Measuring the Quality of Innovative Ideas to Strengthen the Scientific Base for Entrepreneurship Teaching and Research

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Abstract

This paper describes the results of collaborative research between 1000 Pitches student innovation competition and a research team at the Institute for Social Research at the University of Michigan to measure and explore the underlying structure of entrepreneurial ideas. The study drew upon a database of 4537 ideas that reflects the growing interest in entrepreneurship among Michigan students and holds promise for future research and teaching to improve the quality of innovative ideas. The paper reports: 1] the criteria used to evaluate ideas submitted to the 1000 Pitches Competition in 2012, 2] the distribution of ideas across multiple content domains and 3] results of a factor analysis based on 16 measured dimensions of the entrepreneurial ideas. Finally the paper 4] offers suggestions for future research and teaching based on our results.

Introduction

Between 20 and 25 percent of current college students say they want to be entrepreneurs (Keller, 2013). Despite the fact that people are eager to create a winning innovative idea there is little agreement about what one really looks like. A bewildering number of competing hypotheses in the fields of psychology, marketing, business, technology, education, language and communication have been offered to explain what it is makes an idea a winner.

Winning innovative ideas have been hypothesized to be the result of: the *quality of language* used in communicating the idea (McGuire, 2000; Dunlop, Wakefield & Kashima, 2010), whether the idea is presented with *passion or emotion* (Baron, 2008; Cardon, Wincent, Singh & Drnovsek, 2009; Chen, Yao & Kotha, 2009) whether it is *memorable* (Heath & Heath, 2008; Upal, 2007) whether the idea describes the *problem and solution* in adequate detail (Ardichvili, Cardozo & Ray, 2003; Chen, Yao & Kotha, 2009; Hsieh, Nickerson, & Zenger, 2007; Shane, Locke & Collins, 2003) , whether *consumer desires* are taken into account (Appiah-Adu, & Singh,1998; Rogers, 1976) , whether the proposed solution has a *relative advantage* (Rogers, 1976), whether the idea takes the *listener's mindset* into account (Galinsky, Ku & Wang, 2005), how *feasible* the idea seems (Kamal, 2006; Rogers, 2003), the *adequacy of a business plan* (Bracker & Pearson, 1986; Castrogiovanni, 1996; Chen, Yao, & Kotha, 2009), whether the idea can be *scaled up* from a prototype (Blumenfeld, Fishman, Krajcik, Marx, & Soloway, 2000), whether the proposal *captures the attention or evokes an emotion* in the listener (Cialdini, 2009; Cialdini, Braver, & Lewis, 1974; Davenport & Völpel, 2001) and whether the idea could have a *disruptive impact* on society at large (Christensen, 1997; Rigby, Christensen & Johnson, 2002).

As might be expected, these hypotheses point to quite different keys to the creation of winning ideas. Some hypotheses emphasize the quality of presentation of the idea and others to features of the idea itself, including its novelty and feasibility. A major challenge for research attempting to systematically explore the structure of innovative ideas is to find settings that will enable the collection of empirical evidence to choose among these diverse competing hypotheses.

Idea competitions offer a unique opportunity to examine these competing hypotheses. Idea competitions come in a wide variety of forms and are judged in a number of different ways. For example, companies and government agencies judge among proposed solutions to commercial or technical problems using crowd sourcing competitions (Guidici, 2012). Other web-based crowd funding sites such as Kickstarter (Adler, 2011 are judged by anyone online who wishes to invest their money in the idea. Recently innovation and entrepreneurial pitch competitions in

universities to encourage innovative thinking and entrepreneurship in students are also growing in popularity (Keller 2013; Ronstadt, 1990.

Idea competitions offer several distinct methodological advantages as settings for field research on the qualities of winning ideas. First, idea competitions often produce a large number of submissions, allowing statistical power in measurement. Second, the ideas proposed in idea competitions usually vary widely in quality and therefore provide a desirable range of observable statistical variation. Third, competitions often include ideas in a range of different content areas, strengthening the generalizability of findings. Finally in some cases submissions are judged using multiple criteria allowing multidimensional measurement of the quality of each submission.

The 1000 Pitches Competition at the University of Michigan (MPowered, 2013 http://1000pitches.com/) provides many of these advantages. Begun in 2008, to promote interest in innovative thinking and entrepreneurship, the 1000 Pitches Competition has more than lived up its name. In 2012 the competition received 4537 individual innovative ideas in a number of different technical, business and social entrepreneurship areas from University of Michigan students studying in a wide range of disciplines. Entries to the 1000 Pitches Competition are judged using multiple criteria, therefore providing an unusual opportunity to explore the underlying structure of innovative ideas.

In this paper we address several interrelated questions about the underlying features of innovative ideas using data from the University of Michigan 1000 Pitches Competition as a first step in a larger exploration of the structure of innovative ideas. We ask: 1] How are the criteria used to judge the quality of innovative ideas in the 1000 Pitches Competition empirically related to one another? 2] What are common dimensions underlying the criteria for judging innovative ideas? 3] Do the underlying dimensions bring coherence to the multiple and apparently diverse hypotheses offered in the research literature on the characteristics of winning ideas? 4] What are the implications of our results for future research and teaching in the field of innovation and entrepreneurship?

Method

Participants. Participants in the 1000 Pitches Competition consisted of 4537 students at the University of Michigan who offered a pitch for an innovative idea between September 2012 and November 2012. The students were predominantly undergraduates from the College of Literature Science and Arts, the School of Engineering, and the School of Business Administration with a smaller representation from 15 other schools and colleges.

Recruitment. Participants were recruited to the competition through publicity provided by a website describing the procedure by which students could submit pitches as well as by student recruiters at campus tables. Student organizations were also recruited to encourage their members to participate in the competition. Recruiters at sites on campus engaged students in a brief recruitment conversation describing the nature of the competition, encouraging them to submit an entrepreneurial idea, offering an incentive to participate such as a T-shirt, and informing them that the competition had cash prizes for winners.

Pitches. Participating students submitted pitches ranging from approximately 30 seconds to about 4 minutes in length by recording their idea as a video either through a laptop video camera at a campus recruiting station or by connecting to the competition website where they could submit pitches. Students were allowed to submit up to three revisions of their pitch, but only the last version was included in the data for analyses in this report.

Pitch categories. Participants were encouraged to offer their innovative ideas in eight categories. The categories for 2012 included: Consumer products, Education, Environment, Health, Mobile Apps, "MProvements" [ideas for improvements on the University of Michigan campus], Tech and Hardware, and Web and Software.

Competition judges. Student pitches were recorded as videos and stored on a secure website where they were later rated by a panel of trained student judges. Student judges were trained in a workshop that familiarized them with the nature of the videotaped student pitches using video examples of previously submitted pitches. Judges were also familiarized with and practiced using the rating scales. As part of the training workshop judges also compared their practice ratings with other judges to standardize their judgments. They were encouraged to pace themselves while reviewing pitches to avoid fatigue during the judging process.

Rating criteria. The criteria on which each pitch was rated are given in Table 1. The criteria were developed and revised in the 1000 Pitches competition based on accumulated experience over five previous years with consultation with fellow students, local entrepreneurs and University of Michigan faculty members. Table 1 shows the judging variables and provides a brief definition for each rating dimension as well as the score assigned to each variable. The range of content across judging criteria is quite broad, covering characteristics of the idea itself, the style of delivery and ratings intended to evaluate the quality or attractiveness of the idea.

[Table 1 here]

Data. The full 2012 data set of 4537 pitches submitted by students was recorded on videos and stored on a secure website. The full data set included pitches from Michigan students in eighteen schools and colleges across the eight different content categories judged on 16 criteria by up to three student judges for each pitch. For data analytic purposes we eliminated pitches that had been rated by fewer than three judges or that were the result of more than the three permitted pitch revisions. The result was a trimmed and edited data set of 1995 pitch videos with criterion judgments on each pitch pooled across three judges.

Results

Table 2 shows the distribution of ideas submitted in various content categories for the University of Michigan 1000 Pitches Competition in 2012. The frequency and percentage distribution is given for both the total sample and for the sub-sample trimmed by including only those ideas that had been judged by three judges and eliminating several other extraneous variables. The largest proportion of ideas was submitted in the consumer products area. The second largest category was "Mprovements" that is, ideas for improvements to be implemented specifically on the University of Michigan campus. In addition, ideas for mobile apps, innovations in health, tech and hardware also produced moderately high numbers of innovative ideas. The distributions across the total sample and the trimmed sample are quite comparable across all categories with the exception of the “web and software” category where the percentage of trimmed pitches is somewhat underrepresented. This suggests that the trimmed sample should provide relatively representative estimates for the full sample of 4537 ideas.

[Table 2 here]

A first step in describing the underlying structure of innovative ideas involves assessing the relationships among the quality criteria used to judge ideas submitted to the competition. Table 3 shows the means and standard deviations as well as the correlations among all 16 criteria used to judge submissions. All of the variables are positively correlated and show a substantial range from .12 to .66. The strength of the correlations is moderate with no indications of multicollinearity.

[Table 3 here]

In order to better discern the underlying structure of the quality criteria for judging innovative ideas we conducted a factor analysis of the 16 criteria. Table 4 reports the results of the factor analysis. The table displays the rotated component matrix for the factor analysis using a principal components extraction method and a Varimax rotation method with Kaiser normalization. The factor analysis of features of innovative ideas yielded four underlying

factors. The first factor, “presentation quality” loaded on variables having to do with the degree to which an idea was understandable, specified the problem, communicated the solution and its value, was expressed fluidly targeted the audience adequately and was presented with passion. This factor appears to reflect whether the idea was presented coherently, and with adequate detail and enthusiasm. The second factor “feasibility” focused primarily on variables having to do with whether the idea could be implemented effectively. The factor loaded on criteria such as the need for revenue and capital, whether the idea could be scaled up from a prototype, whether it could be sustained over time, and whether the idea had the potential to be disruptive to existing markets. The third factor “perceived value” focused on three variables reflecting the positive evaluation of the idea in terms of its potential impact, desirability, and investment potential. Finally, a fourth factor “captures attention loaded on two variables measuring whether the presentation captured the viewer’s attention and evoked an emotional response.

Conclusion

Taken together, the factors derived from these analyses offer a more coherent and more parsimonious summary of the 16 characteristics suggested in the literature for evaluating the quality of innovative ideas. The “presentation quality” factor, which accounts for most of the variation in the current sample of ideas, may be a kind of “quality baseline” and a necessary but not sufficient standard for the effective communication of innovative ideas. The second factor, “feasibility” appears to capture a group of variables having to do with the implementation of the idea rather than its clarity or uniqueness. The third factor “perceived value” reflects the degree to which the idea actually has value and is appropriate for the commitment of resources. The last factor capturing audience attention and emotions appears to have quite different properties from the first three factors and will important to understand more fully in future research.

Even though the current sample of innovative ideas has a number of distinct advantages including idea variety, large sample size, uniform format, and a common basis for evaluation, the present study has several limitations. First, these results are limited to the brief communication of innovative ideas using video as the medium of communication. Both the brevity of the presentation and the medium may limit the capacity to perceive certain aspects of an idea. In addition, since idea presentations do not involve interaction with an audience, it is not possible to say anything about the interactive aspects of idea development. . Even though our list of 16 idea features is quite extensive and drawn from multiple fields of inquiry, it is unclear whether the range of criteria used adequately covers the entire domain of possible idea

features. Beyond that, whether or not these results are generalizable to other populations of innovators, other fields, or to other types of idea competitions remains unclear.

Our results suggest a number of interesting directions for future research. For example, the current results might provide the beginning of a more general conceptual map of the structure of innovative ideas. What dimensions, in addition to the four we have identified, might be features of such a map that deserve to be explored? Another question has to do with whether some of the underlying dimensions we have identified are more important in some domains of expertise than others. For example, are the questions of feasibility and revenue streams more important in fields focused on business or commercial concerns while less important in fields like engineering where unique problem-solution combinations may be more highly valued? A related question has to do with the expertise of judges of innovative ideas (Csikszentmihalyi, 1996; Reuber & Fischer, 1994). Is it possible that a proposed innovation will be regarded quite differently depending on the expertise of the judges of the idea? In the current research, judges were all students at the University of Michigan, often with genuine expertise in their field of study but not necessarily with the years of experience as a basis for their ratings. How heavily experience and technical knowledge actually weigh in either the production or judgment of innovative ideas remains to be explored in future research.

Our results also have implications for teaching cognitive and evaluative skills important for innovation and entrepreneurship. For example, the factors we have identified and the variables underlying them could be used as benchmarks for students as they develop their own ideas in classrooms, laboratories or innovation incubators. In a similar fashion the factors we have identified and their components could help students evaluate their own innovative ideas and those of their peers in cooperative learning activities. A set of guidelines using the factors and variables we have identified could be used by students in initial idea development and later to monitor project development as increasing technical complexity and challenges of implementation began to emerge. Empirically derived guidelines of this sort could also help students to develop important cognitive skills including the ability to engage in critical thinking about their own ideas, a first step in transforming an idea into reality with a chance to change the world.

References

Adler, Carlye. "How Kickstarter Became a Lab for Daring Prototypes and Ingenious Products." *Wired. com* (2011).

Appiah-Adu, Kwaku, and Satyendra Singh. "Customer Orientation and Performance: A Study of SMEs." *Management decision* 36.6 (1998): 385-94. Print.

Ardichvili, Alexander, Richard Cardozo, and Sourav Ray. "A Theory of Entrepreneurial Opportunity Identification and Development." *Journal of Business Venturing* 18.1 (2003): 105-23. Print.

Baron, Robert A. "The Role of Affect in the Entrepreneurial Process." *Academy of Management.The Academy of Management Review* 33.2 (2008): 328-40. Print.

Blumenfeld, Phyllis, et al. "Creating Usable Innovations in Systemic Reform: Scaling Up Technology-Embedded Project-Based Science in Urban Schools." *Educational Psychologist* 35.3 (2000): 149-64. Print.

Bracker, Jeffre, and John N. Pearson. "Planning and Financial Performance of Small, Mature Firms." *Strategic Management Journal* 7.6 (1986): 503-22. Print.

Cardon, Melissa S., et al. "The Nature and Experience of Entrepreneurial Passion." *Academy of Management Review* 34.3 (2009): 511-32. Print.

Castrogiovanni, Gary J. "Pre-Startup Planning and the Survival of New Small Businesses: Theoretical Linkages." *Journal of management* 22.6 (1996): 801-22. Print.

Chen, Xiao-Ping, Xin Yao, and Suresh Kotha. "Entrepreneur Passion and Preparedness in Business Plan Presentations: A Persuasion Analysis of Venture Capitalists' Funding Decisions." *Academy of Management Journal* 52.1 (2009): 199-214. Print.

Christensen, Clayton M. *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston, Mass.: Harvard Business School Press, 1997. Print.

Cialdini, Robert B., Sanford L. Braver, and Stephen K. Lewis. "Attributional Bias and the Easily Persuaded Other." *Journal of personality and social psychology* 30.5 (1974): 631. Print.

Cialdini, Robert B. *Influence*. HarperCollins, 2009. Print.

Csikszentmihalyi, Mihaly. *Creativity: Flow and the Psychology of Discovery and Invention*. New York: HarperCollinsPublishers, 1996. Print.

Davenport, Thomas H., and Sven C. Völpel. "The Rise of Knowledge Towards Attention Management." *Journal of knowledge management* 5.3 (2001): 212-22. Print.

Denning, Peter J., and Robert Dunham. "Innovation as Language Action." *Communications of the ACM* 49.5 (2006): 47-52. Print.

Denning, Peter J., and Robert Dunham. *The Innovator's Way: Essential Practices for Successful Innovation*. Cambridge, Mass.: MIT Press, 2010. Print.

Dunlop, Sally M., Melanie Wakefield, and Yoshihisa Kashima. "Pathways to Persuasion: Cognitive and Experiential Responses to Health-Promoting Mass Media Messages." *Communication Research* 37.1 (2010): 133-64. Print.

Elsbach, Kimberely D. "How to Pitch a Brilliant Idea." *Harvard business review* 81 (2003): 117+. Print.

Galinsky, Adam D., Gillian Ku, and Cynthia S. Wang. "Perspective-Taking and Self-Other Overlap: Fostering Social Bonds and Facilitating Social Coordination." *Group Processes & Intergroup Relations* 8.2 (2005): 109-24. Print.

Giudici, Giancarlo, et al. "Crowdfunding: The New Frontier for Financing Entrepreneurship?." *Available at SSRN 2157429* (2012).

Heath, Chip, and Dan Heath. *Made to Stick: Why some Ideas Survive and Others Die*. New York: Random House, 2007. Print.

Hsieh, Chihmao, Jack A. Nickerson, and Todd R. Zenger. "Opportunity Discovery, Problem Solving and a Theory of the Entrepreneurial Firm." *Journal of Management Studies* 44.7 (2007): 1255-77. Print.

Kamal, MM. "IT Innovation Adoption in the Government Sector: Identifying the Critical Success Factors." *Journal of Enterprise Information Management* 19.2 (2006): 192-222. Print.

McGuire, William J. "Standing on the Shoulders of Ancients: Consumer Research, Persuasion, and Figurative Language." *Journal of consumer research* 27.1 (2000): 109-14. Print.

MPowered, 2013 http://1000pitches.com/

Reuber, A. Rebecca, and Eileen M. Fischer. "Entrepreneurs' experience, expertise, and the performance of technology-based firms." *Engineering Management, IEEE Transactions on* 41.4 (1994): 365-374

Rigby, Darrell K., Clayton M. Christensen, and Mark Johnson. "Foundations for Growth: How to Identify and Build Disruptive New Businesses." *MIT Sloan Management Review* 43.3 (2002): 22-32. Print.

Roberts, W. Rhys, and WD Ross. "The Rhetoric of Aristotle." (1954)Print.

Rogers, Everett M. *Diffusion of Innovations*. Simon and Schuster, 2010. Print.

Ronstadt, Robert. "The educated entrepreneurs: A new era of entrepreneurial education is beginning." *Entrepreneurship education: Current developments, future directions* (1990):69-88.

Shane, Scott Andrew. *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*. Tran. MA. Northampton: Edward Elgar Publishing, 2003. Print.

Shane, Scott, Edwin A. Locke, and Christopher J. Collins. "Entrepreneurial Motivation." *Human resource management review* 13.2 (2003): 257-79. Print.

Upal, M. Afzal. "An Alternative Account of the Minimal Counterintuitiveness Effect." *Cognitive Systems Research* 11.2 (2010): 194-203. Print.

Upal, M. Afzal. "What is More Memorable Counterintuitive Concepts Interpreted Metaphorically Or Literally". *Proceedings of the 29th Annual Meeting of the Cognitive Science Society, Nashville, TN.* Nashville, TN. 2007. Print.

Table 1

Rating Scales for Judging the Quality of Pitch in 1000 Pitches 2012-13

Quality Criteria	Criteria Description	Rating Scale
Introducing Self	Pitcher introduces self in a memorable way	0-2
Problem	Pitcher gives detail about what makes this a problem	0-2
Product Solution Value	Pitcher shows awareness of the product with an understanding of why it fills a unique need	0-3
Revenue Capital Model	Pitcher describes a method of raising capital or gaining revenue	0-2
Target Audience	Pitcher shows awareness of customer desires and takes into account concerns they might have about adopting the idea	0-3
Scalability	Pitcher provides detail about how the product will scale by giving a specific reason or obstacles they may face	0-2
Sustainability	Pitcher provides detail about why the product is sustainable	0-2
Fluidity	Pitcher conveys the message fluidly with minimal use of hesitations	0-1
Passion	Pitcher speaks in a tone which is enthusiastic as they convey their idea and shows passion or excitement	0-1
Understandability	Pitcher pitches idea in a logical order or sequence so it can be easily followed. Judge is not confused at the end of the pitch	0-1
Emotional Response	Judge has an emotional reaction/response to the pitch	0-1
Attention Grabbing	Judge hears something that catches their attention	0-1
Desirability	Judge would use/buy this product or service and can visualize the product/service being adopted	0-1
Impact	Judge can visualize the impact this product has on greater society	0-1
Invest	If the Judge were an investment capitalist, would invest in this idea?	0-1
Disruptive Idea	Pitcher shows awareness of current offerings and how new offering will change how the problem or market	0-3

Table 2

Distribution of Ideas Submitted for the University of Michigan 1000 Pitches Competition in 2012

CATEGORIES	Total Sample	Percent	Trimmed Sample	Percent
Consumer Products	1241	27.3	435	21.7
Education	277	6.1	141	7.0
Environment	253	5.6	162	8.1
Health	408	9.0	193	9.6
Mobile Apps	607	13.4	264	13.2
MProvements	1067	23.5	574	28.7
Tech and Hardware	436	9.6	210	10.5
Web and Software	248	4.5	16	.8
Total	4537	100	1995	99.6

Table 3

Means, Standard Deviations and Inter-correlations of Judging Criteria, 1000 Pitches Competition 2012

Variable	Mean	STD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Introducing Self	.2	.38	1.00															
2. Problem	.81	.53	.30	1.00														
3. Product, Solution and Value	1.16	.63	.28	.66	1.00													
4. Revenue/Capital Model	.08	.24	.12	.17	.31	1.00												
5. Target Audience	.55	.5	.25	.45	.59	.30	1.00											
6. Scalability	.1	.23	.22	.22	.37	.31	.43	1.00										
7. Sustainability	.05	.17	.19	.15	.28	.27	.28	.48	1.00									
8. Fluidity	.52	.33	.16	.42	.54	.17	.38	.26	.20	1.00								
9. Passion	.31	.31	.29	.45	.53	.23	.43	.29	.25	.46	1.00							
10. Understandability	.54	.33	.24	.44	.59	.17	.45	.28	.20	.57	.43	1.00						
11. Emotional Response	.12	.21	.14	.26	.28	.18	.30	.23	.19	.25	.34	.12	1.00					
12. Attention Grabbing	.12	.22	.24	.31	.42	.24	.35	.30	.27	.29	.46	.29	.49	1.00				
13. Desirability	.37	.32	.18	.47	.58	.20	.46	.28	.20	.39	.40	.50	.25	.32	1.00			
14. Impact	.16	.24	.14	.34	.42	.24	.41	.26	.26	.26	.33	.40	.20	.30	.47	1.00		
15. Invest?	.12	.2	.14	.32	.42	.26	.41	.28	.24	.30	.33	.36	.27	.37	.53	.58	1.00	
16. Disruptive Idea	.21	.35	.29	.34	.47	.32	.46	.44	.38	.30	.38	.28	.34	.43	.32	.25	.37	1.00

Table 4

Factor Analysis of Judged Variables in 1000 Pitches Competition 2012-13

	Component			
	Factor1 Presentation Quality	**Factor 2 Idea Feasibility**	**Factor 3 Perceived Value**	**Factor 4 Captures Attention**
Understandability	***.753***	.124	.285	-.069
Product, Solution, Value	***.752***	.257	.273	.175
Problem	***.733***	.045	.146	.203
Fluidity	***.701***	.090	.135	.110
Passion	***.594***	.173	.093	.415
Target Audience	***.516***	.391	.298	.178
Introducing Self	.460	.305	-.309	.173
Scalability	.203	***.767***	.091	.078
Sustainability	.082	***.766***	.081	.066
Disruptive Idea	.302	***.567***	.063	.392
Revenue/Capital Model	.047	***.556***	.250	.113
Invest	.210	.216	***.746***	.240
Impact	.256	.200	***.743***	.091
Desirability	.529	.107	***.569***	.124
Emotional Response	.093	.095	.116	***.847***
Attention Grabbing	.243	.221	.172	***.727***