Insights into insight – How do in-vitro studies of creative insight match the real-world complexity of in-vivo design processes?

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Abstract

This paper presents approaches to study insight in the context of creative (design) processes. Evidence for the discrepancies between experimental and observational studies of insight moments is collected from the literature. Implications for conducting integrative research that addresses the complexity of real world design environments are discussed. Preliminary results from two case studies looking for insight moments of design teams working on real world design tasks at a medical appliance manufacturer and within an interior design project are reported. A multi-methodological framework inspired by in-vivo-in-vitro research together with ethnographic and practice based approaches is developed and applied.

Keywords

Creativity; Insight; Design Process; Engineering Design; Interior Design

Innovations and the creative processes of coming up with “novel and useful” ideas, products and services in various areas have gained increased attention in political, societal and economic arenas during the last couple of years (EU Commission, 2008; OECD, 2009). A central element in reports about experiences on the path of creating something new that qualifies to be considered as a profound innovation later on is the phenomenon of insight. The experience of insight or an “AHA-moment” describes situations where in an instance suddenly and unexpectedly the solution to a problem becomes apparent together with feelings of clarity and satisfaction (Seifert, Meyer, Davidson, Patalano, & Yaniv, 1996, p. 66f). “Insight is thought to arise when a solver breaks free of unwarranted assumptions, or forms novel, task-related connections between existing concepts or skills.” (Bowden, Jung-Beeman, Fleck, & Kounios, 2005, p. 322)

Since the publication of the still often cited early process model of “productive thinking” by Wallas (1926) the field of creativity research has developed rapidly into a variety of approaches. Narrative accounts by distinguished scientist and artists were soon complemented with experimental studies that developed into a wide range of paradigms and tasks (Weisberg, 1996). Other strands of research focus at the context and personality traits of creative persons with historiometrical and correlational methods (Simonton, 2000) or try to observe and describe creative processes in “real world” environments with ethnographically inspired methodologies (Dunbar, 1996).

If one looks at these more and more specialised and distinct approaches, it becomes quite apparent that terms are frequently vaguely and incongruently defined, and what is studied in lab experimental paradigms has often little to do with the complexity of the real world settings in which the experiences behind the narrative accounts of creative insight were originally encountered (Simonton, 2003). Most of the lab paradigms are structurally different from the real world problems of interest and operate on different time scales for reaching the solution which is considered to be an insight (Csikszentmihalyi & Sawyer, 1996).

The aims of this paper are:

1. Collecting and presenting evidence from the literature on insight studies for the gap between lab and real world studies on creative processes.
2. Discussing the (im-)possibilities of overcoming the challenges in linking the data from (in-vitro) lab studies of insight problem solving and (in-vivo) real world reports of creative insights.

3. Compiling suggestions for more integrative approaches to understanding insights in creative processes that are capable of matching the real world complexity of the phenomenon.
4. Introducing two field studies set out to explore insight moments in real-world design settings.
5. Presenting some preliminary results from the early stages of these studies.

The following sections contain a discussion of the phenomenon of insight and how it has been studied previously, the context dependence of both lab experiments and real world observations, the research design that we are experimenting with in our ongoing studies and two examples from these studies. We conclude with a discussion of these preliminary results and an outlook on future work.

Approaches to studying insights and creativity

In this part we present an overview of selected contributions to the literature of studies of creativity and insight that are vital to the illustration of our further argument. We briefly summarise the development of approaches observing respectively describing insights embedded in creative processes in real life settings and experimental approaches in the lab. Due to the scope of the paper and limited space we refrain from discussing correlational studies on e.g. personality traits here.

Comprehensive compilations of the current state of the field of creativity studies can be found in Sternberg (1999), Weisberg (2006) and Sawyer (2006). A specific focus on different approaches to studying insight and insight problem solving is present in Sternberg and Davidson (1996). Knoblich and Öllinger (2005) provide a rich description of the chronological development of insight studies during the 20th century which we used as the temporal framework for most of the following mapping of selected key ideas and protagonists.

Insights embedded in creative processes

Anecdotes about flashes of insight as the origin of solutions to tough problems can be traced back to the ancient Greek, namely the story of Archimedes and his proclamation of “Eureka!” after understanding the principle of specific weight while entering his bathtub. During the 18th and 19th century more and more of these anecdotes especially about the origins of scientific ideas and concepts can be found in the literature. Attempts of generating descriptive models from these stories and introspective accounts were following (Knoblich & Öllinger, 2005).

One of the historical roots of scientific studies of creativity in the 20th century times can be traced back to Graham Wallas who suggests in his book “The art of thought” (1926) a 5-stage model of the creative process. This early but still well cited model is based on narrative accounts by Helmholtz and Poincaré on arriving at some of their most memorable scientific ideas as well as his own experiences of thinking about challenging self-chosen problems. He distinguishes preparation, incubation, intimation, illumination, verification stages but focuses mainly on the incubation, intimation and illumination stages in the further course of his book, with the question how new insights can be obtained and elaborated at the core of his considerations.

The idea to conceptualise creative processes in stages has become a common theme in research ever since, even though they might include iterative, repetitive or recursive movements. A recent and quite comprehensive overview of process models stemming from a psychological background in that tradition and linking them to process models from the field of (engineering) design is provided for example by Howard, Culley and Dekoninck (2008).

From observational to experimental studies of insight

A first wave of experimental studies of creativity and insight was performed by key figures of the “Gestaltist”-movement mainly before the Second World War (Duncker, 1935; Köhler, 1921; Wertheimer, 1959). They performed observational and experimental studies with animals (chimpanzees) and humans trying to solve problems that require somewhat novel approaches and

tool usage. The idea of restructuring of the problem in order to obtain a solution is considered an essential trait of insights by these researchers (Mayer, 1996).

In his book “Productive thinking”, Wertheimer (1959) tries to inquire beyond purely logical and associationistic concepts. He distinguishes between “sensible thinking” and problem solving that is achieved solely “by recall, by mechanical repetition of what has been drilled, by sheer chance discovery in a succession of blind trials” (Wertheimer, 1959, p. 11) cited in (Knoblich & Öllinger, 2005). This can be considered as an early manifestation of what later turned into the debate between advocates of “special process” vs. “normal thinking” approaches. Even though Wertheimer provides little suggestions for experimental settings to test the ideas and concepts brought forward based on a lot of observational and phenomenological material, his accounts are still a source of inspiration. His emphasis of the importance of being able to perceive the structure of a situation and discover gaps and tensions as prerequisite for success in endeavours of “productive thinking” seems to be still a challenge for researchers, designers or managers seeking profound innovations.

Karl Duncker, a student of Köhler and Wertheimer, esteemed to develop a complete theory of insight. He was very imaginative in developing numerous clever experimental set ups to study his theories and ideas (Duncker, 1935). His distinction between partial and total insight provides a first framing of what is currently studied as analogical thinking. The description of conflict analysis, material analysis and goal analysis as three central heuristics of thinking anticipates ideas from Newell and Simon´s seminal book “Human Problem Solving” (Newell & Simon, 1972).

Most of the contemporary experimental studies can be traced back to the problem solving paradigm brought forward by those two authors. The theory of a “problem space” or “possibility space” in which a solution is sought for by algorithmic or heuristic means is one of the central ideas. Structurally it is assumed, that if the problem is defined and the desired goal state is defined, problem solving is creating a search path through the problem space to the desired solution (Perkins, 1996, p. 508ff). The underlying goal of this approach is to develop a “general problem solver” which is open for computational, algorithmic implementations. Herbert A. Simon´s proposal to distinguish between problems in the natural sciences and problems in the realm of artificial human creation is of specific interest for design and studies of design practices (Simon, 1996).

From new experimental tasks back to ethnographic observations

Within the framework of “insight problem solving” cognitive psychologists have developed a number of experimental tasks that they use for their lab studies (Weisberg, 1996). Besides some newly developed tasks (e.g. matchstick arithmetic (Knoblich, Ohlsson, Haider, & Rhenius, 1999), coin moving (Chronicle, MacGregor, & Ormerod, 2004)), most of the studies on incubation and insight rely on somewhat traditional paradigms (Sio & Ormerod, 2009).

Application of new neuroscientific visualisation methodologies like fMRI spark some innovations in the experimental tasks (e.g. Puzzles with Chinese characters (Luo, Niki, & Knoblich, 2006) or newly developed compound remote associates (Bowden & Jung-Beeman, 2003)) recently. It is important to note that the transfers of experimental settings from cognitive psychology into the realm of neuroscience favour tasks that specifically suit the technical requirements of the brain scanners (Bowden & Jung-Beeman, 2007).

Studies conducting ethnographically inspired observations of creativity and insight in real world tasks and practices try to (re-)evaluate the theoretical concepts that underlie experimental settings for researching creative problem solving or even get ideas for new experimental paradigms. An interesting suggestion to capitalize on the cross-pollination of ideas between lab and real world settings exists in Kevin Dunbar´s “in-vivo-in vitro methodology” developed in the realm of studying scientific creativity (Dunbar, 1996; Dunbar & Blanchette, 2001). Since then there have emerged an increasing number of protocol studies of design meetings and semi-natural/artificial tasks (McDonnell & Lloyd, 2009).

Critique and call for integrative approaches

Even though we have just presented new developments and pathways of the evolution of the study of insight in the context of creative processes, most of the debates about "The Nature of Insight" (Sternberg & Davidson, 1996) are still unresolved. Ill defined concepts and discussions around seemingly opposing conceptualisations e.g. "special processes vs. normal thinking" are still subject to criticism and call for further integrative efforts. The prior chronological overview shows that from the initial narrative descriptions of the phenomenon of insight and creative processes very different approaches were developed to study the phenomena under scrutiny in the laboratory as well as in real world settings.

Insight as (too) broadly defined concept

When working with the concept "insight" one faces the challenge of varying and rather broad definitions. How extraordinary should a leap in a creative process be to qualify as an insight? Does an insight have to be useful, or can any surprising new idea be considered as an insight? And what about seemingly irrelevant insights that cause another and more useful insight – or even a series of insights that redefine the problem and/or the solution space? Disputes continue with the question whether insights should be considered as originating from special cognitive processes or as results of normal thinking.

Structural differences between "insight tasks" and real world experiences

Most lab experiments use tasks for which the solutions are known upfront. For creative problem solving in real world settings most of the time the solution is not known before it has been found as the outcome of a creative process. The underlying assumption for many tasks to study insights in the lab is that they per se cause insights if and when a "right" solution is reported. Solving the insight task is equated to having experienced an insight and thereby forming a somehow circular justification. Such assumptions are neglecting the possibility of other "non-insight" ways of getting to the solution. Another structural difference concerns the timeframes of the tasks in use. Whereas in lab settings most tasks are performed in the range of seconds or minutes, narrative accounts of insight problem solving are talking of hours or days of engagement.

Group Creativity as Blind Spot

Studies investigating individual performance in insight problem solving are neglecting to investigate how new ideas emerge from interactions among group members. "Unfortunately, most laboratory experiments on this subject use unrepresentative participants (viz., college students) and unrepresentative problem solving tasks (e.g., ones that require no division of labour or special expertise), thereby undermining their ability to be generalised to real-world problem-solving groups." (Simonton, 2003, p. 488) In recent years a movement to elucidate this blind spot and to investigate "group genius" (Sawyer, 2007) has started though.

Call for integrative approaches

Simonton concludes from his studies in the field of scientific work, that "the creative process is far less logical and deterministic than often claimed" (Simonton, 2003, p. 488). According to him, creativity has three essential components which should be integrated: the products that contain the creative ideas, the persons who conceived those ideas and the processes the persons involved used to do so (Simonton, 2000). This argument is well suited to encourage the quest for new integrative approaches.

We are convinced though, that such integration should be informed by Neurology and Cognitive Science and consider physiological plausible models of creative processes and insight moments. Socio-cognitive approaches could provide access to the experiences, states of mind and structures of thought that build the foundation for the abilities to perceive and associate items of relevance in processes of knowledge creation (Ringberg & Reihlen, 2008). The integration of experimental and observational approaches remains a crucial topic also for these considerations.

Matching lab experiments with observations of real world complexity

When setting out to study insight, two main approaches were considered so far: (1) Ethnographic studies of the phenomenon in context of real life practices and (2) laboratory experiments seeking to isolate the phenomenon to study it in a controlled environment. As we soon realised, both of these approaches have their challenges when it comes to study an “in flux” phenomenon. Studies of the real world are not necessarily reproducible outside their original context, and results from the lab are only valid for the controlled and stable conditions under which the experiments were carried out (Robson, 2002).

In this sense, both approaches share a general challenge: they are context dependent. If you change one factor in the context of the study, for example a team member, a time constraint or design company, the results from the study are questionable. This is as crucial for lab studies as it is for real life studies, and we concluded that lab-experiments or real world studies alone are unsatisfying for understanding the complexity of insights. From a more philosophical point of view, the relationship between the universal and the particular can be seen as interdependent: ”It is, ..., the fundamental principle of cognition that the universal can be perceived only in the particular, while the particular can be thought of only in reference to the universal” (Cassirer, 1955, p. 86).

In cognitive psychology, the same challenge has been described in relation to studying design of technological artefacts by Ball and Ormerod (2000) amongst others. They suggest developing and applying “cognitive ethnography”, first introduced by Hutchins (1996), as a method to study technological change. Hutchins develops the idea that cognition in real world settings can and should be conceived as being distributed way beyond individuals and including other actors as well as artefacts, thereby meshing up a complex system which as a whole is responsible for the outcomes of the cognitive processes (Hutchins, 1996).

In the study of insight we have therefore set out to design our studies based on a combination of the two perspectives, the particular (the lab) and the universal (the world). If we explore the structurally possible combinations the following options appear:

1. Either – or:
   We could stick to the historically developed disciplinary and methodological camps and either do observational or experimental studies.
2. Both at the same time:
   We could deploy studies on the same task in the lab and in real world settings simultaneously.
3. Integrating/mixing:
   We could perform experiments in real world settings (field experiments) resp. bring “real” tasks into lab settings - an approach that some of the current video/protocol studies are taking.
4. Jumps between both:
   We could move back and forth between the two modes and perform a couple of iterations in one project of longer duration.
5. Neither nor:
   We could come up with something completely different or move to another field of study, which e.g. Knoblich (2009, personal note) decided to do, based on the ill defined character of many of the concepts and the problems for experimental research in cognitive psychology due to that.

From the presented option we feel most inspired by the option to go for integrating/mixing respectively jumping between experimental and observational studies. This calls for crafting research settings that are able to meet up to the promises of an in-vivo-in-vitro-strategy.

Crafting and exploring integrative research settings

Obviously we should try to integrate findings from different approaches and even disciplines to account for the complexity in design thinking and practices (Cross, 2001, 2007) rather than trying to boil it down and reduce it to the extent that the phenomenon might vanish. Methodology wise it seems fruitful to play with observational, reflective and experimental approaches and look for

possible combinations in one project to increase the richness of the knowledge created (Müller, 2008). The challenge is here too, to work with 1st, 2nd and 3rd person perspectives and accounts of insights at multiple levels simultaneously, and collecting them "in vivo" in an unfolding open ended process without too much interference and disturbance.

As epistemological assumption we are thinking about "embodied, situated cognition in relations to other actors and things" and thereby looking for distributed cognition, construction of meaning and sense-making. Such an epistemological stance is very well aligned with practice based studies (Corradi, Gherardi, & Verzelloni, 2008; Gherardi, 2000, 2009) integrating a range of ethnographically inspired and action based approaches. With the "practice lens" for our observation we want to lay the groundwork for studying the complexities of design processes in an "in-vivo-in-vitro"-manner (Dunbar, 1999; Dunbar & Blanchette, 2001). Concerning the format we follow Weisberg´s suggestion to use extensive case studies (Weisberg, 2006, p. 592ff).

Our motivation for conducting exploratory case studies is to get a first hand personal experience how well current theoretical accounts and concepts fit evidence from self-collected data. We are specifically interested in a better understanding of creative design processes including the tools in use as well as conversational and cognitive heuristics and patterns applied in the surrounding of insight moments. We will conduct our observations along the following lines but still keep the openness for unexpected surprises and

- follow the unfolding process
- look for claims of insight moments and analyse the circumstances (close to the event) especially the expression of the content of the insight at this point of time in order to be able to distinguish them from later stages of verification and refinement
- try to trace and accommodate past memories and experiences, environmental cues, random surprising events and coincidences as possible triggers
- look for openness and constraints in the process at the same time
- inquire into motivation and intention to select and pursue a challenging problem that calls for insight solutions.

Experiences from two case studies

In the following we present two case studies (Study A and Study B) exploring insight moments in real world design processes that are currently in progress. For each of both we provide a short outline of the context of the study, the layout, methods in use as well as preliminary results of the observations. We then discuss the implications and further potential for the study of insights in real world settings and the transfer of findings into improved lab settings and research paradigms.

Study A

Context

Study A is conducted at a major international corporation specialized in medical plastics (Company A) and aims at understanding the evolvement of design requirements in an engineering design projects as a consequence of insights in the design teams. The project is looking at process level from early stages of defining new markets to the stages of finalizing new products. Especially in the early stages the project is focusing on the role insights play on defining design requirements.

Set up of study

To achieve a better understanding of the role of requirements and insight in engineering design, the following strategy is tried out in Study A:

1. Ethnographic study: Real world engineering design in Company A
2. Laboratory experiments 1 (Lab 1): Based on observations from Company A, laboratory studies with design teams are used to compare different situations observed. Using both experienced and novice designers, the experiments might also reveal some variances between the preferences for the two groups.

3. Laboratory experiments 2 (Lab 2): This series of experiments seeks to optimise the most successful strategies observed in Lab 1 and finally to conclude what strategy to implement further on.
4. Real world testing: After Lab 1 and Lab 2, the results are taken back to “the real world” and implemented in a controlled setting in Company A. The satisfaction with the suggested changes will be explored through interviews and questionnaires.

The project starts from research question(s) grounded in experience and theory. Based on the research questions, field observations are made, followed by relevant theory, which feed back to the observations and potential new observations. Based on this mix of theory and observations, a hypothesis is made and then tested in experimental settings. The testing feed back to the formulation and scope of the hypothesis, and the final results from the tests are evaluated – and form the fundament for future research questions.

Methods in use

In Study A, the following methods are in play: Participatory research, field observations, practice-based research, experiments, video and voice recordings, interviews and data analysis.

Observations so far

Below, one example from the case study that might be relevant for Lab 1 will be presented:

The researcher is participating in an early-stage innovative process in Company A as a member of an interdisciplinary design team consisting of 5 other members. The task for the team is to define an initial product profile for a new solution to a physical problem related to a specific medical condition. The team members are all from different backgrounds (engineering, marketing, sales, management, manufacturing, design) and from different departments (R&D, marketing, concept, design) within the company, and with limited prior knowledge regarding the medical condition the product is meant for. Since the project start-up, the team members have been finding and sharing knowledge in such a way that the team has a more or less common knowledge base regarding the condition.

In the third meeting, the team was interviewing nurses with special education and long experience with the relevant medical condition. The team asked questions to the nurses, based on the collected and shared information about the condition. Late in the meeting the following occurred: One of the nurses stood up and, using an existing product from the user category, demonstrated a specific user challenge with the product. At a certain point in her demonstration she was suddenly interrupted by the design team, as almost the whole team (at least 4 out of 6 team members) were excited about what she was presenting to the group. As it turned out, several members of the design team had got the same idea for a new way to solve the initial problem.

The product demonstrated in the meeting solved the initial problem in a comprehensive way, while the new idea generated in the group represents a very different and way simpler solution to the problem. The novel idea can be considered as an example of a shared insight amongst the team members as it does not have any similarities with the solution to the problem embodied in the product that was demonstrated first. This insight was seemingly triggered by a cue in the demonstration, possibly a combination of gesticulations and oral descriptions, and based on the fact that despite their varying backgrounds the team members had a shared knowledge related to the initial problem and medical condition.

The situation described above is in itself an interesting observation about a shared insight moment, but it might also be used as input to a controlled experiment studying shared insights. By giving a multidisciplinary group a problem definition and a shared knowledge base, can one use cues to trigger shared insights that will lead to ideas that a similar group will not be able to produce? The observation described is just one of several examples from the case study that might be used in the following experiments.

Study B

Context

Study B follows the interior design process for a shared office space for social entrepreneurs in Vienna, Austria. A 400 m² loft is transformed from an empty space into an up and running office during a 4 month period form December 2009 to March 2010. The project is currently in an early stage but progressing fast: The loft was emptied in calendar week 2/2010 and renovation just started. The work with the designers on the interior design started December 2009 as soon as all contracts for renting the place were signed.

At the centre of the investigation is following/shadowing the core team of two Vienna based designers and the two entrepreneurs owning the place/office space together with a designer from the London based global network organisation, linking similar places all over the world. During the planning and realisation process a number of workshops with potential users/clients and interested people are conducted to discuss the existing plans and get additional ideas.

Set up of study

The set up is exploratory and evaluates the development of key ideas and their implementation in the course of the project along a number of mile-stone-meetings. Between those meetings participatory observations are undertaken.

Methods in use

Mainly participatory observation (ethnographic field work, notes) and interviews at different stages throughout the process (audio recordings) were performed, taking a “reflection of action” (Schön, 1983) approach towards analysing the activities and circumstance of the development of key ideas and possible insights. Some basic introduction to the methods of those reflective practices was undertaken for the people involved (Schön, 1987).

The second level of observation is based on a collection and analysis of sketches, notes/meeting minutes and produced artefacts/prototypes in relation to the reflection of the design process in the interviews. The designers were additionally asked to do a basic self ethnography resp. use their working diaries for capturing potential insight moments focusing at the experience as such, its content and its circumstances.

The possibilities for video analysis of selected workshops/meetings are currently explored.

Observations so far

So far interviews on the initial ideas for the room layout and functional areas were undertaken and several rounds of walking through the loft and talking about the different functional areas to be designed and equipped with furniture were observed as part of the renovation/emptying out activities. The conversations observed so far were centred on efforts to combine new ideas and elements that worked in other situations as well as ideas from prior projects of the designers and applying them to the empty space. The content of the conversations focused in the early phase on desired atmospheres and functional settings in different areas of the loft.

Currently the next phase of building things is about to start. The room concept was transformed into a general plan. An iterative design process and rapid prototyping for elements of the installed furniture is planned for the upcoming weeks.

Additionally to the artistic and technical level it will be interesting to observe how the rather tight budget constraints will affect the quality/originality of ideas. This could mean ruling out some ideas and at the same time a call for additional creativity in terms of finding smart ways to cope with this very fundamental framework. As a result a lot of do-it-yourself and re-use of what can be obtained from sponsors or bought on flee markets (as opposed to catalogue shopping) is expected to be happening.

Concerning the phenomenon of insight so far situations of shared ideation can be reported. At this early stage the people involved seem to be building a common understanding of the different requirements for the various areas in the space. Discussions and conversations are focused on bringing together various ideas, elements observed at other places and matching those ideas with

the functional requirements and possibilities of the location. Some evidence for combinatorial/associative practices is available.

Summary, conclusions and outlook

In this paper we have presented an overview of approaches to study insights and collected evidence for discrepancies between experimental and observational studies of insight moments. We discussed implications for conducting integrative research that addresses the complexity of the real world design environments. Preliminary results from our efforts to get a personal perspective and feeling for these tensions and debates were reported: Two case studies with design teams working on real world design tasks are in progress where we are applying a multi-methodological framework inspired by in-vivo-in-vitro research together with ethnographic and practice based approaches.

With our work we try to follow the call for interdisciplinary and integrative approaches which are able to connect and bridge different zoom levels and perspectives for a more comprehensive understanding of the phenomena at hand. We very much look forward to further exploring what we will be able to observe and learn about insights in the further course of these studies. Some of the challenges that we anticipate are revolving around the following questions:

- How to obtain further data on insight moments in-vivo and account for the complexity around these events from 1st, 2nd and 3rd person perspectives?
- How to trace back the hints leading towards the observed insight moment?
- How are we going to be able to introduce experiments in the real world environments without compromising the role as participant observer?
- To which extend will we be able to abstract input from these case studies to further advance theoretical models?
- How far does the transferability of observed heuristics and patterns reach to other settings – e.g. analogous argumentations between design practices and management challenges?

Overall it seems to be crucial to embed insight phenomena in a plausible neuro-physiological working-model that will be able to help structuring the accounts from different disciplines as well as experimental traditions and paradigms. In order to get inspiration for the realm of experimental paradigms it seems promising to look again at some of the early work related to the insight phenomena (Duncker, 1935; Wertheimer, 1959). In terms of practical applications we hope to be able to generate some insights ourselves of how to increase the likelihood for profound insights to emerge. When trying to get beyond some of the debates about seemingly opposing theoretical accounts it should be helpful to take the slightly paraphrased title of Weisberg´s journal-comment on a target paper by Simonton (Weisberg & Hass, 2007) seriously: “They are all partly right…”

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The work presented in this paper is funded by the EU framework programme 7 – Marie Curie initial training network “DESIRE - CREATIVE DESIGN for INNOVATION in SCIENCE and TECHNOLOGY”.