An Exploratory Study of the Qualities that Distinguish Potential from Realized Innovators

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Abstract

This study explored the similarities and differences between 36 accomplished and 36 hopeful innovators in a large midwestern city in the United States. Both groups reported a higher frequency of recognized ideas when creative thinking occurred in the morning and under conditions of a state of calm. Realized Innovators uniquely approached the ideation process by intentionally applying a set of processes they found reliably effective. Potential Innovators were less deliberate in their approach to idea generation and were more likely to pursue activities with weak associations to creative outputs.
Keywords: innovation, ideation, idea generation, creativity, creative thinking

1. Introduction

According to Powell and Snellman (2004), we exist in "a knowledge economy" where technological and scientific progress contribute to an organization's success more than the availability of resources or a firm's efficiencies. Knowledge has become as vital as roads in a nation's infrastructure (Dijkgraaf, 2017). More than half of all economic growth currently stems from innovation (Flexner, 2017).

When 1,500 international CEOs were asked to prioritize the three most important leadership qualities sought for future business success, 60% chose "creativity" over "integrity" and "global thinking," which ranked second and third respectively (IBM, 2010). In the same period, creativity became an internationally-desired college and career-ready outcome that the United States government found imperative "to prepare 21st century students for a global economy" (National Education Association, 2014). The percent of university graduates trained in creative problem solving predict a business' innovative performance (Kunde, A.W., Kirira, P.S., & Ngondi, 2017).

2. Literature Review

Organizational-level innovation has been tied to knowledge acquisition and management (Liao, Chang, Hu & Yueh, 2012), which is a crucial part of an organization's absorptive capacity (Cohen & Levinthal, 1990).

According to Carlo, Lyytinen and Rose (2012), three dimensions of absorptive capacity interact to markedly affect an organization's base innovation. *Knowledge diversity* enhances an institution's fitness to *sense* the environment, which leads to *experimentation,* which transforms into new knowledge. This is an essential formula to adopt, according to Lenart (2014) because an enterprise's capacity "to "identify, assimilate, internalize and exploit new knowledge from internal and external sources" is strongly related to its numbers of patents, publications and new projects. An organization's realized capacity for innovation rests on the absorptive capacity of its members (Zahra & George, 2002).

There is a growing consensus that that innovation consists of two overarching processes: idea generation and idea implementation. Hammond and her colleagues (2011) separated i*dea generation* from *implementation* in their meta-analysis because the generation of new ideas and solutions appeared more "preparatory" and implementation more "action focused." Rozman and Kovac (2015) concurred that creativity and innovation should be considered independent because "the innovation process starts where the creativity process ends: with new and useful ideas." After a review of 83 scholarly articles, Dorow and her co-authors (2015) concluded that "ideation" and "idea generation" were the same task or activity, required but not sufficient for the management of ideas throughout the innovation process.

In their meta-analysis of individual-level characteristics linked to innovation in 88 studies, Hammond and her cohorts (2011) found four personal variables positively correlated to unique and valuable ideas: creative self-efficacy (r = .33), creative personality (r = .25), openness (r = .24), and intrinsic motivation (r = .24). Innovative employees were affected by three job-related elements: role expectations (r = .44), job complexity and autonomy on the job (both r = .32). Finally, three organizational characteristics supported individual-level creativity: supportive leadership (r = .29), adequate resources (r = .27), and a positive work climate (r = .23). Chen and his colleagues (2005) posit that the creativity expectation cues for employees to deliver on relevant outputs, one of the most consistent findings in creativity research, though Tierney and Farmer (2011) discovered a tipping point for the "be creative" effect in the workplace. As job demands became more complex and challenging, employees' confidence in their actual creative capacity decreased, which reduced their creative performance. This shift in confidence would be significant because an employee's *belief in their ability* to be creative is a key driver of innovation (Hu & Zhao, 2016). Increases in creative self-efficacy correspond with increases in creative performance, even six months after training, in organizational setting (Simmons, Payne, & Pariyothorn, 2014).

Unfortunately, low creative self-efficacy is a real-world challenge identified by numerous educators, researchers, and business leaders (Plucker, Beghetto, & Dow, 2004). And this belief that one's abilities are fixed adversely effects real-world problem solving (Katz-Buonincontro, Hass, & Friedman, 2017). Plucker and his colleagues (2004) identified "People are born creative or uncreative" as one of four false beliefs that maintain low creative self-efficacy despite a predominance of empirical evidence which establishes that creativity is a dynamic phenomenon that can be enhanced in school and work settings with right-fit interventions (Patterson, 2009; Tierney & Farmer, 2011; Simmons, Payne, & Pariyothorn, 2014; Cadle, 2015; Corazza, 2016; Beghetto, in press).

While most of us will not rise to "Big-C" creativity eminence, Sternberg (2012) contends that creativity is within every person's reach via *little-c* or everyday creativity, *mini-c* or creativity present in the learning

process, and *Pro-c* or the creativity that results from the progression from little-c to Big-C. Whether one aims for incremental or radical creativity, Simonton (2013) advocates that individuals approach the process as "an act of free will" navigated in two stages. First, generate a set of original ideas, and second select the useful ones. Glaveanu (2012) finds that creativity supports improvisation and ultimately innovation after it becomes "a practiced type of activity."

After 40 years of research focused on "Big C" creative genius, Simonton (2016) realized that three "everyday thoughts and behaviors" predicted creative outcomes: the *novel* nature of the idea, the *utility* of the idea, and an individual's *prior knowledge* about the utility of the idea. Consistently creative people routinely searched for anomalies ("problem finding"), intentionally inhibited conventional ideas and solutions ("rational suppression"), and used their imaginations and/or explored behaviorally ("mind wandering).

After four decades of case studies, the first author realized that similar methodologies personified the high-performing innovators he had interviewed in the corporate world. The current study evolved from an interest in investigating these observations more rigorously.

2.1 Description of the Exploratory Approach

Inspired by the work of Jordanous and Keller (2016), we chose to adopt a confluence approach to this exploratory investigation, constructing our idea generation survey based on the data that converged between the first author's observations and empirical literature. To this end, we studied whether creativity was a habit (Glaveanu, 2012), checked whether more ideas led to greater creative productivity (Simonton, 2016), questioned whether the diurnal cortisol awakening response boosted creativity (Law, Evans, Thorn, Hucklebridge & Clow, 2015), considered the role that alpha synchronization might play in creativity (Weinberger, Green, & Chrysikou, 2017; Lustenberger, Boyle, Foulser, Mellin, & Frohlich, 2015), and looked at mechanisms that might be associated with self-generated , goal-oriented creative thought (Arreola & Reiter-Palmon, 2015; Benedek, Jauk, Beaty, Fink, Koschutnig, & Neubauer, 2016; Hennessey & Amabile, 2010).

Following Jordanous' (2016) lead, we adopted Rhodes' Four Ps" perspective to take advantage of this studies unique ecological methodology. We recruited *persons* who had received public recognition, or *press*, to study the *processes* and *products* that might distinguish them from hopeful but unrecognized innovators. We were specifically interested in whether: (1) the frequency of recognized ideas mattered, (2) if certain times of day, (3) activities and/or (4) states of mind were more conductive to creative thought than others, and (5) whether creativity-oriented cognition had any links to a habit.

2.2 Research Questions

Would a group of established and hopeful innovators differ in their responses to survey questions, the qualities and conditions they associate with creative ideation? Would any of the five variables predict an established innovator level of performance? Finally, did any meaningful relationships exist between the five variables and innovative thinking?

3. Method

3.1 Participants

Seventy-two businesspeople from a large Midwestern city in the United States agreed to participate. Individuals were recruited and enrolled into one of two groups according to criteria that Carson, Peterson and Higgins' (2005) found unrelated to self-enhancement: the amount of "press" received for creative accomplishments. Individuals were termed "Realized Innovators" (N = 36) if they were mentioned in one of the top 50 newspapers in North America (30 men and 6 women). Individuals were labeled "Potential Innovators" (N = 36) if they were interested in innovation but had no public recognition (22 men and 14 women).

The list of Realized Innovators was compiled from a record people referenced as enterprising and successful in the city newspaper over a year's time in 2016 (N = 47). Eleven failed to respond to a telephone invitation to participate while 36 returned the phone call, agreed to contribute and completed the interview. Realized Innovators included CEOs and high performing employees from a broad range of business industries (e.g., financial, design, engineering, information technology, medicine, education, athletics, law, literature and the arts).

An initial Potential Innovator register consisted of individuals who signed up to attend an innovation seminar created by the first author and provided their email to stay abreast of research developments (N = 352). An electronic message was sent to the distribution list explaining the study and offering a SurveyMonkey link to the investigation. Ninety-nine subscribers agreed to participate and 96 completed the survey. Potential Innovators included mid-level employees from a comparable range of industries as Realized Innovators.

3.2 Measures

A 5-item survey was created with questions that merged the empirical literature and the first author's case study observations. Accepting that public acclaim by field experts is a practical and relatively bias-free means of assessing achievements (Carson, Peterson & Higgins, 2005), we sought information about participants' *frequency of recognition* for innovative ideas. Interested in the impact of diurnal circadian rhythms and particularly the cortisol awakening response, we asked about the *time of day* recurrently associated with idea generation. We measured several cognitive and behavioral processes that met our literature-aligned-with-observation criterion, asking participants to select "all that apply" to a set of *activities* and *states of mind* that regularly accompany their resourceful cognition. Finally, we explored whether *creative habits* existed by asking the degree to which participants rigidly adhered to a regular time, place and/or procedure to think innovatively.

3.3 Procedure

Anticipating that the Realized Innovator group might not respond to an emailed invitation to participate in the study, the first author called each member of the sample to describe the research and explain why they

were personally selected for input. Appointments were made for a telephone interview following informed consent. While the question and answer session was designed to be completed in 10 minutes, the average interview lasted 40 minutes because the researchers did not impose a time limit and the participants appeared eager to expand on their answers.

All members of the innovation seminar's email subscribers received an electronic message that described the study, provided contact information for questions, and offered a link to the informed consent page on SurveyMonkey. Of the group of 96 individuals who completed the survey, a sub-sample of 36 participants was created via online sampling software (www.randomizer.org) to balance the membership in the Realized and Potential Innovator groups.

4. Results

To explore the similarities and differences between Realized and Potential Innovators, the authors contrasted each group's responses to the five survey questions. Next, we studied the variables that might predict membership in each group. Finally, we searched for any cognitive and/or behavioral activities that might accompany the idea generation stage of innovative thinking.

Research Question 1: Compare and Contrast Each Group's Response to Survey Questions

First, we transformed the frequency figures into a dummy variable to generate interval numbers. "Weekly" answers were assigned a 5, with 4 attached to monthly, 3 to quarterly, 2 to annually, and 1 to "rare" recognition. Realized Innovators had a frequency mean score of 4.67 (s = .54), which approached weekly recognition, compared to 3.11 (s = 1.56) of Potential innovators, which was closer to quarterly. Analyzing the data via an independent sample two-tailed *t* test, we found that Realized Innovators scored significantly higher than Potential Innovators on the *frequency* with which they had original ideas, $t(70) = 5.71$, $p = .000$. Because participants could check all that applied, each *time* variable was examined separately using a two-sample chi-square analysis. No hour variable produced significant differences between the groups except for the 10:00pm hour when Potential Innovators (N = 11) reported more insights than Realized Innovators (N = 1), $\chi^2 = 10.0$, $p = .003$. Perceiving more similarities than differences between the groups, we combined the Realized and Potential Innovator samples to establish if there were time-based trends in innovative occurrences. First, we transformed the hour-level data into variables traditionally recognized as periods of the day: beginning of day (5:00-8:59am), morning (9:00am-Noon), afternoon (12:01-5:00pm), early evening (5:01-8:00pm), late evening (8:01-11:00pm) and end of day/nighttime (11:01pm-4:59am). Then, to be as parsimonious as possible in our assumptions, we maintained the dichotomous value for the dummy variable, which was coded 1 for presence or 0 for absence of innovative ideas in the specified period. Table 1 presents the frequency of innovative incidences for each time category. Cochran *Q* test results indicated that at least two of the six variables were significantly different from each other, Cochran $Q = 69.08$, $p = .000$. The McNemar post-hoc test established that all participants experienced more novel and useful ideas at the start of the day and the morning when contrasted to the afternoon, early evening, late evening, and the end of day/nighttime categories.

Table 1. Frequency of Innovative Ideas Occurring at Different Times of the Day

	Presence		Absence	
	Frequency n = 72	Proportion 100%	Frequency n = 72	Proportion 100%
Beginning of day	44	61.11	28	38.89
Morning	21	29.16	51	70.84
Afternoon	7	9.72	65	90.28
Early Evening	5	6.94	67	93.06
Late Evening	14	19.44	58	80.56
End of day/Nighttime	15	20.83	57	79.17

Of the nine surveyed *activities* associated with participants' behavior prior to insightful idea generation, only one separated the groups. As Table 2 suggests, Realized and Potential Innovators were as likely to have state-of-the-art ideas immediately upon awakening, while alone at home and work, during exercise, driving, doing mundane activities, amid nature, or waking up with an answer in the middle of the night. Potential Innovators were more likely to experience insight "in discussion with others," $\chi^2 = 6.54$, $p = .025$. As an interesting contrast, zero Realized Innovators indicated they generated novel ideas during this activity.

Table 2. Activities Associated with the Realization of Innovative Ideas

	Realized Innovators n = 36		Potential Innovators n = 36			
	Yes	No	Yes	No	χ^2	p
Discussion with others	0	36	6	30	6.545*	$p < .05$
Alone at work	8	28	13	23	1.68	
Alone at home	13	23	11	25	.250	
Right after waking	11	25	17	19	2.10	
During exercise	10	26	9	27	.071	
Middle of the night	1	35	2	34	.348	
In nature	2	34	5	31	1.42	
Mundane activities	6	30	10	26	1.29	
While driving	5	31	12	24	3.77	

We performed separate chi-square analyses on each of the 15 *quality of mind* variables the groups experienced immediately prior to realization of an innovative idea. Table 3 describes the data and chi-square results. Realized Innovators reported more creative ideas while in a calm state of mind, $\chi^2 = 4.96$, $p = .026$. Potential Innovators recounted more innovative ideas while thinking analytically, $\chi^2 = 14.4$, $p = .000$ and feeling sleepy, $\chi^2 = 3.96$, $p = .047$.

Table 3. Qualities of Mind Experienced by Realized and Potential Innovators Immediately Prior to the Realization of Innovative Ideas

	Realized Innovators n = 36		Potential Innovators n = 36			
	Yes	No	Yes	No	χ^2	*p*
Analytical	0	36	12	24	14.40***	$p < .000$
Nagging	4	32	4	32	.000	
Questioning	16	20	10	26	2.17	
Urgent	0	36	2	34	2.06	
Methodical	1	35	5	31	2.91	
Calm	28	8	19	17	4.96*	$p < .05$
Dreaming	4	32	5	31	.13	
Anticipating	10	26	5	31	2.11	
Meditative	11	25	9	27	.28	
Curious	4	32	10	26	3.19	
Agitated	0	36	2	34	.51	
Frustrated	0	36	2	34	2.06	
Sleepy	1	35	6	30	3.96*	$p < .05$
Ruminating	7	29	5	31	.40	
Unaware	0	36	1	35	1.01	

Examining the last question via an independent-samples t-test, a statistically significant difference emerged in the degree to which each group was *deliberate* in their approach to innovative thinking, $t(70) = 10.18$, $p = .000$. Realized Innovators described considerably more intentionality in the set-up and management of their insight-oriented reasoning with a mean score of 88.92 (s = 14) as compared to Potential Innovators who obtained a mean of 32.11 (s = 30).

Research Question 2: Do Any of the Five Variables Predict "Realized Innovator" Group Membership?

In the next phase of the analysis, we explored whether we could predict membership in the Realized group because they were the group we wanted to truly study. To that end, we conducted a binary logistic regression with the three variables that differentiated Realized Innovators from Potential Innovators: frequency of innovative ideas, calm state of mind, and deliberate approach to original thinking. As established in Table 4, the model forecast membership in the Realized Group with 93% accuracy. The statistically significant predictive variables were frequency of innovative ideas (Wald $\chi 2 = 7.25$, $p = .007$) and their deliberate quality of habit (Wald $\chi 2 = 12.86$, $p = .000$). The calm state of mind did not add statistically to the regression model.

Table 4. Predictors of Membership in the Realized Innovator Group

	β	S.E.	Wald χ^2	df	Exp(β)	*p*

Frequency	1.78	.66	7.25	1	5.90	.007
Calm	-1.40	1.22	1.32	1	.247	.251
Deliberate	.10	.027	12.86	1	1.103	.000
Constant	-13.59	3.99	11.59	1	.000	.001

We conducted a similar binary logistic regression using the three variables unique to the Potential Innovator group: engaging in innovative thought in the evening, thinking analytically, and while sleepy. As noted in Table 5, the variables that predicted membership in the Potential Innovator group with 76% accuracy was their creative thinking in the evening (Wald $\chi2 = 4.035$, $p = .045$) and association with a sleepy state of mind (Wald $\chi2 = 5.529$, $p = .019$). The analytical thinking variable did not add to the model.

Table 5. Predictors of Membership in the Potential Innovator Group

	β	S.E.	Wald χ^2	df	Exp(β)	*p*
Evening	-1.36	.68	4.04	1	.256	.045*
Analytical	-21.78	11230.2	.000	1	.000	.998
Sleepy	-2.68	1.14	5.53	1	.069	.019
Constant	24.80	11230.2	.000	1	5.9E+10	.998

Research Question 3: What is the Relationship Between Five Variables and Recognized Ideas?

Finally, in our search for the cognitive and behavioral variables most associated with innovative thinking, we considered the Realized Innovator's top three processes. They were having original ideas in the morning, feeling calm, and deliberately approaching idea generation. Using frequency of innovative ideas as the dependent variable, we conducted a multiple linear regression that reached statistical significance, $F = 6.10$, $p = .001$, accounting for 18.4% of the variance in the adjusted R^2. Table 6 presents the beta weights for each variable. The modest prediction stems from the calm and intentional variables and not the morning variable, which had close to a zero correlation to frequency of innovative ideas ($r = -.05$).

Table 6. Variables that Predict Frequency of Ideas in Pooled Groups

	Unstandardized Coefficients		Standardized Coefficients		
	β	S.E.	*β*	*t*	*p*
Morning	.094	.32	.033	.293	.770
Calm	.765	.33	.261	2.29	.025
Intentional habit	.013	.004	.347	3.09	.003
Constant	2.56	.411		6.23	.000

As an afterthought, we explored the efficacy of the methodologies uniquely used by Potential Innovators. Using Realized Innovators' frequency of ideas as the dependent variable, we performed a linear regression using the four unique qualities and conditions they associated with creative output: evening thinking time,

discussion with others, analytical cognitive process, and sleepy state of mind. The results did not reach significance, $F = .223$, $p = .80$, suggesting little relationship between the four characteristics used and recognized output.

5. Discussion

This study explored whether established innovators (person) utilized methodologies (process) or contexts (press) that were advantageous for the generation of innovative ideas (product), particularly compared to hopeful innovators. Distinctions emerged in our sample groups' practices and procedures that suggest favorable and irrelevant characteristics.

Regarding our first research question, three attributes defined our Realized Innovators. They had a higher frequency of acknowledged outputs, they were creative in a state of calm, and they were methodical in their approach to innovation. Potential Innovators presented larger within-group differences though, as a group, they generated ideas in the evening, felt insightful when sleepy, found "discussion with others" helpful, and felt the analytical state of mind helped. Both groups felt morning hours yielded stronger innovative ideas compared to any other time of the day and both groups selected the state of calm as the quality of mind most conducive to innovative thought. All other variables were statistically insignificant.

When membership in the Realized Innovator group was treated as a dependent variable to establish an answer to our second research question, two variables predicted inclusion in the established group with 93% accuracy. First, Realized Innovators gained *frequent recognition* for their creative ideas and, secondly, they *routinely applied a time, place and procedure* to guide their generation of ideas. Logically, one must repeatedly produce good new ideas to gain frequent recognition, which results in a greater volume of ideas over time. This validates Simonton's (2013) belief that, to enhance creative performance, one must *create* choices to *choose* among choices. Established innovators pursued a habitual approach to ideation deliberately, frequently and methodically as corroborated by the ease in which they described a time, place and procedure when asked if they wanted to add comments. Though easier for participants to comment when speaking to someone on the phone in contrast to typing "additional comments" in a survey, it is interesting to note that 100% of Realized Innovators elaborated on their answers compared to 18% of our total responding population (N=99) of Potential Innovators.

Taken together, this exploratory investigation reinforces Mel Rhodes' (1961) contention that "the 4 Ps of creativity act in unity" and creativity must be pursued in a holistic context. In our study, volume of ideas was the *product*, recognition one aspect of *press*, intentional habit was the *process*, and Realized participants the embodiment of the creative *person*. When viewed through this 4 Ps lens, our results suggest that approaching idea generation through a deliberate practice may be a great equalizer for those of us not born with eminent genius.

7. Limitations and Suggestions for Future Research

Though three variables predicted membership in the hopeful innovator group with 76% accuracy, there was a substantial variability of responses in our Potential Innovator sample. This detracts from our ability to

draw meaningful conclusions about our budding innovators, though one possible supposition is that the Potential Innovator's approach was not routinely applied and/or did not result in recognized innovative output.

In our final analysis, two methodologies explained 18.4% of the variance associated with the frequency of recognized ideas, which were the defining attributes of Realized Innovators: the deliberate use of a habit and a calm mental state. The unique qualities of Potential Innovators were unrelated to the actual production of innovative ideas, suggesting that their belief in their chosen methodology and innovation might have been recognition of "a fortuitous response" (Simonton, 2016).

One of the limitations of this study stems from its self-report nature and differing approach to data collection. We could estimate the accuracy of our Realized Innovator's frequency of ideas because we knew something about their actual output while we had to rely on the self-awareness of Potential Innovator participants regarding their frequency of "recognized" ideas. We are less confident about their "frequency" variable's value as a result. We also do not know the degree to which we may have elicited additional or different information from Potential Innovators had we interviewed them versus recorded their responses online. We recommend that future research address these issues.

8. Conclusion

Overall, our results endorse further research contrasting individuals with high and low innovative achievement to define the processes that lead to valuable and bold ideas.

9. References

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