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# HOW INTUITION AFFECTS DESIGNERS' DECISION MAKING: AN INTERVIEW STUDY

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## 1. Introduction

There is a saying that "every medal has two sides", and so does intuition in regard to its influence on problem solving and decision making processes in complex environments. Within recent decades, increasingly research has been done to explore how to understand intuition and its differences with the so called 'rational processes' in various fields such as in business [Sloman 1996], management and also science. A review of recent trends in conceptualisation and maeasuring intuition as well as the influence on problem solving and decision making has been presented by [Dane and Pratt 2009].

What kind of processes and/or activities do we portray when we talk about intuition? Obviously, already defining intutition is a problem as 'intuition' occurs in the head (brain) of the individual, thus intuition is not directly observable and accessible by another person. According to the Oxford English Dictionary the definition of the term "intuition" has evolved throughout the centuries. In the 15th century, intuition was seen as the activity of looking upon or into something, as a kind of contemplation or inspection. Around the 18th century, a new meaning was added, the immediate apprehension of an object by the mind without the intervention of any reasoning process. A common acknowledgement of intuition as being based on actions can be found throughout these different stages. Although these definitions relate to a process it is interesting that there is no appropriate verb to describe the process of arriving at a judgment by intuition.

The explanation of how intuition 'works' does not seem to be very controversial among researchers; most authors agree upon that intuitional processes can be described by the so called two systems or two minds modell. A typical example is the model by Evans and Jonathan [2003]. The authors classify the working system of the human mind into two systems: System 1 and System 2. System 1 comprises a set of autonomous subsystems including both innate input modules and domain-specific knowledge. System 2 allows for abstract reasoning and hypothetical thinking but is restrained by the capacity of the working memory and correlates with measures of general intelligence.

According to most empirical findings, intuition is based on a large amount of practice and accumulative experience which needs System 2, reasoning and rational thinking to structure and evaluate information in order to gain knowledge. Then, with time passing by, the reasoning process will need less time as intuition will be developed. According to Sinclair & Ashkanasy intuition is the result of non-sequential information processing and it contains both cognitive and emotional elements, which lead to instant responses without any use of conscious reasoning (2005, as cited in [Hensman and Sadler-Smith 2011].

But how does intuition affect designers' decision making? Answering this question is important as the knowledge when and where designers use intuition, might influence the acceptance of the concept of intuition and elicit or enhance intuition in those situations which are best suited for intuitive judgments.

## 2. Theoretical background

Exploring how intuition works and influences performance has become a popular research topic in the last decades, not only in business and management but also in product development. In the latter field intuition has been characterised as non-rational what is why the "use of intuition" has been considered as unwanted or even harmful for reaching successful results.

Hubka and Eder [1982] for example argue that the designer should work on a knowledge-based level (conscious level) and not jump to conclusions in a rush. The authors consider that jumping to conclusions too quickly without full consideration and investigation of the situation at hand might lead to negative results due to the higher probability of missing critical issues. Meanwhile a growing agreement has been reached that intuition does exist and play an important role in human decision-making in design. For example, Badke-Schaub and Eris [2013] hold a different towards the argument made by Hubka and Eder. They claim that a designer would be paralyzed if he/she were trying to stick to the principle of "not jumping to conclusions", because this would limit the efficient 'use' of intuition.

Another critique directed to the assumption of human beings as rational problem solvers was brought up in the early 50ies by Simon [1953]. He introduced the notion "bounded rationality", which claims that people do not behave like rational decision makers, instead they prefer choosing satisficing rather than optimizing solutions, and due to their limitations, for example in terms of memory capacity this might be often more successful. Limitations exist inside and outside the human being, such as time pressure, unreliable information and restricted memory capacity that prevent humans from acting as rational problem solvers.

A general summary about the extended research on the concept of intuition provides a more balanced view, indicating both, the positive and the negative face of intuition. Sometimes intuition leads to a surprisingly excellent results and sometimes to the opposite. Thus, the question arises: If intuition is successful, is it due to just luck or to other unknown influencing variables? Klein [2007] argues that the person herself cannot provide explanations about their own intuitive behavior as for the person the intuitive result seems to come from nowhere. Usually we do not realize the associations and connections that lead to intuitive judgments. Moreover, Klein [2007] argues that there is a general need to strengthen our intuitional judgment, to arrive at more accurate insights. But in what way can we strengthen our intuition?

Patton [2003] states that the intuitive answer is a combination of one's skills and experience. The expert, as Patton points out, does not necessarily need to read through information and data any faster than a less experienced person. Experts develop a capability of grasping certain patterns of operations and activities. By a large amount of practice experts gain the capability of tackling different situations as patterns which help to recognise a situation as a type of situation often connected with specific activity schemata. They build up a platform of patterns with which intuitive decisions will be made [Eisenhardt, 1999], [Prietula and Simon, 1989], [Simon 1997], as cited in [Patton 2003]. In a similar way researchers explain why chess experts show a higher performance than novices: chess experts seldom waste time in processing unrelated information or exploring unproductive pathways.

In a similar way Dane et al. [2012] state that intuition is helpful when the person possesses a rich body of domain-specific knowledge; on the contrary, intuition will lead to negative results in case the person has got only low domain expertise. In addition, they pointed out that an individual would perform worse when he/she uses intuition for solving problems that are decomposable.

Thus, indicators are necessary to determine when the person should use intuition and when not? An international survey involving more than 1000 participants found that intuition is more relevant in fields like corporate strategy & planning, human-resource development, and public relation whereas intuition is less relevant in operations and product management, and also in finance and mechanical technology. Thus, the authors conclude that intuition is much more likely to be applied to personal or people-related decisions [Parikh et al. 1994], as cited in [Hensman and Sadler-Smith 2011].

Levinthal [2006] introduces the concept of 'mindfulness' as the ability to cope with new problems in a flexible way and allowing more new insights, whereas less mindful actions are routine answers, allowing quick reactions and thus they can be more efficient.

In terms of successful use or non-use of intuition Dane et al. [2012] states that those persons who lack relevant knowledge or experience would perform worse if they use intuition. The reason can be that the person reduces her actual perspective on what she knows without awareness that things could be otherwise. practical experience is then limited to few patterns which might not be applicable. Hensman and Smith [2011] also found that persons feel more confident when they have a so called gut feeling, for example police officers. An experienced police officer would more likely know what happens in a specific situation compared to a novice police officer. In this case, the experienced police officer would be more confident even if he does not grasp the whole information. His strong intuition is based on a rich body of practical experience and knowledge, which means that he can quickly and accurately respond to different situations by means of recombining different knowledge swiftly without involvement of too much reasoning. This is the same as chess masters mentioned above.

## 3. Research Approach

This study aims to explore whether designers have access to their intuition and if so, how do they elicit and use intuition and how does the company environment influence this process. The three specific objectives are:
1.  to find out when and where designers probably use intuition;
2.  to seek more insights into how intuition interacts with rational processes and
3.  to figure out how companies have an impact on the use of designers' intuition.
As this study is an exploratory study the qualitative interview methodology was adopted for this research.
Altogether 8 designers were recruited, they are from different disciplines and companies (e.g. Company N, Company X, Samsung, Company A, see Table 1) as can be seen in Table 1.

**Table 1. List of interviewees**

| Name | Age | Formal Position and Company |
|---|---|---|
| Interviewee A | 40 | Principle Designer, Company N |
| Interviewee C | 28 | UI Designer, Company N |
| Interviewee R | 28 | Visual Designer, Company X |
| Interviewee L | 27 | UX Designer, Company N |
| Interviewee W | 26 | Master Student, IUB |
| Interviewee X | 25 | Product Manager, Lab W |
| Interviewee H | 24 | Founder, Company D |
| Interviewee J | 23 | Shoe Designer, Company A |

The interview was half-structured in the way that the three topics (use of intuition, elicitation of intuition, influence of the company environment) were used as the main frame of the interview added by questions relating to the specific area. The interview data were transcribed  and sub-categories were defined for the three main topics based on the answers of the interviewees.

## 4. Results

The results of the analyses of the interviews are presented in three sections that represent the three research topics in sequence.

### 4.1 When and where do designers use intuition (see Table 2)?

The use of intuition is always implicit and instCompany Aneous and leads to an intuitive judgment. On a macro-scale, four categories have been created based on the answers of the interviews to uncover different categories of situations when designers use intuition; these catgeories are: generating ideas, searching information, selecting ideas and presenting the ideas to others.
The most frequent moment when designers use intuition is during the phase of *Generating Ideas* (7 out of 8). Most designers tend to generate ideas by trying to free their mind with the help of methods such

as brainstorming. In this situation, unrelated information gathered in the last days might be linked together, which somehow makes sense to designers. As said by Interviewee R "I will design really fast, without information collection and research in the beginning and I will start to sketch out my idea as soon as it comes out." Intuition, as Interviewee R said, plays an important role in helping generating ideas at the beginning stage. But how a designer generates ideas is related to a company's contextual environment. Interviewee J, a junior designer working for Company A, mentioned that he had to bring up concepts based on trends and markets instead based on intuition.

The next often mentioned category is Selecting Ideas: Most interviewees (6 out of 8) reported that they use intuition when choosing an idea among a collection of possible ideas to continue a project. Designers report that at the moment of selection they often resort to intuition because they do not have enough time to check an idea thoroughly by rational means or statistical tools. Intuition, however can help to do a quick and effective selection among the ideas. It is a process where rough ideas and concepts will be narrowed and at last one or two ideas will be selected finally, as told by Interviewee W. Besides, she mentioned that an idea at the beginning might not be a sketch. Instead, "it is about how you start to solve a problem." Selecting Ideas is a peeling-off the process where the idea will get shaped. The interviewees agreed that more experience in the related domain could help designers to avoid some old tricks and ideas which would fail, thus making the selecting ideas phase smoother and faster.

The next frequent use of intuition (5 out of 8) is when they search information. When the designer can't answer to the current situation by existing patterns, designers tend to search new information either from design field or other fields. Where to find information, using what methods and through which ways all associates with the use of intuition, which is different from person to person. For example, as said by Interviewee H, he seeks new information in magazines, academic papers, articles in the library when running out of inspiration. However, Interviewee A told, he would like to start with mindless browsing when he does not have a clue. Interviewee L prefers searching information of similar products and asking specialists for consultancy. Thus, intuition can also be treated as catalysator of studying methods, which leads to different ways of information search.

In the interviews and new knowledge, recombining and integrating the different pieces of knowledge into an innovative way. Four designers (4 out of 8) referred to intuition as useful to get inspired, for example in situations with incoming new knowledge; designers are capable of considering implicit and explicit interrelations between existing patterns.

Interviewee W mentioned that she once received a design case named temperature controller. During the time, they had to design a shape for the controller but they got stuck in a dilemma of whether to choose rectangular shape or circular shape. An idea suddenly popped up in her mind that semantic research that she had learnt before could be useful for the selection. So she captured an insight of "high & low" by seeking out the basic language of temperature "cold & hot", which prompted her to choose a rectangular shape instead of circular shape which does not fit the mental model of human beings. Also as mentioned by Interviewee H, when he finds something interesting but irrelevant, he will take down notes and keep them. Some days later, he would look back to them and might have something new, which could help him integrate them into his projects and form a really creative concept.

Moreover, intuition also plays an important role when presenting the own ideas to others. At this stage, designers have to consider to whom and when they explain their ideas or decisions. As said by Interviewee A, "designers with more experience know to choose the right person to tell and moreover when it is a good time to do so." Picking the wrong person or the wrong time might lead to insufficient or demotivating feedback.

### Table 2. When and where do designers use intuition

| Stage 1: Generating Ideas | | N =7 |
|---|---|---|
| Explanation | By leveraging intuition, designers are able to  make connections to stimuli, collected knowledge, past experience, and patterns in order to generate different ideas. The use of intuition in this phase depends on pragmatic  factors and individual preferences of designers. | |
| Quotations | Interviewee A: *I got an idea from finished design products for my user experience design.* | |

| | Interviewee R: *I will design really fast, without information collection and research in the beginning. I will start to draw my idea as soon as it comes out.* | |
|---|---|---|
| **Stage 2: Selecting ideas** | | N = 6 |
| Explanation | Intuition can help designers to manage a quick and effective selection among the ideas. However, applying intuition could also be risky for young designers because they do not have enough experience to avoid some pitfalls that would lead them to failure. | |
| Quotations | Interviewee A: Experienced designer: *I tried and I know you will fail as I did. But young designers often reinvent things which is already invented, of course repeat in a wrong way. Experienced designer can help young to avoid it.*<br>Interviewee L: *The design procedure will be smoother and faster if I practice more. And I won't make mistake even the process is too fast.* | |
| **Stage 3: Searching information** | | N = 5 |
| Explanation | There are several kinds of ways that designers use search information. Everyone may have his own ways to approach a problem. Interviewee A prefer mindless browsing while Interviewee L would like to find a similar competing product and ask specialists for consultancy. | |
| Quotations | Interviewee A: *Mindless browsing helps for inspiration, in my case. Just browse internet for fun. But I have a background process in my brain. As soon as I find a clue, I can get an idea.*<br>Interviewee L: *Normally I will find relative products and refer to some successful cases. I would also ask professionals in related industry. It is relatively slow if you find data by yourself. Asking people is a better solution.* | |
| **Stage 4: Search for inspiration** | | N = 4 |
| Explanation | There are three ways to break patterns, which of course can be combined:<br>Gain deep knowledge about a domain<br>Use feedback from users and colleagues<br>Enhance stimulus material | |
| Quotations | Interviewee A: *Deep knowledge about a domain is always a great foundation. Actually it helps you to change yourself to new. So it needs to be no-old-trick-repetition.*<br>Interviewee H: *When I find something interesting but irrelevant, I will take down notes and keep them. Later in some days, I will look back to them and might have something new, which can help me integrate them into my projects and form a really creative concept. Afterwards, I will test it in a targeted market and if it is accepted, I will try to make it a real product.* | |
| **Stage 5: Presenting ideas** | | N = 7 |
| Explanation | Knowing how to approach the right person and promote the own design work is an essential capability for designers. Young designers (J and C) encounter difficulties when presenting their ideas to clients. Interviewee As mentioned experienced designers know better about how to promote their ideas. The implicit root that causes the difference is intuition. | |
| Quotations | Interviewee H: *I usually will try to find a way to test my concepts and ideas, collecting feedback to improve them. Then, I will test them again and try to verify my thoughts. This way, both me and my colleagues will be convinced and notice that there might be a real need from a targeted market.*<br>Interviewee W: *An idea should not be so concrete if you want others accept your idea because intangible ideas will bring more space to discussion, allowing others to develop the idea.* | |

**4.2 How do designers enhance intuition (see Table 3)?**

The eight interviewees referred to three ways which help to their view enhancing intuition. Six out of eight designers mention that with an increase in the amount of knowledge the performance of intuition will reach a higher level. "Rome is not built in a day and neither is learning the process." Said Interviewee H, "I learned a lot from projects I did before, which prompts me to make a quick and accurate response to a new case." A similar response was given by Interviewee W, saying that reading really helps her expand her knowledge base and some books written by designers that she admires have great impact on her. But there is a disagreement between Interviewee H and Interviewee W. Interviewee H prefers reading books widely in his spare time whilst - due to limited spare time - Interviewee W explains that she first figures out if a book benefits her work before reading through it. Anyway, both of them agree on the fact that reading and acquiring new knowledge can enhance their

intuition. Interviewee A said that deep knowledge about a domain is always a great foundation and actually it helps you to renew yourself. In other words, gaining knowledge either within the discipline or out of the discipline will prompt designers to form new and innovative visions instantly.

The second frequent way (5 out of 8) to enhance intuition can be summarized as being sensitive to life. It is a process of energy recharging and it is a source of inspiration. No innovations, crazy minds, fCompany Astic ideas can be brought up out of the thin air. Instead, it is the miscellaneous experiences of life that instills energies and inspires souls. "Try to be more sensitive and imaginative. Even some usual things in daily life have their values. You may find interesting associations when you look into them carefully." (Interviewee R). Interviewee H shares the same thought, that remaining sensitive enables him to notice interesting things so that sometimes he will be inspired when associating these observations with his work.

The third way is named two times as combination of interests. Combining factors that a designer is interested in with a design case the designer is working on can motivate himself/herself and the designer could find that the design case has become more attractive, which makes him/her more energetic and motivated to do the design. As said by Paul et.al [2011], as the composer of the context, the factor you choose must be of interest for you, it should be appealing to work with, excite you, or give you this sensation that you are "on to something" new and innovative. Interviewee R mentioned that if you do something you love, you would feel more engaged in doing it. Interviewee R always starts her design from what she finds interesting and treats herself as the first user. In this way, a quick and good design can be completed.

**Table 3. How do designers enhance intuition**

| Way 1: Enlarging knowledge base | | N = 6 |
|---|---|---|
| Explanation | Enlarging knowledge base is considered as a good method for the use of intuition in design work. It concludes different ways such as reading, collecting visual data, website, etc. Some interviewees like L, A and H prefer to collect various kinds of data which mightnot be related to their current design tasks. However, Interviewee like H prefer making sure that information collected will definitely contribute to her work. | |
| Quotations | Interviewee A: *Deep knowledge about a domain is almost always great foundation. Actually it helps you to change yourself to new.*<br>Interviewee L: *I will make a visual data base which contains the pictures I collect. The intuition and inspiration can be enhanced through collecting and observing carefully. Reading books related to other fields also helps a lot to design.* | |
| Way 2: Being sensitive to life | | N = 5 |
| Explanation | Being sensitive to life and looking into details in life is crucial for improving the quality of use of intuition. It is miscellaneous of life that installs energies and souls into minds and ideas. | |
| Quotations | Interviewee R: *You should discover details in life, which may not only be something visual, but also be a feeling or behavior. In fact, sometimes you are not record it on purpose, but it will come out when you need it and become your inspiration.*<br>Interviewee L: *In daily life, you need to see more, think more and pay more attention to details in life* | |
| Way 3: Combing interest | | N = 2 |
| Explanation | Designers collect information they are interested in. The designer tries to make a combination between this personal interesting information and the design task. | |
| Quotations | Interviewee W: *Google has 8/2 principle – using 20% of your time to do what you like.*<br>Interviewee H: *When I find something interesting but irrelevant, I will take notes and keep them. Later in some days, I will look back to them and might have something new, which can help me integrate them into my projecs and form a really creative concept.* | |

### 4.3 How do designers elicit intuition (see Table 4)?

Intuition is often an unconscious process what makes it very difficult to be controlled. Thus, designers may resort to different ways to elicit intuition. Three ways have been identified by the inteerviewed designers to trigger intuition.

The first way is mindless browsing, which is brought up by Interviewee A. As he said, sometimes he needs different types of data to figure out a proper solution so he will start browsing Internet for fun. But he has a background process in his brain that tackles with incoming information automatically. As soon as he finds a clue, he can get an idea.

The second way is to seek a balance between life and work (see also Table 2 "being sensitive to life"). As mentioned before, it is life that helps recharge energy and provide a source of inspiration for work. Enjoying life is not wasting time. Instead, people are always inspired by inconspicuous things in life. So seeking a good balance between life and work can allow you to live with more freedom, which makes you more sensitive to life. However, sometimes seeking a good balance between life and work rests with working conditions of companies, which will be mentioned later.

The last way mentioned is crossing academic fields. Acquiring new knowledge from other fields is an effective way that can help designers get out of the box and think in other ways. These new disciplines always plays the role of enzymes that help break patterns, which opens a source of inspiration. Interviewee H mentioned that he once was asked to design a light-railway system for Higher Education Mega Center in Guangzhou. He said usually his team begins with logical thinking and planning. However, it would lead them to a deadlock sometimes. So when he ran out of inspiration, what he did is to seek relevant information from other fields, which could be valuable for our design. When he came across a book about biological cells, he was attracted. He learned from the book that operations of biological cells need a highly-effective mechanism. And the mechanism could be referred to his light-railway system, which indeed inspired him a lot during the design process. Interviewee H found that the body could only keep in function when biological system is working in a highly-effective way. The way is a repetitive and interactive process where information will be received and delivered effectively. This being the case, the body can always make a right prediction and give a right order to organizations. By learning from the structure of biological systems, Interviewee H arrived at a new direction for his design, focusing on the highly-effective flow of information and leveraged the feedback mechanism and cooperative mechanism from biological cells and applied them to his design to work out a smart and automatic light-railway system.

**Table 4. How do designers elicit intuition**

| Way 1: Mindless browsing with background process | | N = 3 |
|---|---|---|
| Explanation | Not being fixated on the own idea allows a more open view while searching for information. Even relaxing time might be helpful to on the back of a background control. Mindful actions could break routines, allowing more new insights to be discovered. | |
| Quotations | Interviewee A: *Using reason for finding intuitive solutions may be not a good way. Just browse internet for fun. But I have a background process in my brain. As soon as I find a clue, I can get an idea.* | |
| Way 2: Relaxing supports creative work | | N = 2 |
| Explanation | Relax time is very important for creative work. Interviewee A and Interviewee W emphasize that good ideas could be triggered when they are in a good mood. | |
| Quotations | Interviewee A: *Working hard is a usual way to make something…but just great for a simple repetitive work.* Interviewee W: *Google has 8/2 principle – using 20% of your time to do what you like.* | |
| Way 3: Crossing disciplinaries | | N = 5 |
| Explanation | Designers collect information they are interested in and think of connections between this personal interesting information and the design task. This process especially in multidisciplinary team interaction motivates the designer. | |
| Quotations | Interviewee L: *A lot of innovations and ideas are an correlation outcome by multi-disciplinary teams. My colleague once came out of a camera idea based on the little puppet of Google maps.* | |

## 4.4 What is the relation between intuition and environment in companaies

The use of intuition not only relevant for the individual subject but intuition is also affected by the environment of organizations.

To begin with, the findings show that intuition might be ignored or despised in a hierarchical, more constrained-type company. Interviewee J, who once worked in Company A, one of the biggest shoe brands in China, said that he did not have incentive to brainstorm ideas or integrate what he finds interesting into his work because such an activity is not welcomed and would incur a storm of criticism. Also, the working environment of Company A is quite constrained, which means that designers feel a lot of pressure from bosses, colleagues and clients. This being the case, designers seldom get a chance to exhibit their own style of working, instead they have to obey rules and orders. A similar case happens to another interviewee. Interviewee L, who once worked in Samsung and now works for Company N, has experienced similar working conditions. She said that environmental factors have a huge influence on the freedom of using intuition. Samsung is a company with strict rules and hierarchy where you can hardly find a way to share your thoughts and ideas. Tasks are given through a hierarchical structure. The director of designers will give commands to the experienced designers. And the experienced designers will give commands to junior designers. For example Interviewee L, what she was doing was limited to visual design of PVC for routers due to the hierarchical structure. Interviewee L said she felt like a screw being delivered through a production line. She did not have a sense of involvement.

Compared with companies like Samsung and Company A, even though Company N is hierarchical, the working environment is much more comfortable and relaxed in Company N. Interviewee L has taken a role as integrator and it has allowed her to work with more free space. In this way, Interviewee L gets more chances of communicating with colleagues and shares her thoughts with teams.

This opinion is also shared by two other interviewees: Interviewee R, who once worked for Company N and now works for Company X and Interviewee A, who is a principle designer in Company N. "Generally speaking, the working environment in Company N is good and I do not need extra time for better work," said Interviewee A. A nice working environment allows him to seek a good balance between life and work. Also, Interviewee R mentioned that Company N has an open environment for designers, which encourages designers to think widely. However, a drawback of Company N was – according to Interviewee R, that an innovative concept has to go through a series of stages before becoming a tangible product, which might cost a lot of time and resources.

Compared with hierarchical, less constrained company like Company N, Company X is a non-hierarchical company which is known for designing Apps for smartphones in China. As the example of Interviewee R cited before, the design of an App named remote controller only took 10 days before being introduced to markets, which is really fast and effective. This is a main advCompany Age of Company X, Interviewee R said, we welcome intuitive concepts and we like discussing them during group meetings. As long as we find some bright spots from a concept, we will start doing it.

As to the drawback of Company N mentioned by Interviewee R, it is unavoidable for Company N. Based on an opinion from Interviewee H, Company N is a huge-size company, which means it must have a rigorous managerial system to help supervise its daily operations. So Company N, to some extent, cannot act as a non-hierarchical company like Company X that can respond more fluidly, flexibly and effectively to situations as the arise. In addition, companies like Samsung and Company A that do not welcome intuition and radical innovations tend to rely on rationality and historical data. Those companies cannot suffer risks and loss brought on by intuition. They prefer measurable knowledge, incremental innovation, relying on the past instead of predicting the future by using intuitive knowledge.

Furthermore, it has been found that persons in less-constrained companies tend to be more collaborative. Collaboration can motivate designers by sharing knowledge and ideas and by these providing suggestions and honest feedback. However, collaboration does not only enhance the information transfer but also fullfils the need of human beings for affiliation. Interviewee R mentioned that the developer she worked with in Company N was really nice to her, making her feel like being part of the team and sharing the same goals.

**Table 5. Interrelations between the use of intuition and characteristics of the organizational environment**

| Organization environment | | N = 10 |
|---|---|---|
| Explanation | In a hierarchical and constrained environment it is difficult to come up with innovative ideas; one reason might be the limited use of intuition in such an environment, employees are expected to work according to clear instructions - what might prevent critical thinking. In non-hierarchical companies such as startups, design can be realized easier because there are not too many rules to follow, new ideas are more easily accepted. The design process can be more efficient but has to stand more risk of failing. | |
| Quotations | Interviewee L: *Environmental factors have a huge influence on your freedom. Samsung has a very strict structure, so you can't find ways to share your ideas. The task is given by hierarchies from top to bottom. You need to report from bottom to top. You only focus on your part. But the working environment in Company N is much more comfortable and relaxed. Our department doesn't have a lot of designers. My responsibility is wider. My job is more about collaboration. In Samsung, you can't feel like you belong to the team.* Interviewee R: *In Company X you can realize your design. But Company N has a lot of hierarchies, so your design will probably stay in the sketch phase and will not appear in real device. But both of them are very open, the difference is how far you could go.* Interviewee H: *Big companies need management to make sure the information is conveyed through all the departments. But as startups, we are already very efficient.* | |
| Colleagues | | N = 6 |
| Explanation | Collaboration among colleagues can improve designers' content-related work , but it also creates a so-called we-feeling in the team what motivates designers to be more productive and creative. Non-collaboration can demoralize designers with an immediate impact on his work. | |
| Quotations | Interviewee R: *The developer I worked with in this case is very nice. He gives me a feeling that we are in one team and have the same goal. He also gives me a lot of suggestions. But some developers always say "I can't do this", "your design can't be realized", "looks not good",..* Interviewee L: *I always ask colleagues from other departments, especially some knowledge which is related to my work but I am not familiar with. This could save a lot of time and help me improve.* Interviewee J: *If you do something creative, you'll either be criticized for the crazy mind or ignored. They won't show too much concern about your innovation. So, I do not have any motive power to do such a thing.* | |

## 5. Discussion

The goal for the research project presented in this paper was driven by the question of the role of intuition in design, and how designers working in industry describe their views on the use of intuition. Giving credit to the widely accepted assumption that the information processing activities of human beings are steered by two distinct cognitive systems, the evolutionary older unconscious system and the system which stands for rational and intentional processes, we drew the conclusion from the data, that both systems – although very different in terms of process and result – are connected with each other at different moments in the process. Whereas the conscious system includes deliberate processes of analyses and decisions the nonconscious system generates holistic associations, which are often accompanied by an emotional link.

Many designers claim that their design process is driven by intuition rather than by rational thinking. This argument is also used to defend the critique of structural methods in design (see for example [Daalhuizen 2014]).

Bringing the results of the eight interviews together it becomes obvious that intuition doesn't stand alone but is enriched by rational information processing. Thus, intuition can also be seen as part of rational information processes and vice versa. A similar idea has been brought up also by other authors who describe intuition and rationality as interrelated processes and both should be taken as important influence on the design thinking process. Many authors describe the relation between the conscious

and unconscious part as symbiotic relationship instead of mutual competition ([Dawes 2002], [Hayashi 2001], [Schoemaker and Russo 1993], as cited in [Cuellar 2007]).

The following figure (Figure 1) depicts the results from the interviews of eight designers (see previous chapter) working in different companies and illustrates the interrelations between the influencing variables named by the participants.

These results make clear that experience is always the bridging variable between the situation described as an array of data which encompass knowledge (K), the current characteristics of the situational environment (E) and the structure (S) of the work environment. These three information units determine the degree to which experience will come up with a quick answer to the different demands of a design situation and the developed answer by the strategic designer envisions that these scenarios are based on his/her intuition, which may prompt him/her to make further decisions on the investment based on his/her past experience. So intuition plays an important role in seeking a good balance between use of system 1 and system 2 because designers rarely make the right choice by solely relying on either intuition or rationality.

When time and the relevant information are available, rational thinking and analysis can help uncover important cues and develope new patterns. [Klein 2007].

The process of rationality is also the stage where a designer can gain knowledge. Access to new knowledge enhances the effectiveness of intuition. Ann and Eugene [2011] mentioned that one who has gut feelings tends to find objective data to back up the assumptions he/she made, which can also create opportunities for learning. During the learning process, the knowledge base will be broadened, which provides a stronger foundation of inspiration to designers. As said by Interviewee A, "deep knowledge about a domain always serves as a great foundation and can actually help reinvent yourself." When new knowledge is introduced, patterns can be broken and new patterns can emerge. But also here, additional contitons need to be taken into account. There is a need for direct feedback which allows the uncontionious decision to change the routine and to break exisiting patterns of behaviour.
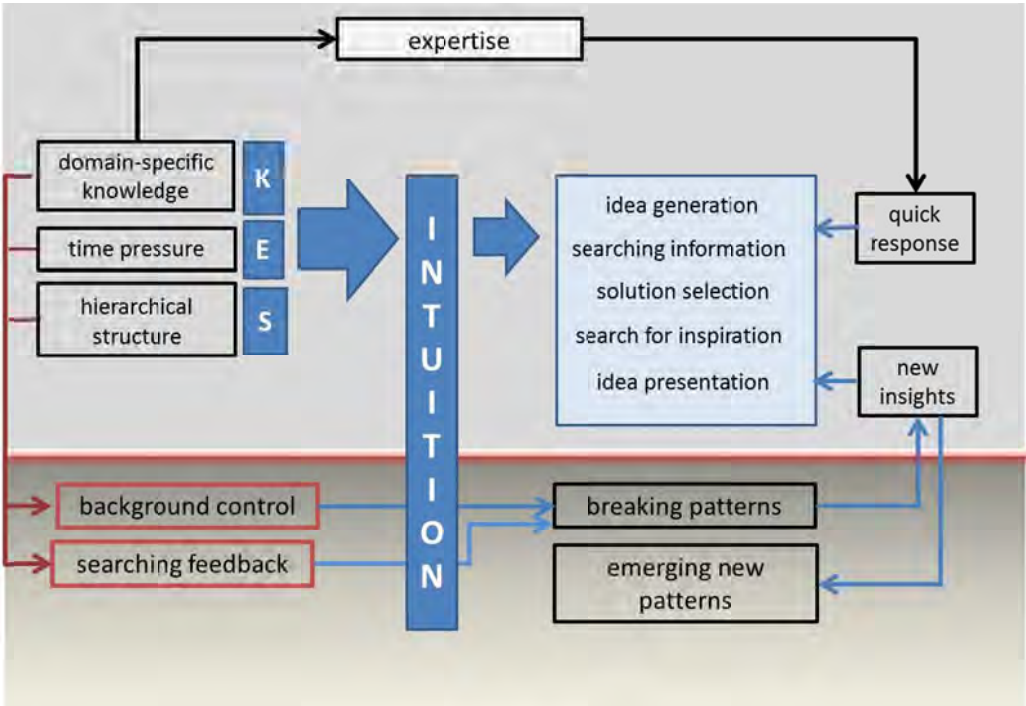


**Figure 1. A model of interacting variables and the role of intuition**

We assume that aiming at an improvement of the design process at the intersection of intuition and rationality, the activity of reflection should be taken into consideration. Learning to be more attentive on own conscious and unconscious processes might provide an additional access into the own steering functions of our brain.

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