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Shared Insights in Design Processes – A Discussion of In-vivo Evidence in and beyond Existing Creativity Frameworks

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Abstract. This paper presents evidence for shared insight moments in real world design processes in the context of product development for a large international medical appliance manufacturer. The findings are discussed related to the existing literature of insights in creative processes and regarding possible explanations from analoguous fields of interest, like brainstorming and multiple discovery.

Keywords: creative insight, shared insights, design, creative processes

1 Introduction

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). Studies of creative processes and practices as well as the contexts and spaces in which they occur promise to elucidate the phenomena involved and thereby contribute to enabling and fostering creativity. Recently an increasing interest in the applicability of "designerly ways of knowing" (Cross, 2007) and the work practices of designers and interdisciplinary design teams when dealing with open ended or ill-defined problems to other areas like management, policy making or societal development can be observed (Hargadon, 2003).

The phenomenon of insight (aka Eureka- or AHA-moments) forms the core of many narrations about creative processes that lead to profound innovations in science, art and business (Sternberg & Davidson, 1996). Especially reports about break-through ideas from leading scientists and famous artists informed most of the early attempts to scientifically study creativity, the creative process and "productive thinking" (Wertheimer, 1959) during the 20th century. Many of these reports give the impression that creativity is something happening to lone geniuses in their heroic struggle to create something new. Creativity research has developed along various strands and approaches since then (Sawyer, 2006; Sternberg, 1999). Currently a movement towards trying to understand the underlying "normal" (vs. assumed extraordinary) processes can be recognized (Weisberg, 2006). At the same time an increased appreciation of the shared and distributed character of creativity in groups and networks of practitioners is emerging (Sawyer, 2007).

Even though the insight concept gets challenged in the light of these trends, the fascination about "creative leaps" and Eureka-moments that produce novel ideas that have the power to transform and solve complex problems remains (Weisberg, 2006, p. 445f). Descriptions of insights or AHA-moments are focusing on 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).

1.1 Motivation

Our motivations and interests in this paper concerning insight moments are threefold and lie somehow in the middle ground between the mentioned "lone-hero" and "group-genius" (Sawyer, 2007) approaches. First of all we set out to explore insight moments by designers respectively within real world design settings which are normally organised within team structures that can be characterised as even interdisciplinary or cross-functional.

Secondly we want to report about two observations of what we propose to call shared insights in design teams as a selection from the preliminary results of a number of exploratory case studies conducted during the last 8 month. We want to take the opportunity in this paper to discuss these observations in the light of

the insight literature, in which we have not found comparable reports or satisfactory explanations.

Thirdly we want to suggest avenues for further exploration of the reported observations from other but somehow related strands of research i.e. brainstorming. By doing so, we hope to be able to engage in conversations with researchers that might have found traces of similar events by accident in their studies (ethnographies, videos or the like) of design processes which were conducted with other initial intentions or people that could provide explanations to our observations from analogous fields and theories.

1.2 Structure of Paper

To open up for engaging in these conversations we have structured our paper as follows: We start out with a condensed review of the literature focusing on insights embedded in creative processes and showing the rare examples of studies of insights by designers respectively within design processes we are aware of. Then we introduce the two exploratory case studies focusing on insights and handling requirements and constraints within design processes that formed the context for making the observations of "shared insights" that we report about as main part of this section. In a third step we argue for a gap in the insight literature to account for our observations and present candidates for looking at them from additional literature that seem to inquire structurally analogous fields which provide the basis for our discussion and outlook.

2 Literature Review

2.1 Insights during creative processes

Comprehensive compilations of the various approaches within and the current state of the field of creativity studies can be found in Sternberg (1999), Sawyer (2006) and Weisberg (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. Besides a history of successes one can read from these contributions also challenges due to the broadness or ill-defined character of the notions of "creativity" and "insight" in use as well as a number of conflicting views that call for integration (Simonton, 2003).

An interesting recent attempt to come up with an ontologically and epistemologically well grounded concept of "minimal creativity" is presented by Dustin Stokes (2007; forthcoming). Ontological approaches like Stokes´ suggestion will of course be evaluated based on their ability to account for findings from narrative and experimental accounts (Weisberg, 1996). Additionally we have to be aware of other strands of research that focus at the context and personality traits of creative persons with historiometrical and correlational methods (Simonton, 1999) or try to observe and describe creative processes in "real world" environments with ethnographically inspired methodologies (Dunbar, 1996). Still there is more to do in order to come up with working models that are neurologically plausible, philosophically stringent and appealing even to practitioners. For us it seems promising to seriously attempt to account for "embodied, situated cognition in relations and coupling with things and other actors" in the context of creative cognition and practices (Hutchins, 1996).

For our observations of insight moments we build our starting point on the still widely used five-stage process model by Graham Wallas, that distinguishes between exploration, incubation, intimation, illumination and verification (Wallas, 1926). Various similar models help to structure observations of creative processes ever since (Hadamard, 1954). A recent and quite comprehensive overview of process models stemming from a (cognitive) psychological background and linking them to process models from the field of (engineering) design is provided for example by Howard, Culley and Dekoninck (2008). Most of these process models are stemming from the dominant cognitivist traditions in creativity research that focus on individuals and their mental processes, rather than trying to understand the social and cultural influences and environments in which creativity is manifesting itself.

2.2 From cognitivst to socio-cultural considerations of insight

According to John-Steiner (1992) the distinction intrapsychic vs. interpersonal has not yet been successfully integrated. Csikszentmihalyi and Sawyer (1996) made one of the first contributions towards positioning the intra-psychic creative processes and insights in the social milieu in which they occur. Their approach is still useful as inspiration for our considerations here. Seeking to account for the "social dimensions of a solitary moment" they state: "Although the moment of creative insight usually occurs in isolation, it is surrounded and contextualized within an ongoing experience that is fundamentally social, and the insight would be meaningless out of that context. Therefore, […] we needed to incorporate

perspectives that explored the ways that social factors influenced the stages of the creative process." (Csikszentmihalyi & Sawyer, 1996, p. 334f).

Based on that initial observation they review three approaches as starting points for developing their own model, namely (1) ecological (Harrington, 1990); (2) symbolic interactionism (Woodman & Schoenfeldt, 1989) with distinctions of primary components of environmental factors (culture and group, task constraints), social influences (social facilitation, rewards and punishments, role modelling), cognitive style (ideational, fluency, problem solving style), personality traits (autonomy, intuition) and antecedent conditions (past history, socialisation, biographical variables); and (3) systems view (Csikszentmihalyi, 1988). These should in our opinion be complemented by distributed cognition approaches including actors, artefacts and context/space (Ball & Ormerod, 2000; Hutchins, 1996).

In the empirical work used to inform their model, Csikszentmihalyi and Sawyer interviewed 60 (aiming at 100) outstanding senior scientist, artists and businessmen. As in most of the narrative accounts mentioned above and at least in the nine selected illustrative examples of their article (including two artists and one writer) there is no experienced designer present in the sample. From the interviews it is interesting to note though, that although most respondents described insights as occurring during a solitary idle time, several described how insights can be sparked by interaction: "It´s very exciting to have another mind that is considering the same set of phenomena with as much interest as one is. It´s very exciting, the sparks, and dynamics interaction, and very much newer things, new ways of looking at things, that come out of those conversations." (Csikszentmihalyi & Sawyer 1995, p. 348).

2.3 Insights during design processes – existing reports and studies

From the insight literature reviewed so far we can see that reports about insights by prominent, experienced designers (as well as architects and engineers) that made mayor contributions to their field are rare. If compared to the large number of reports about/from outstanding senior scientist, artists and businessmen normally presented as evidence in the classical case studies as well as in more recent interview studies regarding creative insight, they might even be considered as very rare. A nice exception is an Australian interview series with 45 experienced designers (Murty & Purcel, 2006). They even propose distinctions between different levels of insightfulness.

Besides general considerations there is fairly little empirical material of insight moments in the often cited classics on design thinking (Cross, 2007; Lawson, 2004). Cross (2007) is providing protocol evidence from only one single and one group encounter of an insight, where in the group condition the insight is mentioned by one out of three persons. In the following, Cross is not really elaborating on the notion of insight further, but proposes his "bridging hypothesis" as alternative/replacement for the "leap characteristic" of creative insights that can be traced back to Gestaltists´ treatments of the subject (Cross, 2007, p. 065ff).

Additional to the general under-representation of accounts for insight moments in design processes respectively by designers, the criticism from the general introduction to the creativity literature holds here as well: If we compare the different approaches and concepts in use it becomes quite obvious that terms are quite often vaguely and incongruently defined. What is studied in lab experimental paradigms of insight problems has 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) are making the distinction between the scale of years for "discovered problem finding" and hours for "presented problem solving" types of incubation. This needs to be contrasted with the second or minute scales in lab paradigms of cognitive psychologists (Bowden & Jung-Beeman, 2007; G. Knoblich, Öllinger, & Spivey, 2005; Sio & Ormerod, 2009). All these observations add up to opening an interesting occasion to try out something else and new in terms of research approaches and methodologies applied.

3 Observations of Shared Insight

3.1 Background: Purpose and design of our study

Based on the identified gaps and challenges within the insight-literature, we initiated two different research projects to follow the calls for integrative approaches. The projects are venturing to track and observe insight moments as well as the handling of requirements and constraints in real world design processes. They aim to study the complexities of design processes in an "in-vivo-in-vitro"-manner (Dunbar, 1999; Dunbar &

Blanchette, 2001) based on the idea of combining and contrasting field studies with laboratory experiments. In this paper we will focus on the "in-vivo"-part of these projects.

One project is targeted at innovative product development processes of medical devices, the other follows the interior design process at a shared office space for social entrepreneurs. Both started with exploratory observational studies looking for the phenomena and concepts of interest in professional design environments. Thereby following Weisberg´s suggestion to use extensive case studies to understand creative design (Weisberg, 2006, p. 592ff).

Our research framework is theory-driven, ethnographically inspired and based on participant observations, interviews as well as audio and video recordings. As epistemological assumption we are considering cognition as embodied, situated and in relations to other actors and things, thereby looking for distributed cognition, construction of meaning and sense-making. Such a 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. The two studies and their underlying methodology are further described in Wiltschnig and Onarheim (2010).

3.2 Context: two exploratory case studies

Based on the literature review above, our focus in these studies was on tracking and researching individual insights. But in one of the studies, two occasions occurred, where several members of a team were observed getting the same insight simultaneously and independently. We propose to call those events "shared insights" and will in the following describe the two situations, one being a meeting of the design project team (Case A) and the other being a cross-functional technical workshop (Case B). Both of the shared insights were observed at Coloplast A/S, a major international corporation specializing in medical devices. The data was collected through attending product development meetings and workshops at the company and consists of field notes and audio/video-recordings.

3.2.1 Case A

In case A, one of the researchers was attending as a member in an interdisciplinary design team consisting of 5 other members. The task for the team was to define an initial product profile for a new solution to a physical problem related to a specific medical condition. The team members were from varying backgrounds (engineering, marketing, sales, management, manufacturing, design) and from different departments (marketing, concept development, design) within the company, and with limited prior knowledge regarding the medical condition the product was meant for. During the project start-up, the team members were finding and sharing knowledge in such a way that the team had a more or less common knowledge base regarding the condition to design for.

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 used an existing product to demonstrate a specific user challenge. At a certain point in her demonstration members of the design team suddenly interrupted her, as they wanted to share an idea with the team. As it turned out, four out of six team members had got the same idea for a novel 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 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 by the nurse.

3.2.2 Case B

In case B, one of the researchers was attending as a team member a two day, cross-functional technical workshop where a team of eight specialists were gathered to work with a concrete technical challenge in one of the ongoing product development projects. The team consisted of two industrial designers (including the researcher), one production specialist and five engineers (manufacturing, mechanical, chemical). Their experience at Coloplast varied from two days to 15 years, and their prior knowledge related to the project at hand varied from limited to extensive knowledge.

The task given was highly constrained, and two potential but not completely satisfactory solutions were presented to the team at the start of the workshop. A lot of the time spent in this phase was focused on getting a shared understanding of the problem at hand. As the workshop went on, the team discovered critical flaws with the solutions presented and technical requirements that completely changed the solution space. This led to a situation where other types of solutions were investigated to fulfil the new

requirements, but this process was strongly guided by the two solutions presented at the start of the workshop. In this process the team members were grouped in pair A, B, C and D, working on new ideas for about ten minutes before presenting for the other pairs.

This process was repeated, and in one of these iterations the following occurred: Pair C talked together for a couple of minutes, discussing challenges with one of the suggestions described in the previous idea presentation, suddenly interrupting the conversation as they both wanted to sketch a new idea to explain it to the other. Before they got the time to present the sketches to one another, the next round of presentations began, so they had to present the sketches to the whole group immediately. While the other pairs presented variations over the existing solutions, both members of pair C came up with a completely new and different solution, still fulfilling all the key requirements but in a novel way.

Even though the two solutions presented were not completely identical, they where both based on the same concept and distinctly different from the existing solutions and thereby opening up for a whole new category of possible solutions. The first presentation from pair C resulted in a spontaneous applause in the group, followed by the other member of pair C jokingly claiming "That was my idea!". Looking closer at this shared insight; the two similar ideas were not expressed during the conversation in pair C, but emerged from it and where then elaborated in parallel individual work.

3.3 Surprising findings: shared insights

While looking for individual insights of designers in real world design meetings, we surprisingly found occasions of insights that occurred to more than one person simultaneously, and had equal or widely shared content for the people involved. From the perspective of the insight literature reviewed at the beginning we did not expect to observe such "shared insights". To our knowledge similar descriptions and investigations of the shared content and simultaneous character of insights have not been reported in that specific research tradition so far. So either we are confronted with phenomena that can be reduced to individual insights in a shared context or we report first traces of something new that needs further investigation.

Even if the first option would be the case, the material presented can be considered a contribution to design studies addressing the argued lack of examples of creative insights by designers in their professional work environments. However from the perspective of the insight literature reviewed at the beginning, there are reasons to believe that our observations are fresh, at least for that specific research context. An in depth analysis of the existing video material and looking for further similar material or even experimental lab evidence is part of the anticipated future work in that regards.

4 Literature to Continue

In order to be able to make novelty claims beyond the literature that we are aware of and have already mentioned, it is necessary to explore further to which extend existing theories are able to explain the phenomena observed. Beyond that, we have to inquire whether there are candidates in other areas and streams of research that could be helpful to get a better understanding of our surprising prototypical evidence. The next section is set out to present our attempts in that respect in two directions: (1) Production paradigms and (2) Multiple discoveries.

4.1 Production paradigms

In contrast to the insight literature that has been the focus of much of our endeavours in the present paper, there is another common theoretical strand in the creativity literature dealing with individuals coming up with similar ideas: production paradigms, such as brainstorming (Osborn, 1963), divergent thinking (Guilford, 1959), or the Torrance Test of Creative Thinking. Such approaches are often group based, but can just as well be done individually.

Most measurements of brainstorming effectiveness tend to measure quantitative production rather than constraint satisfaction (as in the problem solving literature). The success measure for creativity in production paradigms is the number of ideas produced assuming that quantity breeds quality (Osborn, 1963). A typical measure of individual or group creativity in brainstorming is threefold: the measurement of the number of ideas produced (fluency); the number of unique ideas produced (originality); and the number of distinct categories from which the ideas where drawn (flexibility) (Guilford, 1959). The distinction between effect measures in the problem solving or insight literature vs. production paradigms is that the former frequently utilize closed (single-right-answer) and the latter frequently utilize open (multiple possible answers) problems in empirical studies.

Interesting for our present purpose of looking at shared insights, is the observation that the production of the same or similar ideas is very frequent in these production paradigms. It is important to stress that the production paradigms evaluates creativity in very

different ways from the insight or problem solving literature. While the problem solving or insight literature most often attempt to find evidence of leaps in the problem space, restructuring of the problem or solution space, and an estimate of the level of constraint satisfaction, production paradigms do not concern themselves much with the level of match between each individual solution to the problem formulation. Rather, the unit of analysis is the production ability of the individual or group in question. In production paradigms there is no need for big leaps, surprising results, or restructured problem spaces before an idea is counted towards individual creativity.

Two consequences from these kinds of estimates can be drawn: (1) a certain (frequently large) proportion of the pool of ideas in production paradigm responses will be shared (or parallel), implying that parallel idea production is more or less common. (2) The parallel production of the same ideas by two or more individuals leads to a devaluation of these individual's level of creativity in production paradigms. If ideas are not original (i.e. uncommon in a set of ideas) they are not counted as creative.

From this perspective parallel idea generation in production paradigms is not even theoretically surprising. It can be expected that subjects produce similar ideas when generating novel exemplars. Future studies of shared insights may look further into this distinction between problem solving and production paradigms in creativity.

4.2 Multiple discoveries

The second field to look for analogies for the explanation of our observations are discoveries happening simultaneously by seemingly isolated (groups of) inventors or scientists. So called "multiple discoveries" (defined as the independent and simultaneous formulation of identical inventions, concepts or theories) have puzzled sociological and psychological creativity scholars for decades. Examples of them include the invention of the telephone done seemingly independently by Elisha Gray and Alexander Graham Bell. The invention of the light bulb was done simultaneously and independently by Sir Joseph Wilson Swann and Thomas Edison. And upon learning that Alfred Wallace had formulated a similar theory to his own on natural selection, Charles Darwin noted that "I never saw a more striking coincidence; if Wallace had my manuscript sketch written out in 1842, he could not have made a better short abstract" (Simonton 1999, p. 173). Historians have identified hundreds of such cases (Merton, 1961).

The reason for the interest in multiple discoveries by sociological and psychological scholars alike seems to be the understanding that these instances speak to the nature of grand creations: are they the result of individual genius or collective properties of the scientific discipline. Proponents of the socio-cultural explanation hold basically that the individual creator is largely irrelevant to the cultural progress represented by the inevitable accumulation of technological expertise. The spirit of the times (Zeitgeist) is ultimately responsible for any given advance. It is only when the "time is ripe", that progress happens, and scientific breakthroughs occur. Counter this with an individual genius model of scientific progress: Great scientists and inventors holding special talent, personalities and backgrounds are the true cause of discovery and invention. Finally, Simonton (1999; 2003) has advanced a third theoretical explanation: creativity is stochastic in nature, and scientific progress is a matter of chance and luck.

Characteristic for this line of research is that the multiple discoveries under scrutiny are of the world-changing kind. In terms of Margaret Boden's distinction between historical (H) and psychological (P) creativity, the literature has focused solely on historical accounts and neglected more mundane kinds of multiples (Boden, 2004). If we follow that line of argument further structural analogies from design processes to Kuhnian "paradigm shifts" can be drawn (Kuhn, 2007). Concerning the messiness of creative production, Ludwig Fleck´s analysis of scientific progress, which was a major source of inspiration for Kuhn, might be even a more fruitful source for comparisons (Fleck, 1980).

4.3 Understanding shared insights as individual instances of insights

Seeking to understand our two cases in the perspective of the existing insight literature, the most natural explanation is that what we have observed are two individual insights occurring at the same time. Following this logic, we could use the shared insights to better understand the situations where such individual insights occur. Seeing them as two instances of simultaneous individual insights we discuss in the following what was shared and what was not shared for the participants getting the insight. We will relate this to four different factors: setting/context, background knowledge, cues and requirements.

In both cases the setting and the group context in which the insights occurred where similar. Both of the teams were relatively newly founded, and consisting of members with various backgrounds and knowledge. The two situations were open and without an

externally defined hierarchy, and they were joyful, relaxed and outside of the normal working context. The insights occurred after approximately the same number of shared working hours within the team (8-10 hours), and in a situation where a lot of new information was introduced to the teams.

In terms of shared knowledge, one can assume that all the team members had a shared knowledge base in relation to the specific projects at hand, as both teams had spent several hours working together on defining the problem. Some members had more extensive prior knowledge to the specific (and/or similar) projects, but all members shared a large part of the project relevant knowledge. In contrast to that, the team members involved in both of the cases had diverse backgrounds, and varying knowledge of the product category, the market situation and the company in general. Especially in Case B, this is unmistakable, as pair C consisted of the project manager (with extensive knowledge of the project and the company) and a new employee (with very limited knowledge of both the specific project and the company in general).

One could also use instances of shared insights to investigate what kind of cues might have led to the insights. In case A it could have been a verbal and/or gestural cue from the nurse presenting the existing product. In case B it might have been something said in the conversation in pair C, as both the participants suddenly ended the conversation to start drawing. As most modern design is performed in multi-disciplinary and cross-functional teams, this individual perspective might not be sufficient when studying insights in design teams though. In relation to design requirements, both shared insights showed good examples of bending or reconstructing requirements by breaking out of underlying assumptions of how the requirements could be fulfilled – and by that coming up with novel solutions.

5 Conclusions and Further Research on Shared Insights

In this paper we have presented evidence for shared insights from two exploratory in-vivo case studies of real world design processes. The findings have been discussed based on a review of the insight literature, and an attempted accommodation in analogous fields of research. Future work in the short run will be dedicated to an in depth analysis of the video material recorded and an extension of the discussion relating shared insights to the suggested additional strands of research.

In our efforts to further study creative processes prospectively, it will be interesting to note the frequency with which shared insights occur. At the moment it is unclear whether we happened to stumble upon two isolated and rare cases, or whether shared insights are actually commonplace in design when looked for specifically. A broader empirical basis should allow us to come up with a taxonomy of insight moments in general and particularly a further clarification of shared insights. This would also pave the way for further development of experimental approaches to studying insights in design.

Reports of shared insight might also be important when seeking to understand what kind of settings and cues elicit or trigger insight moments, as different descriptions of the same insight will give more accuracy when looking for the source(s) of insights. At the same time they show in a nutshell the embeddedness of individual insight experiences in the relational and conversational dynamics in which they evolve.

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