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Avoiding Construct Confusion: An Attribute-Focused Approach to Assessing Entrepreneurial Mindset

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ABSTRACT

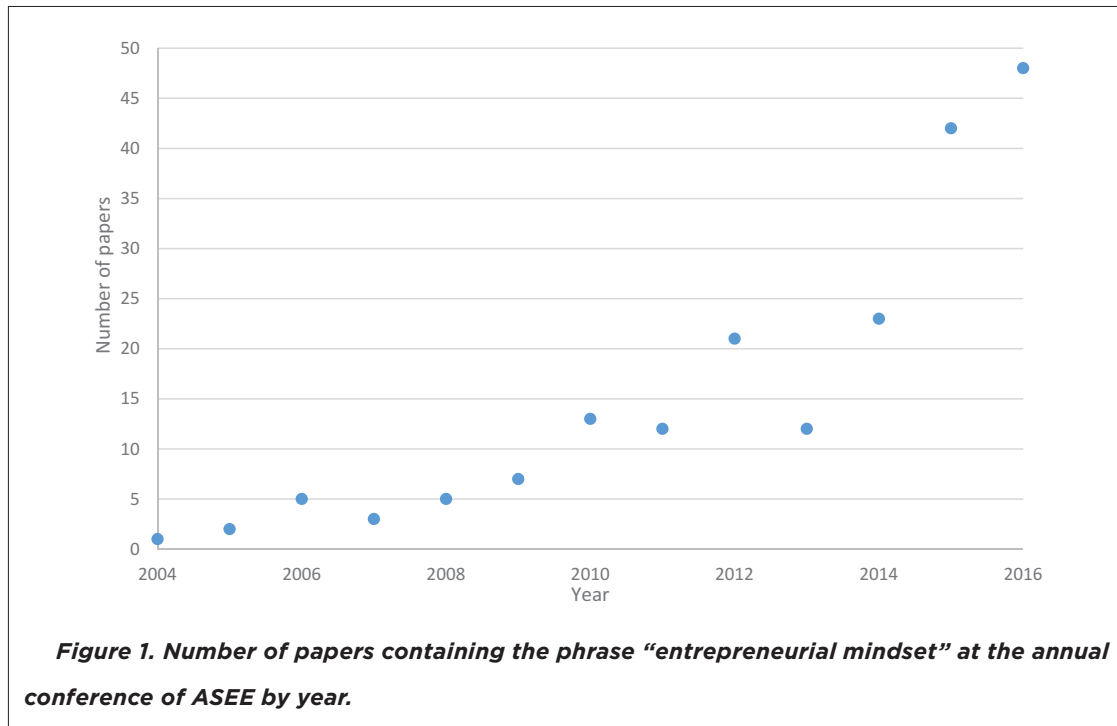
The term “entrepreneurial mindset” is often included in the program objectives of engineering entrepreneurship programs. However, the definition of the term has been argued and debated by many in the community and in the literature, leading to challenges with how to best design assessment of engineering entrepreneurship programs. The purpose of this paper is to present a research-based approach to conducting assessment, discuss the various definitions of entrepreneurial mindset including how the term is fraught with construct confusion, and to propose an approach to assessing entrepreneurial mindset that focuses on specific attributes rather than the omnibus construct.

Key words: Entrepreneurship, student assessment, program evaluation, validity

INTRODUCTION

The engineering entrepreneurship education community is in desperate need of assessment approaches that are rooted in rigorous research. In addition to providing information about the impact on student learning and development, assessment data can inform what is and what is not working in educational programs. Assessment is especially important for entrepreneurship programs, which may exist along the fringes of the engineering curriculum. While many leaders of engineering entrepreneurship programs are interested in assessment for program improvement, some may be pressured by administrators to demonstrate their programs' worth, given tightening financial circumstances.

Over the past several years, I have worked with faculty on the assessment of newly developed programs relating to innovation and entrepreneurship. Repeatedly, when I ask faculty about the goals of their programs and what impact they hope to have on students, they say they hope their program will improve students' “entrepreneurial mindset.” The phrase “entrepreneurial mindset”

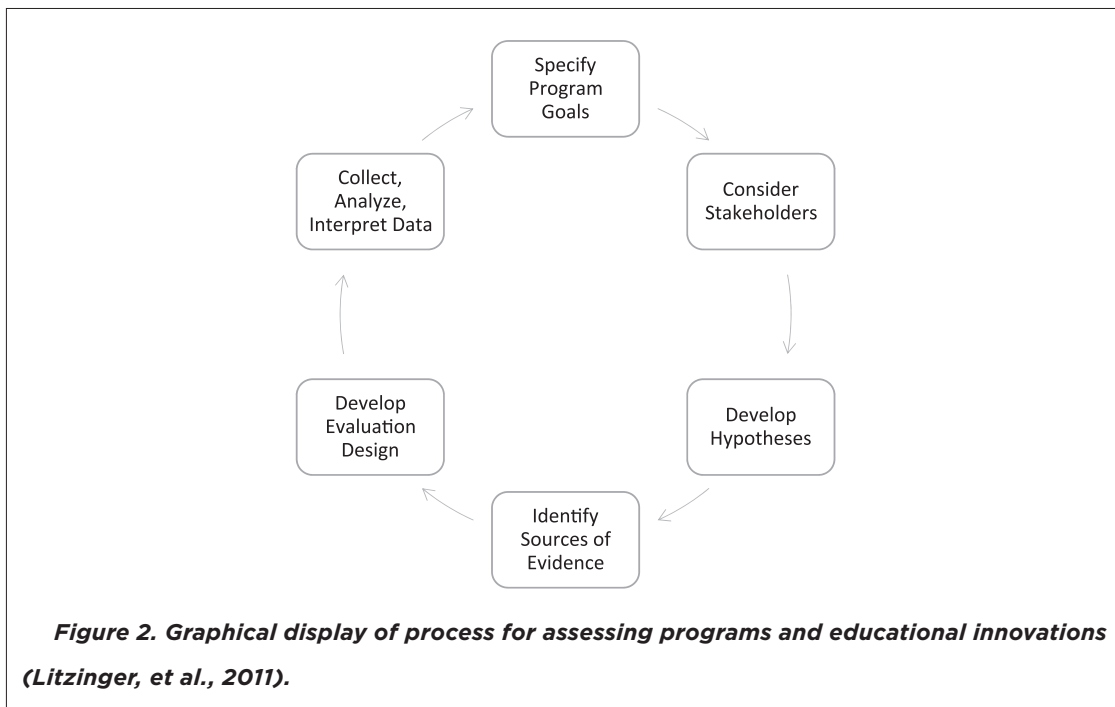


began appearing in scholarly papers in the 1990s (for example, Bettis and Hitts, 1995). The number of times that “entrepreneurial mindset” has appeared in papers in the general literature and engineering education literature has skyrocketed since then (see Figure 1). Many researchers and practitioners have debated the definition of entrepreneurial mindset, and in some cases its very existence, leaving assessment experts with the challenge of how entrepreneurial mindset could be assessed and measured practically.

The purpose of this paper is to discuss approaches and concerns with the assessment of entrepreneurship education programs. This paper will identify concerns with treating entrepreneurial mindset as a psychological construct, given the current state of research. An approach to assessing entrepreneurship programs using specific attributes, primarily the knowledge, skills, and attitudes related to program outcomes will be delineated.

IMPORTANCE OF A SYSTEMATIC APPROACH TO ASSESSMENT

In order to be most impactful, assessment of entrepreneurship programs should be conducted in a systematic and rigorous way. First, clear and measurable programmatic goals or objectives need



to be developed. Doran (1981) developed the S.M.A.R.T. framework for writing objectives, advocating they be specific, measurable, attainable, relevant, and time-bound. Litzinger et al. (2011) developed a research-based approach to conducting assessment of STEM focused projects, as illustrated in Figure 2. The authors advocate for the use of guiding questions in each stage of project assessment.

By far, one of the most challenging aspects of developing the assessment plan for entrepreneurship programs is writing clear and measurable objectives. The domain of entrepreneurship education makes this process more difficult, as the emphasis is typically less on the cognitive domain (Anderson & Krathwohl, 2001) and more on the affective (Krathwohl, Bloom, & Masia, 1964) and conative domains (Huitt & Cain, 2005). Writing S.M.A.R.T. objectives and identifying related evidence for skills in the cognitive domain is fairly straightforward. For example, a typical program goal might be that students will be able to write a business plan for a venture or to conduct various financial analyses. Evidence to support whether students meet this program objective would involve assessments targeting specific writing and financial skills.

Assessment of the affective domain (which relates to individuals' interests, attitudes, and values) and the conative domain (which relates to the mental processes that guide and activate behavior and includes elements of both the cognitive and affective domains), is much more difficult. Leaders may say, "we want students to be more creative as a result of participating in the program." While constructs such as creativity have been well-researched in the social sciences, they are often very



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complex and difficult to measure. Given the complexity of these constructs, assessment consultants, if available, need to dig deep in order to figure out what is actually being targeted by a program. For example, perhaps a program desires students to have better knowledge of the steps of the creative process and how these steps can be applied to an entrepreneurial endeavor. Perhaps the program wants students to be able to generate a greater number of unique ideas for products or ventures (Smith, 1998). Or perhaps the program is interested in students possessing greater confidence or self-efficacy to be creative individuals (Tierney & Farmer, 2002).

Because constructs such as creativity are complex and can be approached in multiple manners in the assessment process, having a clear understanding of both the construct of interest and what a program intends to target is critical for obtaining data that is meaningful and helpful. The importance of construct clarity as it relates to entrepreneurial mindset is no different. Entrepreneurial mindset is a very complex omnibus construct that is likely comprised of multiple subconstructs, making its operationalization and measurement more difficult. Additional discussion of the importance of construct clarity follows.

THE PROBLEM WITH ENTREPRENEURIAL MINDSET: A CASE OF CONSTRUCT CONFUSION

Defining psychological constructs targeted by a program is necessary for both writing educational objectives as well as identifying sources of evidence used in data collection. Defining entrepreneurial mindset has been challenging, due to the fact that the term “mindset” has both colloquial and technical definitions. The Cambridge Dictionary definition of mindset is a “person’s way of thinking and their opinions” (Retrieved March, 2017). Merriam-Webster defines mindset as “a mental attitude or inclination” (Retrieved March, 2017). The word originated from educators in the 1920s, defined then as “habits of mind formed by previous experience” (Online Etymology Dictionary, Retrieved March, 2017).

Other casual definitions of entrepreneurial mindset abound at various institutions and organizations. For example, faculty at Worcester Polytechnic Institute stated, “Entrepreneurial mindset...is a way of life and an approach to solving problems” (Retrieved, March 2017). VentureWell defines entrepreneurial mindset as “a particular set of attitudes, skills and behaviors that anyone can use in order to succeed academically” (Retrieved, March 2017). The Network for Teaching Entrepreneurship defines entrepreneurial mindset as a “set of skills and behaviors that can be taught, practiced, and cultivated” (Retrieved, March, 2017) such as opportunity recognition, comfort with risk, creativity, and collaboration. Multiple workshops at both the annual American Society for Engineering Education (ASEE) and VentureWell Open conferences have addressed the topic of how to define and assess entrepreneurial mindset (e.g. Zappe, et al., 2015).



Faculty members who teach entrepreneurship likely have their own definitions of entrepreneurial mindset. Follmer, Zappe, Kisenwether, & Reeves (2015) found that faculty members who taught entrepreneurship believed mindset to be composed of a variety of characteristics such as opportunity recognition and ability to actualize ideas. Zappe, Hochstedt, Kisenwether, and Shartrand (2013) found that engineering entrepreneurship faculty felt that acting on opportunities, belief that one can be successful, passion, and resourcefulness were most important.

The Kern Entrepreneurial Engineering Network (KEEN) takes an approach of defining entrepreneurial mindset as a set of characteristics and skills that include “3Cs”: demonstrating curiosity, being connected, and creating value (KEEN, Retrieved 2017). Recently, Davis, Hall, and Mayer (2016) defined entrepreneurial mindset as “the constellation of motives, skills, and thought processes that distinguish entrepreneurs from nonentrepreneurs and that contribute to entrepreneurial success” (p. 2). As the authors note, most previous definitions focused on the traits that are “linked to entrepreneurial intentions and success” (p. 2). They cite previous literature that has focused on individual traits, such as risk propensity, tolerance for ambiguity, autonomy, persistence, and passion. The authors argue that, “what may draw people to entrepreneurship is personality, and what makes them good at it is their skill set” (p. 4).

The literature base on growth versus fixed mindset, based on the research of Dweck (2006) has increased confusion regarding entrepreneurial mindset. According to Yeager and Dweck (2012), the term “mindset” refers to the “implicit theories about the malleability of human characteristics” (p. 302). In other words, do individuals believe that certain characteristics can be changed or not? Individuals who have a fixed mindset believe that their abilities are unchangeable. Individuals with a growth mindset believe that their abilities can be developed through hard work or practice. Individuals can have a different mindset about different characteristics or abilities. For example, an individual may feel that he or she can develop in skills relating to technical writing, but may feel like his or her creativity cannot change through any type of training or practice. Fixed mindset does not equate to the meaning of “innate,” but rather to the individual’s belief that a particular characteristic is nonchangeable. Likewise, growth mindset does not equate to the meaning of “learned,” but rather the individual’s belief that a characteristic can be enhanced with practice.

The distinction between growth/fixed mindset and entrepreneurial mindset is extremely important and needs to be disentangled. Most definitions of entrepreneurial mindset that have been proposed include a set of characteristics and skills that entrepreneurs or aspiring entrepreneurs should have. For, example, Davis (2015) distinguishes characteristics in the entrepreneurial mindset as either being related to personality traits or being skill-based and therefore more easily developed. However, even though research suggests that a particular characteristic, such as creativity, may be malleable with training (Rose & Lin, 1984), individuals can still have a fixed-mindset towards that characteristic.



Although entrepreneurial mindset and growth/fixed mindset are distinct concepts, interesting research questions may be explored relating growth/fixed mindset to various knowledge, skills, and attitudes (KSAs) comprising the entrepreneurial mindset.

THE IMPORTANCE OF CONSTRUCT CLARITY IN IDENTIFYING SOURCES OF EVIDENCE

Purzer, Fila, and Nataraja (2016) found that most assessment efforts of engineering entrepreneurship education initiatives focused on the use of self-report surveys. In their content analysis, the authors noted that most articles detailing assessment of engineering entrepreneurship education failed to present sufficient validity evidence for the use of these rating scales. Validity refers to “the degree to which evidence and theory support the interpretations of test scores for the proposed uses of tests” (AERA, APA, & NCME, p. 11) and is typically considered to be the most fundamental aspect of educational and psychological testing.¹ Establishing the validity of an instrument, whether we are referring to a rating scale or an achievement-type test, begins with construct definition.

The *Standards for Educational and Psychological Testing*, jointly written by the American Educational Research Association (AERA) the American Psychological Association (APA), and the National Council on Measurement in Education (NCME) (2014), emphasize the criticality of defining a construct:

“To support test development, the proposed construct interpretation is elaborated by describing its scope and extent and by delineating the aspects of the construct that are to be represented. The detailed description provides a conceptual framework for the test, delineating the knowledge, skills, abilities, traits, interests, processes, competences, or characteristics to be assessed. Ideally the framework indicates how the construct as represented is to be distinguished from other constructs and how it should relate to other variables” (p. 11).

What are the consequences of having a poorly defined construct? MacKenzie (2003) states, “[I]f you only have a vague idea of what you are trying to measure, it is easy for the measures to become contaminated by unrelated factors and/or for them to underrepresent the conceptual domain”

¹In the test development literature, the word “test” could refer to a variety of measures, including achievement-style tests or rating scales. The recommended steps for developing cognitive tests and non-cognitive rating scales are the essentially the same. In this section, the word “test” refers to any type of quantitative instrument intended to measure a construct and is one source of evidence possibly used in the assessment process.



(p. 324). Construct-irrelevant variance refers to the inclusion of concepts that are not related to the construct that the instrument intends to measure. Construct underrepresentation refers to a test failing “to capture examinees’ behaviors [or attitudes] that represent aspects of the target domain or construct the test purports to measure” (McCallin, 2016, p. 569). Both construct-irrelevant variance and construct underrepresentation are threats to the validity of test scores.

Because of construct confusion surrounding entrepreneurial mindset, developers of instruments intended to measure entrepreneurial mindset need to be especially cautious. Efforts have been made to develop omnibus scales of entrepreneurial mindset. For example, Li, Harichandran, Carnasciali, Erdil, and Nocito-Gobel (2016) discuss the development of a rating scale intended to measure entrepreneurial mindset, as conceptualized by KEEN. After conducting an exploratory factor analysis (EFA), the instrument included 29 items loading on 10 or 11 factors. The number of factors that emerged (with only a few items measuring on each) suggests that the scale is highly multidimensional and not likely measuring one unidimensional construct. The concern with omnibus instruments such as the one by Li et al., is the oversimplification of entrepreneurial mindset into a scale measuring complex subconstructs, each of which being measured by just a few items.

Entrepreneurial mindset is perhaps not a construct in its own right, but an omnibus construct consisting of multiple subconstructs, some of which have been studied extensively (e.g. curiosity, creativity). Creating omnibus measures of entrepreneurial mindset could very well lead to construct underrepresentation, by oversimplifying the subconstructs that comprise entrepreneurial mindset. Constructs such as curiosity (Zappe, Yoder & Hylton, 2018; Grossnickle, 2016) are extremely complex and are unlikely to be measured adequately within just a few items on an omnibus instrument. The interpretation of omnibus scales of entrepreneurial mindset could be far-reaching by suggesting that students who score high on such scales also possess high levels of individual subconstructs, which are not likely to be adequately represented on the scale. As McCallin states, “[Construct underrepresentation] threatens validity when score reports lead to interpretations beyond those supported by the test” (p. 570).

While the discussion here relates to validity of educational and psychological tests, the importance of construct clarity extends to other forms of evidence used in the assessment process and in research in general. In qualitative approaches, validity and reliability relate to the credibility, trustworthiness, and transferability of the research. Clearly defining the construct of interest can help guide rigorous assessment and strengthen arguments relating to credibility and trustworthiness. Whether using a quantitative or qualitative approach for assessment, one needs to have a clear understanding of what the construct of interest entails, both for purposes of clearly delineating program objectives as well as identifying appropriate sources of evidence.

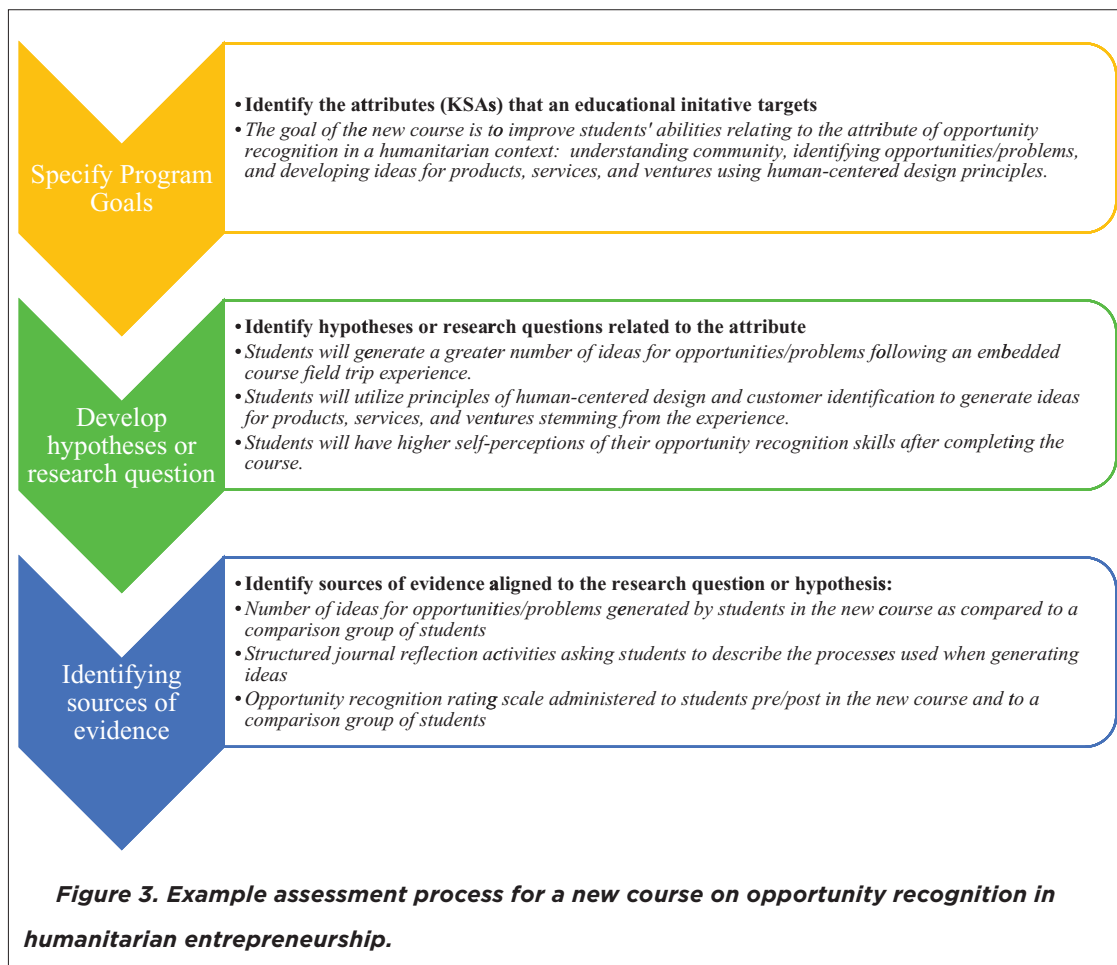
**AN ATTRIBUTE-FOCUSED APPROACH TO ASSESSING ENTREPRENEURIAL MINDSET**

Given the current understanding of entrepreneurial mindset, I advocate for an attribute-focused approach to assessing entrepreneurship education initiatives. Rather than focusing globally on the omnibus construct of entrepreneurial mindset, programs should focus on the specific attributes or KSAs that they feel that their program will impact and which would be most important for stakeholders. Reasons to use an attribute-focused approach include, 1) the lack of consensus and rigorous research concerning the definition of entrepreneurial mindset as a construct, and 2) the challenge of adequately measuring an omnibus construct that is comprised of many complex subconstructs.

To demonstrate an example of this approach, consider the assessment of a new course on opportunity recognition being developed in the Humanitarian Engineering and Social Entrepreneurship (HESE) program at Penn State. While one could potentially say that the goal of the class is to increase students' entrepreneurial mindset, identifying KSAs that comprise opportunity recognition will be more helpful in enacting a practical assessment plan. Identifying KSAs and corresponding sources of evidence would occur through discussions with the instructor as well as a literature search. Opportunity recognition is increasingly being studied in the entrepreneurship literature. For example, Kuckertz, Kollmann, Krell, and Stöckmann (2017), define opportunity recognition as "being alert to potential business opportunities, actively searching for and gathering information about them, communicating on them, addressing customer needs, and evaluating the viability of such potential entrepreneurial activities" (p. 81), and have developed an instrument that could potentially be used as a source of evidence. Figure 3 provides a possible start to the assessment plan for the new course. In this example, focusing on the KSAs relating to opportunity recognition will likely lead to more meaningful data than focusing on the omnibus construct of entrepreneurial mindset.

For other educational initiatives, goals may include other attributes, such as creativity, risk taking, or curiosity, which have been studied extensively. In some cases, these constructs have also been fraught with challenges with definition and measurement, such is the case with curiosity (Grossnickle, 2016) and creativity (Plucker & Beghetto, 2004). Yet, these constructs have a rich history in the psychology literature, which can help to guide assessment of entrepreneurship initiatives. There may be additional unexplored areas or constructs within the engineering entrepreneurship context that could pose interesting areas for future research. Focusing on how these individual constructs relate to engineering entrepreneurship education, rather than debating what constitutes entrepreneurial mindset, will help to move the field ahead.

In conclusion, when developing an assessment plan, evaluators need to have a clear, operationalized definition of the construct of interest. Entrepreneurial mindset has not been well-defined in a theoretical, rigorous manner. Existing definitions often depict entrepreneurial mindset as consisting



of multiple subconstructs, many of which have been extensively studied and have a strong theoretical basis in the psychological literature. While a completely agreed upon definition may never come to fruition in the engineering entrepreneurship community, continued research will help understanding within the domain to progress. In the meantime, individuals interested in assessing their programs and educational endeavors are encouraged to be explicit on what they are measuring and to consider focusing on targeted attributes or KSAs, rather than the omnibus construct of entrepreneurial mindset.

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