

A Literature review on importance of Creative & Innovation in Product Design: To the Global Turbulent market

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Abstract: In today's highly volatile and turbulent market environment with petite product life cycles, product design must not only persuade the quality and speed of production, but it must ensure that products themselves have included innovative as well as creative values. While the need for innovation and creation for new product development remains forever in a rapidly oscillating market environment. Hence the most part of employees, employers and others are in acuity that the creativity and innovative are analogous. This paper disseminates the discrepancy of creative & innovative products towards the product design standpoint. In doing so, we define the research queries formally, and provide a precise answer, under a fussy set of assumptions. We find that an innovative artifact engenders a new market and creative product filches the major market share, which stretch to improve the environmental and contextual variables such as market growth rate and trailblazer artifacts into global market.

Keywords: *innovative, creative, product design, artifacts, methodology.*

1. Introduction:

We live in a world of turbulent change. New technology, new artifacts and new problems we are bombarded with something strange/new in daily life. The developments are shifting faster than we envision. In this global turbulent market the growth and success as an organization was ultimately based on fundamental discoveries and their success rate. The effects of creativity and innovation are not limited to the world of business. Creativity and innovation were also evident in the development of the modern civil service system (Morris, 1979), and the development of non-profit organizations such as hospitals (Mumford, 2002) [1]. Hence to challenge the competitive market one has to instigate the qualitative product rapidly, quantitatively. Traditional problem solving methods and approaches no longer are effective in all situations, to overcome these we must gaze innovatively and search creative way of doing things. Creativity and innovation are inextricably linked to corporate cultures that put an emphasis on teamwork, collaboration, communication, appropriate risk-taking, freedom to innovate and other factors [3].

The primary management and leadership task is to forge an environment in which creativity can flourish. Innovation

occurs in a continuous process of organizational learning, knowledge development, divergent problem solving, and investment. Innovation is a calculated process through which the knowledge, skill, and ability of all organizational members are focused on meeting their consumers' needs in a new way.

Now a day's firms are facing high volatile rivalry in launching new products. Because of benchmarking and interchangeability, within a petite period the product is replicated by other competitive firms. So to keep the market alive and to stretch the 'PLC', the firm should acuity to launch innovative products and these artifacts should develop creatively to fletch the global market.

This paper address the question of how creativity and innovation discrepancies. In doing so, we define the question formally, developed a methodology for answering the question, and we provide a specific answers for a class of high volume. We believe the answers to queries are useful to firms attempting to understand the relative leverage they can achieve through product design and development.

2. Need for Innovation and Creativity?

The *AMA/HRI Innovation Survey 2006* found that more than two-thirds of the 1,356 global respondents considered innovation either “extremely important” or “highly important” to their organizations today. Yet, those impressive numbers seem modest when compared to respondents’ predictions about the future. About half of respondents think innovation will be “extremely important” to their organizations in 10 years, and 35% say it will be “highly important.”

Innovation is a prerequisite for success and perhaps even for survival. That’s why innovation has found its way to the top of the agenda at organizations around the world. Innovation become a corporate priority that touches every facet of, and

indeed every employee in, an organization. External constituents, too customers, academia, the government, vendors, even competitors are playing a growing role in companies’ creative processes. [3]

3. The relationship of innovation and creativity

Creativity, which we define as the combination of *idea generation* and *idea validation* is essential to the innovation process. Again and again, novel ideas need to be incorporated into the innovation process (figure 1). Creativity is even necessary before the actual innovation process can begin, and can thus be considered as “pre-innovation”: Although the first idea itself might be elusive, it is prerequisite for scientific, technological or procedural innovation. [11]

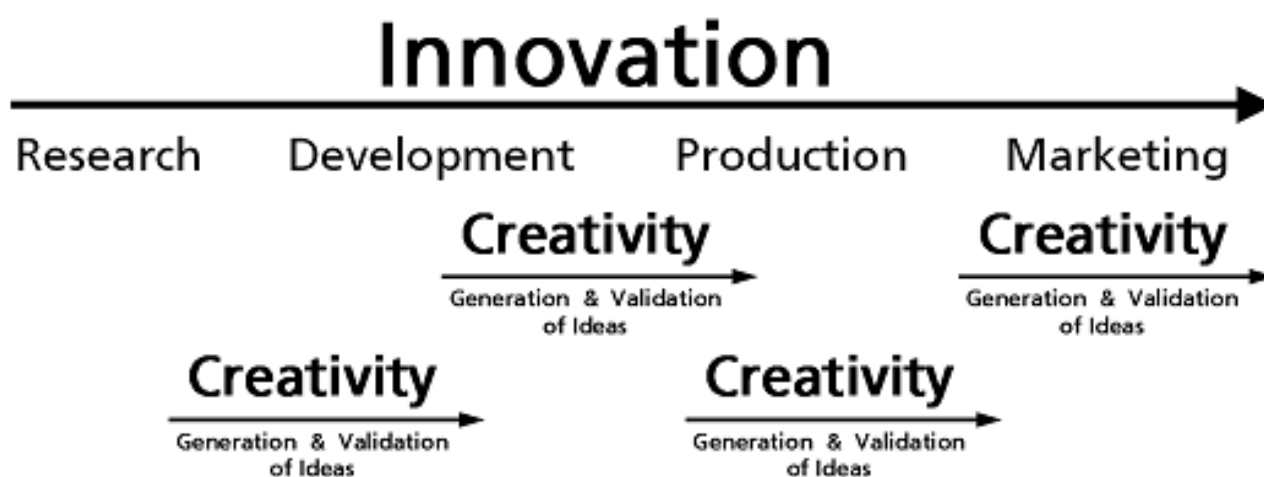


Figure 1: The relationship of innovation and creativity

Shalley & Gilson (2004) state that “most managers would agree that there is room, in almost every job, for employees to be more creative.” Although we generally agree with this view, creativity seems to be more important in some work domains than in others. While creativity is a *sine qua non* in advertising and marketing, it might be less desirable in accounting, although a novel accounting process can well be a valuable innovation. Most scientific and technological innovation is expected to originate from research and development (R&D) organisations or departments. As creativity is the source of innovation, it can well be claimed that creativity is essential for successful R&D and that creativity in R&D thus deserves special attention. [12]

3. What is Innovation?

Innovation is the term used to describe how organizations create value by developing new knowledge and/or using existing knowledge in new ways. The term is often used to mean the development of new products or services, but organizations can also innovate in other ways, such as

through new business models, management techniques and organizational structures. [3] If it is granted that creativity and innovation are critical to the growth and performance of organizations, then a new question comes to the fore: What, exactly, do we mean by the terms creativity and innovation? Our intuitive conception of creativity holds that it involves the production of new ideas (Guilford, 1950). Creativity, however, is not simply a matter of idea production although this may be an important influence on creativity. Rather, creativity is defined as the production of high quality, original, and elegant solutions to problems (Besemer & O’Quin, 1999; Christaans, 2002; Ghiselin, 1963; Mumford & Gustafson, (1988) [1].

Innovation will always remain risky. Many projects will fail, and most opportunities won’t warrant substantial investment. We don’t limit innovation to the commercialization of scientific breakthroughs. We define innovation broadly as a new match between a need and a solution. The novelty can be in the need or the solution—or

in a new marriage of an existing need and an existing solution (Karl Ulrich, Christian Terwiesch, 2009) [4].

“In our perspective, innovation is an absolute new product or service. Innovation does from vacuum.” Exp: electricity etc,

4. What is creativity?

A scientific definition of creativity that is elegant is: generation of something that is both novel and useful toward accomplishing desired goals (Amabile, 1996; Weisberg, 1993) [2].

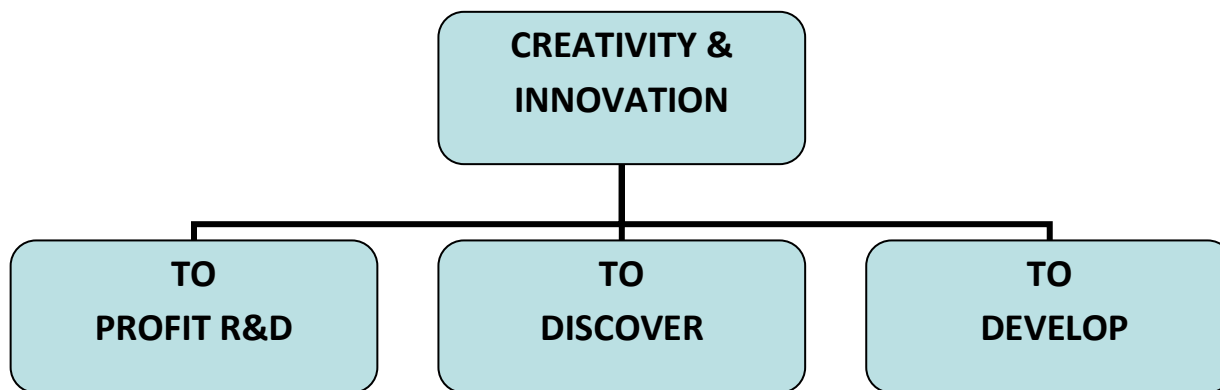
According to Heinze (2007) there are five types of scientific creativity:

1. Formulation of a new idea (or of a set of new ideas) that opens up a new cognitive frame or brings theoretical claims to a new level of sophistication (basic assumptions TO theory, e.g. Einstein’s theory of specific relativity)
2. Discovery of a new empirical phenomenon that stimulates new theorizing (observation TO theory, e.g. Darwin’s theory of evolution)
3. Development of a new methodology, by means of which theoretical problems can be empirically tested (theory TO method, e.g. Spearman’s development of factor analysis to test his theory on mental abilities)

4. Invention of a novel instrument that opens up new search perspectives and research domains (technique TO new possibilities, e.g. scanning tunnelling microscopy which made nanotechnology possible)
5. New synthesis of formerly dispersed ideas into general theoretical laws enabling analyses of diverse phenomena within a common cognitive frame (single ideas TO general theory, e.g. general systems theory) [13].

All of these types of creative acts are achievements in their own right. Their diversity cautions against a definition of scientific creativity that is too narrow to reflect this range. Another danger in the study of creativity is to focus only on exceptional persons and events (like the examples in the above list). Although the study of exceptional persons or events might cast an interesting light on creativity in general (Holm-Hadulla 2007), it appears to be more useful to concentrate on average people. We propose that in normal circumstances the development of creativity in ordinary employees is a more feasible way of inducing idea generation and validation than hiring or nurturing a genius, as by definition a genius is the great exception.[11][14]

5. WHY CREATIVITY AND INNOVATION?



Finally, the innovation concept seems to overlook all the research on technology transfer and absorptive capacity, which emphasizes the need to focus efforts not just on accessing technology, but also on R&D, so that the firm can benefit from technology developed outside the organization (Cohen and Levinthal, 1989; Trott and Cordey-Hayas, 1993).

One of the more challenging issues for R&D managers is when to outsource R&D activities due to the inherent risk of giving away critical core competencies to others .[11]

If we discover it ourselves, we will get it to market first

It is necessary to counsel caution here, for there are clear potential financial benefits from being the owner of the proprietary technology and having secure intellectual property protection. For example, Pilkington developed the

float glass manufacturing process and then licensed it to every glass manufacturer in the world

6. TO BE CREATIVE / INNOVATIVE:

Amabile states that organizational creativity stems from the ability to “do what you love and love what you do”. [6] When this state of gratification is achieved, the potential for innovation and creativity is at a maximum. Within complex organizational systems, managers and leaders must create an environment in which all employees are able to love their work. Such an environment begins with five key management practices:

1. The individual is allowed considerable degree of freedom or autonomy in the conduct of work.
2. Individuals are appropriately matched to their work assignments on the basis of skill and interest to maximize a positive sense of challenge in the work.
3. Projects are managed effectively by setting and communicating the overall work goals while maintaining procedural autonomy within the work group.
4. Clear planning, communication, and feedback loops between the supervisor, work group, and individuals are maintained.
5. Work groups consist of individuals with diverse skills who communicate effectively; challenge, support, and constructively critique each other; and are committed to the work at hand.[6]

A love for one's work stems from an internal motivation to engage in challenging, rewarding, and mind-expanding work [7]. A creative work environment begins with management. If they are able to cultivate these ideals within their own practice, a creative work environment for all organizational members can be created. The successful organization is the one that can stretch the limits of individual and collective knowledge, skill, and ability to meet complex consumer needs.

7. IMPACT OF CREATIVITY AND INNOVATION?

The key point here is that firms recognize that innovation success involves more than simply being first to commercialize a technology. Here we have some points to stretch to win.

1. If we are the first to commercialize an innovation, we will win.

2. If we create the most and best ideas in the industry, we will win.
3. If we discover it ourselves, we will get it to market first.
4. We should control our intellectual property (IP) so that our competitors do not profit from our ideas.
5. To profit from R&D, we must discover, develop and ship it ourselves.[8][10]

Rothwell and Zegveld (1985) identify three important factors: To market first.

1. *Technology explosion*. An estimated 90 per cent of our present technical knowledge has been generated during the last 55 years.
2. *Shortening of the technology cycle*. The technology cycle includes scientific and technological developments prior to the traditional product life cycle. These cycles have been slowly shortening, forcing companies to focus their efforts on product development. For example, the market life of high volume production cars has decreased from approximately 10 years in the 1960s to approximately six years in the 1990s. In some cases, a particular model may be restyled after only three years.
3. *Globalisation of technology*. Countries in the Pacific Rim have demonstrated an ability to acquire and incorporate technology into new products. This has resulted in a substantial increase in technology transfer in the form of licensing and strategic alliances [9][10].

8. Creativity as Multi-Level Phenomena

Figure.2 Creativity does not develop in a vacuum. It is always rooted in the patterns, priorities, materials, trends, and techniques of traditions and collectives even though, paradoxically, it must somehow also deviate to some extent from the collective and traditional to be truly creative. Large-scale collectives, such as societal or organizational cultures both constrain creativity by channeling it in certain directions, and provide individuals with raw materials (including knowledge, skills, and strategies) that provide starting points for creative production (James, 2005; Mar'i, 1976; Osche, 1990; Simonton, 1999). [2].

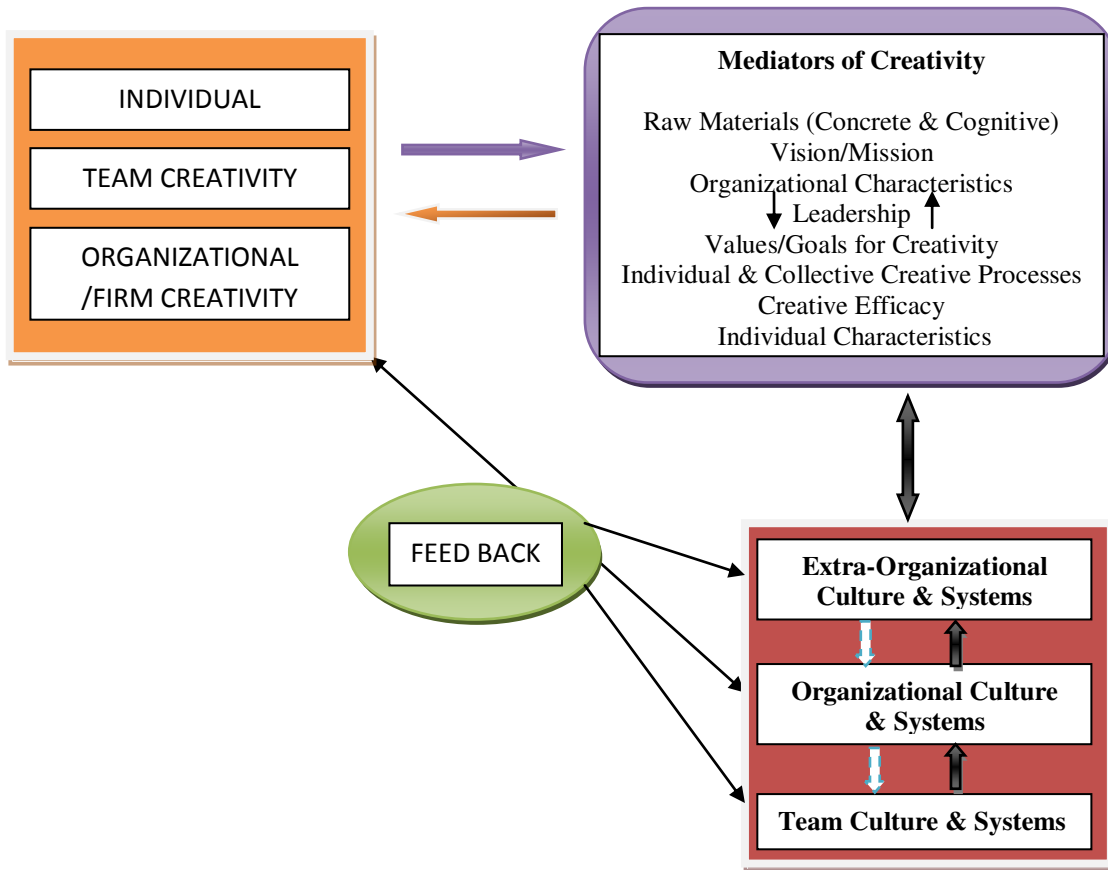


Figure.2 A model of multi-level organizational creativity

9. RISK FACTOR FOR CREATIVE AND INNOVATIVE PRODUCTS:

According to Claver *et al.* (1998), the ideal profile for creativity is *Adhocracy*: Openness for new technologies (and change in general) and the readiness to take risks, both factors these authors identify as creativity-promoting, are part of the ideals and values immanent to the *Adhocracy* culture. The flexibility to react rapidly to new developments, to incorporate new technology, and to address new problems and ideas as they arise, has also been found to be typical of highly creative research groups (Heinze 2007). It is therefore advisable to create an *Adhocracy* type environment if high creativity is desired, while alternative corporate cultures might be more valuable in other parts of a larger organisation[15][13].

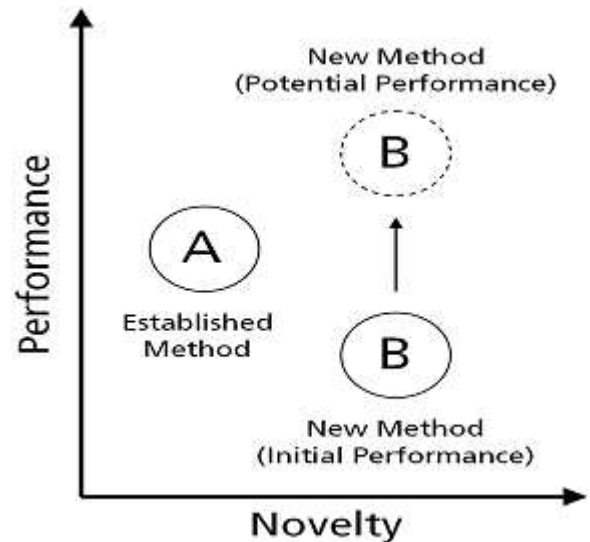


Figure 3: A risk associated with creativity lies in the unknown potential of method B (adapted from Young (2007))

It thus seems fitting to consider the risks posed by a creative approach to problem solving. The main risk in taking a new path lies in abandoning a well-trodden one.

This has to be done at a point in time when it is not clear where the new path might lead to. The dilemma that novel, high potential methods perform worse than long established concepts and procedures has been addressed by Young (2007) [16]. It seems to be a general rule that in the beginning new methods have poorer performance than well established procedures. On the other hand, they have the potential to result in higher performance, if enough effort and time are invested (figure 3). This is inherently associated with considerable risk, as it is not clear what the potential performance of the novel method is: The chances that it will never exceed the established, by-the-book procedure are considerable. In that case all the invested means and efforts were futile. Practically, this risk can lead to the effect that “negative stereotypes and immediate work demands can lead to a premature rejection of potentially valuable new ideas,” if no sufficient emphasis is put on the introduction of novel ideas as a management principle (Mumford 2000). Again, it seems to be essential to define “success” in a way that allows creative failure to be considered a necessary step on the way to improved performance [17].

10. Measuring Creativity for Innovation Management

Bledow et al (2009) defined innovation as the development and intentional introduction into practice of new and useful ideas by individuals, teams, and organizations. The term “value innovation” (e.g., Kim and Mauborgne, 2004; Dillon, Lee and Matheson, 2005) is somewhat more explicit: It focuses on innovation as a process through which organizations find novel and effective ways of serving their current customers and identifying new markets, thus linking innovation to what customers value. This terminology makes it clear that, at the level of organizations, innovation is not just a matter of coming up with a new idea but requires a valuable product, although “product” is not confined to devices or even tangible objects, but covers the full value chain, including marketing, market research, sales, advertising, distribution and customer service. In recent years it has become almost axiomatic that the innovation process is a key one: At the macro level (for instance national innovation policy) it is accepted as vital in meeting the challenges of the early 21st century arising from technological advances, social change, globalization, and now the global financial crisis, while at the meso level of the individual organization innovation is “a key to organizational effectiveness and competitive advantage” (Davis, 2009) and thus ultimately to commercial success and creation of wealth.

Haner (2005) emphasizes that there is an overlap between the processes of innovation and creativity:

“Creativity processes and innovation processes are ... different, but they display common characteristics and patterns that allow for joint reflection.” Roberts (1988) reinforces this duality: He divided innovation into two stages or phases: Invention and Exploitation. Invention involves the generation of novel ideas, and Exploitation involves the implementation of these ideas in the sense of value innovation. Bledow et al (2009) made a similar distinction, and explicitly identified the first phase (Invention1) with creativity. They saw the complete process of innovation as involving novelty production (in effect, creativity) plus innovation implementation (Exploitation). Looked at in this way, creativity is not identical with innovation but does form an indispensable element of the two-part process just outlined. West (2002) stated the matter quite explicitly: “Creativity is the development of ideas, while innovation ... is the application of ideas.”

West also envisaged the joint action of creativity and innovation implementation as sequential: “Innovation then can be defined as encompassing both stages—the development of ideas—creativity; followed by their application (emphasis added)”. However, more recent organizational theory does not see the interplay between creativity and innovation implementation as strictly sequential, with creativity always preceding innovation implementation and being completely separate from it. Haner (2005) concluded that “both creativity and innovation processes need to be seen as complex, partly iterative and partly simultaneous efforts”. Thus, the two elements of innovation may alternate, or may occur simultaneously. According to Gupta, Smith and Shalley (2006), the synchronous pursuit of both creativity and innovation implementation involves “organizational ambidexterity,” whereas sequential processing involves “punctuated equilibrium.”

11. Measuring Product Creativity

There have been extensive studies on how to measure a creative product in its broadest sense. O’Quin and Besemer (1999) describe three common approaches used to measure product creativity: indirect measurement, global judgment and criterion-based measurement. These approaches have been developed both in a domain-general and a domain-specific context. [18]

Some of the possible solutions include the use of expert raters (Amabile, 1996), divergent thinking based scoring of creative products for originality or fluency (Reiter-Palmon et al, 2009), or assessment of a product’s historical impact (Simonton, 2009) [19][20][21]. Horn and Salvendy (2006) offer a detailed comparison of specific product creativity measurement tools, including rating scales and subjective assessments [22]. The former include

Besemer and O'Quin's (1987, 1999) Creative Product Semantic Scale (CPSS) and Reis and Renzulli's (1991) Student Product Assessment Form, while the latter is based on Amabile's (1983, 1996) Consensual Assessment Technique (CAT) [18][23][19]. Horn and Salvendy (2006) also report that the rating scales have been tested in a variety of domains, including art work, cartoons, chairs, advertisements, scientific and creative writing, audio-visual products and social studies. The CAT has been applied to stories, art, poetry and other aesthetic products [22]. Much of the research has been geared toward evaluating either aesthetic or organizational products. The assessment of aesthetic work (such as a painting or poem) has been extensively investigated for nearly a century (Baer, Kaufman and Gentile, 2004; Cattell, Glascock and Washburn, 1918; Child and Iwao, 1968). Within industrial/organizational psychology or business, assessing creative products may mean studying group creativity or the performance of teams (e.g., Shalley, 2002). There are, however, surprisingly few studies aimed at assessing the creativity of products in the sense of tangible, scientific or technological products – that is, engineered artifacts or manufactured consumer goods. Where studies do relate to products, in the sense just described, it is primarily in connection with related concepts, such as “usability” (see, for example, Han et al, 2000). Looking at one such domain (mathematics), Mann (2009) argues that many of the current assessments are time-consuming to score; they also tend to be separate instruments designed to measure the specific domains. As a result, most of the work on mathematical creativity assessment cannot be easily applied to related domains (such as engineering). [24][25][26]

12. Conclusions

Innovative and Creativity research has contributed many practical guidelines on how to manage R&D in a way that fosters new artifacts. It would certainly be desirable to create an ideal environment for creativity and to be innovative by combining as many positive factors as possible, but even the well-considered adjustments of a few parameters might have a considerable bearing on both creativity and innovation. There are certainly some overlaps in the research regarding the process of creativity and innovation. In both, we must challenge assumptions and prior knowledge. The process of product innovation is dependent on “product emergence and ... ideation” (Goldenberg and Mazursky, 2002) [27]. To facilitate an effective product innovation process a valid method of measuring product creativity is needed that can be used reliably by non-experts without special training in the assessment procedure [28]. While the present paper disseminated the discrepancy of creative & innovative

towards the product design standpoint focused on the impact of affect on creativity and innovation, researchers should also consider the influence of these variables on subsequent affect.

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