important to think about future possibilities than past accomplishments. (achievement-cognition)
47. I believe that in order to succeed, one must conform to accepted business practices. (identity development-cognition)
48. I believe that any organization can become more effective by employing competent people. (personal control-cognition)

49. My preference is to/ will be to delegate routine tasks after only a short period of time. (identity development- behavior)
50. I will spend a considerable amount of time analyzing my future business needs before I allocate any resources. (achievement-behavior)
51. I feel very good because I am ultimately responsible for my own business success. (personal control-affect)
52. I believe that to become successful in business you must spend some time every day developing new opportunities. (identity development-cognition)
53. I get excited creating my own business opportunities. (personal control-affect)
54. I make it a point to do something significant and meaningful at work/school every day.(achievement-behavior)
55. I usually take control in unstructured situations. (identity development-behavior)
56. I never persist very long on a difficult job before giving up. (self esteem- behavior, scored as reverse measure)
57. I spend a lot of time planning my business activities. (personal control-behavior)
58. I believe that to arrive at a good solution to a business problem, it is important to question the assumptions made in defining the problem. (identity development-cognition)
59. I often feel badly about the quality of work I do. (self esteem-affect)
60. I believe it is important to continually look for new ways to do things in business. (identity development-cognition)
61. I believe it is important to make a good first impression. (self esteem-cognition)
62. I believe that when pursuing business goals or objectives, the final result is far more important than following the accepted procedures. (identity development-cognition)
63. I feel depressed when I don't accomplish any meaningful work. (achievement- affect)
64. I often approach business tasks in unique ways. (identity development-behavior)
65. I believe the most important thing in selecting business associates is their competency. (achievement-cognition)
66. I take an active part in community affairs so that I can influence events that affect my business. (personal control-behavior)
67. I feel good when I have worked hard to improve my business. (achievement- affect)
68. I enjoy finding good solutions for problems that nobody has looked at yet. (identity development-affect)
69. I believe that to be successful a company must use business practices that may seem unusual at first glance. (identity development-cognition)
70. My knack for dealing with people has enabled me to create many of my business opportunities. (personal control-behavior)
71. I get a sense of accomplishment from the pursuit of my business opportunities. (achievement-affect)
72. I believe that currently accepted regulations were established for a good reason. (identity development-cognition, scored as reverse measure)
73. I always feel good when I make the organizations I belong to function better. (achievement-affect)
74. I get real excited when I think of new ideas to stimulate my business. (identity development-affect)
75. I believe it is important to approach business opportunities in unique ways. (identity development-cognition)

76. I always try to make friends with people who may be useful in my business.  
(achievement-behavior)
77. I usually seek out colleagues who are excited about exploring new ways of doing things.  
(identity development-behavior)
78. I enjoy being the catalyst for change in business affairs. (identity development-affect)
79. I always follow accepted business practices in the dealings I have with others. (identity development-behavior, scored as reverse measure)
80. I rarely question the value of established procedures. (identity development-behavior, scored as reverse measure)
81. I get a thrill out of doing new, unusual things in my business affairs. (identity development- affect)
82. I find it difficult to express my opinions when others don't share them. (interpersonal relationships)
83. When I don't understand a question, I ask for additional explanation. (interpersonal relationships)
84. I find it easy to see things from someone else's point of view. (interpersonal relationships)
85. I find it hard to express my feelings. (interpersonal relationships)
86. I can detect the mood of others by looking at them while we are conversing.  
(interpersonal relationships)
87. I get so caught up in what I have to say that I am unaware of the expressions and reactions of my listeners. (interpersonal relationships)
88. When I am wrong, I admit it. (interpersonal relationships)
89. The best way to help others understand me is to tell them what I feel, think, and believe.  
(interpersonal relationships)
90. When the conversation turns to feelings, I tend to change the subject. (interpersonal relationships)
91. When I have the impression that I might have hurt someone's feelings, I apologize.  
(interpersonal relationships)
92. I become defensive when I am being criticized. (interpersonal relationships)
93. When I am angry and someone asks if I am, I admit it. (interpersonal relationships)
94. When I talk to someone, I try to put myself in the other person's shoes. (interpersonal relationships)
95. When someone has difficulties finding the proper words, I gladly help by suggesting what I think the person wants to say. (interpersonal relationships)
96. It upsets me if someone disagrees with me, especially if that person doesn't have my experience. (interpersonal relationships)
97. When I encounter a problem with a person or organization, I am comfortable in discussing the problem face-to-face. (interpersonal relationships)
98. In situations where I must negotiate a solution, I achieve my optimum solution.  
(interpersonal relationships)
99. I avoid expressing my disagreement with people because they might get angry with me.  
(interpersonal relationships)
100. I am able to resolve problems without losing control of my emotions. (interpersonal relationships)