# KEYS to Creativity and Innovation: An Adopt-A-Measure Examination

**Mary Kay Culpepper**

The International Center for Studies in Creativity

Buffalo State College

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> Most great ideas for enhancing corporate growth and profits aren't discovered in the lab late at night, or in the isolation of the executive suite. They come from the people who daily fight the company's battles, who serve the customers, explore new markets and fend off the competition. In other words, the employees. (Spender & Strong, 2010, p. I1)

So began a recent *Wall Street Journal* article about the source of innovation in corporate America. Authors J. C. Spender, a visiting professor at ESADE, the Spanish graduate business school, and Bruce Strong, a founder of Connecticut-based management consultancy CBridge, put forth the case that tapping into employee creativity is imperative to success.

That charge was echoed by a report from IBM entitled "Capitalizing on Complexity" (2010). Some 1,500 chief executives around the world ranked creativity as the most critical leadership quality required in the next five years. The report recommended that CEOs "craft a creative organization," and "equip their entire organization to be a catalyst for creativity" (p. 32).

If a creative environment is an imperative, assessment is necessary to both identify a starting point and a destination. One of the first and highly respected assessments is KEYS to Creativity and Innovation (Amabile, Burnside, & Gryskiewciz, 1999). Because it measures management practices, resources, motivations, and interactions of individual work groups, it plumbs the very factors Spender and Strong (2010) recommend for engaging employee creativity at cutting-edge companies.

Called "The Creative Environment Scales: Work Environment Inventory" (WEI) at its inception in 1989, the instrument was designed by Teresa M. Amabile, currently a professor and director of research at Harvard Business School, to focus on factors that drive the development of creative ideas in the workplace (Amabile & Gryskiewicz, 1989). She envisioned that it "could serve as a tool

for research and theory development, particularly for scholars interested in understanding contextual influences on creative behavior in work organizations….KEYS was also intended to serve as a tool for practitioners interested in diagnosing the degree to which an organization's work environment fosters creative work in individuals and groups" (Amabile, Conti, Coon, Lazenby, & Herron, 1996, p. 1182).

In drawing up the measure, Amabile was guided by her previous research (e.g., Amabile, 1983; Amabile & Gryskiewciz, 1988) that identified an interactionist construction of organizational creativity, examining the creativity of individuals and groups within the context of the workplace (Woodman, Sawyer, & Griffin, 1993).

Her findings led to the identification of three organizational components that make up a work environment that influences individual or team creativity: an organization's motivation to innovate, use of resources, and management practices (Amabile et al., 1999). She hypothesized, in turn, that individual creativity hinges on expertise, creative skills, and the task motivation of individuals. At the time she created KEYS, she maintained that employee motivation is the most important factor on the degree of innovation within a company. Her intrinsic motivation principle of creativity (1983) posits that individual motivation is enhanced not by external forces, but rather when people are interested in and enjoy the challenge of the work itself. In other words, the social environment has a direct bearing on motivation, which in turn has a direct bearing on creativity (Amabile et al, 1999).

Her later work (2007) suggests that the perception of progress enhances an individual's sense of motivation. Yet, while progress and intrinsic motivation appear to hold true for workers in the developed world, a concern might potentially arise when KEYS is administered elsewhere. Hessels, van Geldren, and Thurik argue that "necessity motives play a major role in developing countries"

(2008, p. 325), emphasizing the role external pressures play in those creative climates. Studies have yet to be published specifically exploring the effectiveness of KEYS in measuring such extrinsic motivation in developing countries (Google Scholar search, November 11, 2010).

Amabile developed the theories that inform KEYS in research she conducted (1989) through a series of interviews with North American R & D scientists, managers, and employees. They indicated environmental stimulants such as freedom, effective project management, and sufficient resources, and deterrents such as time pressure, competition, and overemphasis on the status quo color the social environment of the workplace. While she felt that the interviews offered an abundance of information, the process was too cumbersome and limited to perform on a large scale (Amabile et al., 1999).

The WEI became her first solution to that dilemma. It consisted of 135 items: eight scales describing stimulants to creativity, four describing obstacles, and two overall scales of organizational creativity and productivity. After evolving through serial revisions and editions, the formerly pencil-and-paper measure acquired its present name in 1995 (Amabile et al., 1999).

In its fourth and current online-only incarnation, KEYS has 87 questions, and 10 scales. Four (Freedom, Challenging Work, Managerial Encouragement, and Work Group Supports) describe management practices; two (Organizational Encouragement and Lack of Organizational Impediments) describe organizational motivations to creativity; and two (Sufficient Resources and Realistic Workload Pressures) describe resources. A further two dimensions (Creativity and Productivity) describe perceptions of outcomes. Possible responses to the numerical items are "Never," "Sometimes, "Often," and "Always." Each response is given a particular numerical score. Additionally, three checklist questions at the end of KEYS require respondents to identify the most

important stimulant and obstacle to creativity in the work environment, as well as one suggestion for improving that environment (Amabile et al., 1999).

KEYS employs a scoring scale of 1 to 100, with 50 being the median score. Higher scores on all scales point to a more creative climate, since scoring has been reversed for those that relate to obstacles in the workplace (Amabile et al., 1999).

## Using KEYS

Because it can be administered to managers as well as rank-and-file employees, KEYS has the ability to assess individual perceptions of influences at multiple levels throughout organizations, a tactic Amabile (1996) says transcends measuring individual personalities. Instead, "…we focus on the work environment perceptions of project team members and the relationship between those perceptions and the creativity of the project outcomes" (p.1158).

KEYS is marketed and administered internationally through The Center for Creative Leadership (CCL) in Greensboro, North Carolina. Corporations interested in improving team creativity, productivity, and innovation are the measure's primary customers (http://www.ccl.org, 2010).

Part of the appeal of KEYS is the option the CCL offers of comparing an individual organization's results to either the overall normative group or to one of 17 industry normative groups, which range from automotive to health care to manufacturing (Amabile et al., 1999).

KEYS can be given to teams with as few as three people and as many as 500, which renders it suitable for examining a variety of groups that share a work environment within an organization (Amabile et al., 1999).

Initially written in American English, KEYS has undergone a translation/back translation process for other languages, including German and Portuguese (Amabile et al., 1999).

Among American companies, Cargill Incorporated, the largest privately held corporation in the country, is listed on the CCL website as a KEYS client (http://www.ccl.org, 2010). Rich Products, a privately owned American food processor, has implemented KEYS as well (Argona, n.d.). The military also uses the instrument; The United States Coast Guard's organizational performance consultants offer KEYS for units and individuals ("USCG: Organizational performance," 2010).

The base price of the measure is $2,000, and includes 100 invitations, a 189-page user's guide, and electronically accessible reports and administration. It takes employees about 20 minutes to complete (http://www.ccl.org, 2010).

To become authorized to purchase the instrument, KEYS facilitators are required to undergo a written qualification process managed by the CCL. Due to potential sensitivity in interpreting and delivering results, facilitators are urged to have managerial experience as well as a background in psychology, organizational development, or assessment (Sorensen, 2009). Moreover, KEYS facilitators are required to sign a confidentiality agreement; impartial and confidential interpretation is considered essential to obtaining relevant conclusions based on the assessment (Callahan, 2001). In turn, that same confidentiality is thought to help ensure that workers will candidly answer the survey questions (Amabile et al., 1999).

Facilitators are considered plausible candidates for selecting groups to take KEYS, and the user's manual offers theoretical case histories and sampling procedure guidelines to assist with the process. Several customized options for scoring are offered (i.e., comparing respondents by years of service, gender, function, or managerial level). The manual also discusses acceptable response rates (≥75%),

and suggests ways, such as incremental emails or incentives, to increase response (Amabile et al., 1999).

Scores are delivered to the facilitator in a feedback document that details response rates, graphs performance on scales, and charts responses to the checklist questions. In addition to graphics displaying KEYS norms, the user's manual also features sample PowerPoint slides and a workbook explaining score interpretation to assist in clarifying the results to employees and implementing a plan of action (Amabile et al., 1999).

## Reliability Analyses

It fell to research to reveal if KEYS repeatedly renders similar results – which, according to Carmines and Zeller (1979), is the generally accepted definition of reliability.

As Table 1 shows, internal scale reliabilities derived from Cronbach's alpha vary from minimally acceptable (.66) to extremely strong (.91), with a solid median of .84. Only two of the scales – Freedom and Workload Pressure – show reliabilities below .80 (Amabile et al., 1999, p. 24).

The test-retest reliabilities across a period of three months range from a low of .71 (Workload Pressure) to a high of .94 (Organizational Encouragement). This strong short-term test-retest reliability seems to indicate that the results are not arbitrary or influenced by a particular project. However, Amabile (1996) cautions that scores should not necessarily be expected to stay stable indefinitely: "As an environment changes, which most environments do, ratings on an environment inventory should also change" (p. 1167). Indeed, the results of a KEYS assessment could be markedly different after a radical organizational change, such as a takeover or a downsizing (Amabile et al., 1999, p. 25).

Beyond internal measures, reliability in creativity testing also demands some indication of stability (Piirto, 1998). Stability for KEYS has been ascertained in part by CCL's insistence on having credentialed facilitators conduct the assessment. Moreover, all assessments are scored by computer at the center, which ensures as much as possible that the results are standardized, and that they continually replenish KEYS databases (http://www.ccl.org, 2010).

## Validity Measures

As the critical relationship between concept and indicator, validity addresses the assessment in relation to its use, and can be determined in a number of ways (Carmines & Zeller, 1979). For example, the format of a tool can be considered to constitute face validity to a user; the online format of KEYS is authoritative and efficient, which can be construed as having significant face validity to a corporate respondent (Callahan, 2004).

To address convergent validity, Amabile (1999) used the data from the Work Environment Scale (WES; Insel & Moos, 1974) to derive moderate correlations. An assessment for employees and supervisors, the WES employs 10 subscales and three sets: Relationships, Personal Growth, and System Maintenance. While the WES did not specifically measure the aspects of the workplace most associated with creativity, Amabile hypothesized there was enough overlap between the constructs measured by the two assessments that WES would modestly correlate to KEYS. As can be seen in Table 1, that was indeed the case. For example, median *r* for creativity stimulants ranged from .58 for Organizational Encouragement to .23 for Freedom.

Discriminant validity was established by comparing KEYS to two assessments of individual creativity, the Kirton Adaptation-Innovation Inventory (KAI; Kirton, 1976) and the Work

Preference Inventory (WPI; Amabile, Hill, Hennessey, & Teague, 1994). Because KEYS shows low correlations to the two measures, Table 1 suggests it does not measure individual creativity. For instance, median *r* for the creativity stimulant Freedom was -.08 with scales on the WPI, and -.02 on the KAI, while the creativity obstacle Workload Pressure was -.02 with scales on the WPI, and -.03 on the KAI (Amabile et al., 1999).

A central theoretical concern in the construction of KEYS was the desire to measure the influence of work environment on organizational creativity. To that end, Amabile (1996) conducted a confirmatory factor analysis of the eight-factor model of her work environment scales. She devised an input correlation matrix of 66 work environment items from a database of 26 companies ($N$=3,708), allowing items to load only on one scale. The goal was to maintain a structure as simple as possible. The overall fit measures generated by her confirmatory factor analysis signified a moderate fit to the data, yet a large chi square (17,305.48, $p < .001$) indicated room for improvement. Amabile argues given the fact that concepts measured by KEYS are theoretically related, these results are not surprising. A more complex model might better fit the data, but "maintaining a simple structure was central to the purpose of separately assessing each aspect of the work environment that is thought to be related to creativity" (p. 1165).

That said, her insistence on simplicity has its critics. Mathisen and Einarsen (2004) note that in-depth results from Amabile's exploratory factor analysis have not been reported, and they claim "a revision of the instrument may be needed to improve the factor structure" (p. 128). Generally speaking, a loosely specified model of confirmatory factor analysis offers less value than one with greater specificity (Kline, 1994). Yet, "the degree of precision is a question of tolerance," (Ritchey, 2008, p. 53); that is to say, it is up to the analyst to determine how much error in measurement can

be tolerated without encountering practical problems or drawing faulty scientific conclusions. Clearly, Amabile sides in favor of the ease of taking and scoring KEYS.

To assess criterion validity across various work environments,[1] Amabile (1996) devised a three-phase, nine-month study which surveyed workers in a large American electronics company with departments that produced clearly creative work as well as those that produced work that was less so. "This study was designed to determine whether the stimulant scales would be rated higher and the obstacle scales lower for work environments surrounding projects with highly creative outcomes, compared to environments of projects with less creative outcomes," she hypothesized (Amabile et al., 1999, p. 26).

In the first phase, 141 mid-level managers from four departments were asked to nominate high- and low-creativity projects with which they had been involved; multivariate analysis showed a clear difference between the two ($F(10,131) = 17.9$, p.001). In the second phase, independent experts from each of the divisions sampled in the first phase rated the nominated projects on creativity, quality, and their degree of familiarity with the projects; projects from the first phase nominated as highly creative were likely to be rated more creative by the expert panel than the ones described as low in creativity ($t(92) = 3.42$, p,.001). In the third phase, 12 high-creative and 11 low-creative projects from the second phase were ultimately selected, and 250 employees who worked on those projects were asked to take KEYS; 68% ($n = 170$) of those employees returned usable assessments. Some of the results are not as strong as those in the first phase; a smaller separation exists between the high- and low-creativity projects. Amabile (1999) reasons that the time lag between the work and the assessment could be the cause or perhaps that the environment had actually changed.

Nonetheless, the figures in Table 2 illustrate that the high-creativity project environments scored higher on the stimulant scales of Work Group Supports ($M$=3.30), Challenging Work ($M$=3.25),

Organizational Encouragement (*M*=2.83), and Supervisory Encouragement (*M*=3.12), as well as the criterion scales of Creativity (*M*=2.89) and Productivity (*M*=3.02). Low-creativity projects ranked higher on the obstacle scales of Organizational Impediments (*M*=3.83). No differences were apparent for the scales concerning Workload Pressure and Sufficient Resources (Amabile et al., 1999).

The study is important to evincing the validity of KEYS because it independently and quantitatively measures individual perceptions of the work environment, apart from the creative products made in that environment. Moreover, it affirms Amabile's confirmatory factor analysis. It also shows that the results could measure both technical and non-technical work, and that the perceptions of the work environment can be aggregated across different respondents in the same environment (Amabile et al., 1996). Indeed, it could be argued that the study succeeds as a test of criterion-related validity as defined by Carmines and Zeller (1979) insofar as it demonstrates that KEYS meets the criterion of detecting the environment for creativity through the measured projects.

Yet and still, Mathisen and Einarsen (2004) urge further study, perhaps involving external ratings of creative products at various times, to more accurately gauge the predictive validity of KEYS in the workplace.

## Applications in Research and Practice

In the 15 years since its creation, KEYS has achieved stature as an accurate measure of an organization's climate for creativity and innovation (http://www.ccl.org, 2010). The broad applications for corporations Amabile suggested when she created KEYS have indeed come to pass;

the database includes responses from organizations in North America, Europe, South America, Asia, and India (personal communication, October 20, 2010).

Although CCL will not disclose the number of people who have taken the assessment, the center does confirm KEYS is one of the most-administered organizational assessments in its portfolio (http://www.ccl.org, 2010). Amabile et al. (1999) states that some 12,525 surveys were examined during the reliability and validity analyses.

More than 1,225 published papers have cited KEYS and the analysis (1996) written by Amabile et al. By contrast, Insel and Moos' WES, a comparative assessment in the KEYS validity studies, has been cited in about 350 publications since 1974 (Google Scholar search, October 22, 2010).

KEYS has proven adaptable to research beyond its initial scope. Amabile and Conti (1999) employed the assessment, adding a handful of other variables such as chaos, morale, and feelings, to measure the effects of corporate downsizing. They found that KEYS plumbed the effects of the change on the creative climate. Mathisen and Einarsen (2004) note that "this finding indicated that the work environment is of major importance to creativity in organizations" (p. 137), though they recommend further research on the matter.

Amabile continues to incorporate KEYS in her work at Harvard. With her books and in *Harvard Business Review* articles such as "How to Kill Creativity" (1998) and "What Really Motivates Workers" (Amabile & Kramer, 2010), she broadly communicates its findings to an attentive corporate audience. Authors who refer to the measure (e.g., Perry-Smith & Shalley, 2003; Shalley, Zhou, & Oldham, 2004) often invoke it to discuss implications for individual creativity in the workplace, or refer to its strengths in describing the corporate climate (e.g., Unsworth, 2001; Adams, Bessant & Phelps, 2006), while expanding the theory in the field of organizational creativity.

## A Personal Orientation

As editor in chief of *Cooking Light* magazine for almost a decade, I came to view our offices as a sort of creativity lab; in some ways, I was one of the innovators Spender and Strong (2010) invoke.

Searching for ways to improve the quality of the magazine and satisfy our readers, I encouraged the staff to pursue creativity at work. I adjusted the makeup of work teams, incorporated my colleagues' suggestions in producing the magazine, and directed them to exchange ideas in regularly scheduled open forums. In so doing, I began to sense how a supportive atmosphere, challenging work, and freedom to pursue an independent course could change our day-to-day work, making the experience more gratifying for the people working there and, ultimately, making the product more appealing to the audience we served. The changes proved profitable; the magazine's verified circulation increased 18% during my tenure to a historic high of 1.8 million readers (Audit Bureau of Circulations, 2009). If I had the use of such a complete assessment tool as KEYS, I can only speculate how much more successful the magazine might have been.

Having constructed KEYS herself, Amabile says she uses it to her advantage in her office at Harvard. Keeping in mind its precepts of motivation and engaged management, she removes obstacles and effects opportunities for her staff so they can "make the research we carry on as rewarding and creative as possible" (personal communication, October 20, 2010).

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## Footnote

[1]The KEYS user's manual (Amabile et al., 1999) also reports a 1998 construct validity study conducted with principals and other personnel from public schools. In light of the findings, Amabile contends KEYS is valid for use in measuring administrators' perceptions of school environments, although mean scores tended to be higher than those in workplace environments.

## Table 1

Keys Summary Table

| | Reliability | | Scale Intercorrelations | Convergent Validity | Discriminant Validity | |
|---|---|---|---|---|---|---|
| | Alpha | Test-Retest | Median *r* with KEYS Stimulant & Obstacle Scales | Median *r* with Scales on the WES | Median *r* with Scales on the WPI | KAI *r* |
| **Creativity Stimulants:** | | | | | | |
| Organ. Encouragement | .91 | .94 | .49 | .58 | . 02 | –.11 |
| Super. Encouragement | .91 | .90 | .42 | .43 | .03 | –.27 |
| Work Group Supports | .86 | .88 | .42 | .32 | .00 | – 16 |
| Sufficient Resources | .83 | .75 | .34 | .45 | .00 | – 10 |
| Challenging Work | .79 | .82 | .36 | .42 | .03 | – 14 |
| Freedom | .66 | .80 | .36 | .23 | –.08 | – .02 |
| **Creativity Obstacles:** | | | | | | |
| Organ. Impediments | .84 | .89 | .41 | –.53 | –.03 | .14 |
| Workload Pressure | .77 | .71 | .24 | –.06 | –.02 | – .03 |
| **Criterion Scales:** | | | | | | |
| Creativity | .84 | .87 | .46 | .43 | .09 | – 02 |
| Productivity | .86 | .84 | .47 | .46 | .06 | – 14 |
| *N* | >12,100 | 40 | >12,100 | 56 | 69 | 69 |

*Note.* Adapted from *User's Manual for KEYS: Assessing the Climate for Creativity, A Survey from the Center for Creative Leadership*, by T.A. Amabile, R.M. Burnside, and S.S. Gryskiewicz, p. 24. Copyright 1999 by Center for Creative Leadership.

## Table 2

Phase 3 Work Environment Assessments for 12 High- and 11 Low-Creativity Projects

| | High Creativity | | Low Creativity | | | |
|---|---|---|---|---|---|---|
| | M[a] | (SD) | M | (SD) | F (1,140) | Partial Eta$^2$ |
| Work Support Groups | 3.30 | (.31) | 2.94 | (.26) | 9.12** | .30 |
| Challenging Work | 3.25 | (.22) | 2.87 | (.43) | 7.05* | .25 |
| Organ. Encouragement | 2.83 | (.33) | 2.51 | (.26) | 6.55* | .24 |
| Super. Encouragement | 3.12 | (.42) | 2.78 | (.34) | 4.54* | .18 |
| Organ. Impediments [γ] | 2.05 | (.37) | 2.32 | (.28) | 3.83$^+$ | .15 |
| Freedom | 2.94 | (.30) | 2.72 | (.38) | 2.38$^\pm$ | .10 |
| Workload Pressure [γ] | 2.52 | (.19) | 2.62 | (.40) | .71 | .03 |
| Sufficient Resources | 2.83 | (.33) | 2.78 | (.33) | .10 | .00 |
| Creativity | 2.89 | (.28) | 2.60 | (.27) | 6.43* | .23 |
| Productivity | 3.02 | (.33) | 2.72 | (.32) | 4.94* | .19 |

*Note.* Adapted from *User's Manual for KEYS: Assessing the Climate for Creativity, A Survey from the Center for Creative Leadership*, by T.A. Amabile, R.M. Burnside, and S.S. Gryskiewicz, p. 31. Copyright 1999 by Center for Creative Leadership.

[a] Means are on a 4-point scale, with a higher number indicating a higher level of the variable.

$*p < .05$, $**p < .01$, $^+p = .06$, $^\pm p = .15$.

[γ] These scales have not been reversed; higher numbers indicate higher levels of Organizational Impediments and Workload Pressure.

## Appendix

Transcript of telephone interview with Teresa M. Amabile, October 20, 2010.

Q: Given the hundreds of thousands of people who've taken KEYS in the last 15 years, and the companies that have changed with its help, what would you say its chief effects have been?

A: I am proud and excited that KEYS, as a formal instrument, is 15 years old. I'm thrilled with the number of people who've used it in research, and that the field in general has found it useful. Thinking about the companies who've used it, I believe the most important change is an increased awareness of the social environment.

KEYS has the strongest validation data of any measure of its kind. And that data says the general indication of the work environment is that there is a link between creativity and productivity.

That's not obvious to everyone, though. There is such an orientation now toward hiring the right people—'getting the right people on the bus,' as they say. But simply hiring skilled, intelligent employees is not enough. Even employees who have a high level of domain relevancy and creative thinking skills can find themselves in an environment that dampens their motivation.

I am not confident that any instrument, including KEYS, can bring about lasting change in all companies. That has to happen at the very top levels of an organization, which is difficult in companies of over 500 people. I do, however, believe that KEYS has raised individual awareness about the importance of a manager's role in the work environment.

Q: What insights has your knowledge of KEYS given you in constructing your own work environment?

A: I like to believe it's had some influence—and that I have influence on my workplace, too. Frankly, it fits beautifully into my life as a professor. I've been a tenured professor since 1984, and there is challenge in this work, a high degree of it.

I've been at Harvard for 16 years, and before that, I was at Brandeis for 17. I came here because I wanted to branch out from the research world and extend my work with creativity into the real world. At the time, there wasn't a business school at Brandeis, and my research then was increasingly focused on business. Here at Harvard Business School, it's pretty much what everyone does all the time. It wasn't easy at first, though, because everyone uses a different language, the language of management, not psychology. I had to learn it. I'm still learning, still enjoying the challenge.

As director of research, I knew I could try to give my staff, and the doctoral students I work with, stimulants in place—and hold back the obstacles—to make the research we carry on as rewarding and creative as possible.

Q: What do you see for the next 15 years of KEYS?

A: KEYS is migrating to an all-electronic format at the Center for Creative Leadership, where it's hosted, which will more easily enable the database to continually grow and inform our research.

I think there is room for more cross-cultural representation for KEYS. Frankly, the existing data is weighted to North America. While we have responses from Europe, South America, Asia, and India, I don't know of any data from Africa. The community of researchers needs to do more to broaden its cross-cultural basis in general. There's an opportunity for that with KEYS.

Q: What (if anything) from your undergraduate degree in chemistry do you draw on in your approach to your work?

A: I would have to say, that studying chemistry taught me to focus on getting really good data. Really good data can unlock all kinds of secrets.

Q: When you consider the future of creativity research, what do you think will be known that isn't known now?

A: Two things: First, I believe we'll see tighter links between the work environment and psychology, links explored by examining what people do and think day by day.

Then, from understanding the psychology of the environment, I believe research will explore the neuropsychology of creativity, and link that into perceived theory. The research that's just beginning there is very exciting.