Explorative Investigation of Intuition in Design Activity

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ABSTRACT

Intuition is within our everyday life. Every human being is intuitive whether they recognize it or not; it is not an option but an integral part of our cognition. Even though it is impossible to deny its presence in design activity, difficulties arise in describing its mystery. Intuition, having a significant interdisciplinary research background, ranging from art and humanities to mathematics, management to business, philosophy to psychology, neuroscience to cognitive science, has been a major interest in numerous disciplines. Although it is highly 'relatable' with 'design cognition', the concept of intuition is not discussed at its premier level within the design research. Despite the rising interest, it still needs to be thoroughly investigated.

The thesis in this sense, aims to discuss the concept of intuition and examine how designerly activities resonate with the well-known theories on intuition. Inspired by Sinclair's (2011) 'integrated framework of intuition', this study aims to conceptualize a framework, then identify intuitive functions as direct matching, associative matching, incremental synthesis and radical synthesis. Those theoretical assumptions are then tested with an exploratory study by tracing the design behaviors of novice and expert designers. By doing this, the thesis seeks to reveal 'design moves' that go hand in hand with the cognitive features of intuition. While intuition is believed to be a cognitive ability frequently associated with expert (experienced) professionals, this study aims to manifest it as a personal aspect where everyone experiences it in their own unique way. In a broader perspective, this study aims to contribute to the theory of intuition and thus provide an alternative perspective to the 'unprincipled' behaviors

of the designer. In its essence, this study seeks to know what makes intuition integrally linked with design activity and why it is important to understand its presence.

Keywords: Intuition, Tacit knowledge, Design Activity, Design Cognition, 'Undisciplined Designerly Behavior'

ÖZ

Sezgi günlük hayatımıza dair yaşantımızın pek çok alanında yer almaktadır. Her zaman farkında olmasak da her insan sezgiseldir; sezgi bizim için bir seçim değil, insan bilişinin bir parçasıdır. Bu anlamda tasarım aktivitesindeki yerini inkâr etmek imkânsız olsa da sezginin gizemini anlatmaya çalışmak oldukça zordur. Sanat ve Beşerî bilimlerden matematiğe, işletmeden ticarete, felsefeden psikolojiye, nörobilimden bilişsel bilime uzanan bir disiplinler arası araştırma geçmişine sahip olan sezgi pek çok disiplinde odak noktası olmuştur. "Tasarım Düşüncesi" ile yakından ilgili olsa da sezgi kavramı "tasarım araştırmaları" alanında ne yazık ki en kapsayıcı düzeyde incelenmemiştir. Günümüzde konuya yönelik artan ilgi nedeniyle daha kapsamlı bir incelemeyi çoktan haketmektedir.

Bu anlamda bu tez, sezgi konseptini tartışmayı ve tasarımcı aktivitelerinin sezginin en bilinmiş teorileriyle nasıl ilişkilendiğini incelemeyi hedeflemektedir. Sinclair'in (2011) sezgiyi kendi editörlüğünü yaptığı kitabındaki pek çok araştırmacıların yaptığı çalışmalar ışığında bütüncül bir şekilde incelendiği çalışmasından esinlenerek bu çalışma da kendine ait teorik bir çerçeve oluşturmayı, daha sonra da sezgisel fonksiyonları "direk eşleşme", "çağrışımsal eşleştme", "artımlı sentez" ve "radikal sentez" olarak saptamayı amaçlar. Bu çalışmada tartışılan teorik varsayımlar daha sonra deneyimli ve deneyimsiz tasarımcıların tasarım davranışlarını takip eden bir dizi keşif çalışmasıyla irdelenmiştir. Böylelikle, çalışma sezginin bilişsel özellikleriyle örtüşen "tasarım hareketlerini" ortaya çıkarmayı hedeflemiştir. Sezgi uzman (deneyimli) profesyonellerle ilişkilendirilen bilişsel bir yetenek olsa da, bu çalışma sezgiyi herkesin kendine özel şekilde deneyimlediği kişisel bir yeti olarak öne

sürmektedir. Daha geniş bir bakış açısıyla, bu çalışma sezgi teorisine katkıda bulunarak tasarımcının ‘prensiplere bağlı olmayan’ davranışlarına alternatif bir bakış açısı sunmayı hedeflemektedir. Özünde bu çalışma sezgiyi tasarım aktivitesiyle nasıl bu denli iç içe geçtiğini ve sezginin varlığını anlamanın neden bu kadar önemli olduğunu anlamayı amaçlamaktadır.

Anahtar Kelimeler: Sezgi, Örtük bilgi, Tasarım Aktivitesi, Tasarımcı Düşüncesi, ‘Prensiplere bağlı olmayan tasarım davranışları’

DEDICATION

To my family…

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Chapter 1

INTRODUCTION

Investigating the concept of intuition at start began with the humble research inquiry, then it has turned into a responsibility and purpose of this thesis. At the end of the long-lasting research journey, intuition gained much more significance than what was expected in the beginning. Intuition in this study[1], is acknowledged as an integral part of human cognition, a human quality that is inherent to every individual. It is neither an option nor a method. Such cognition naturally has its presence in any human activity as well as in the performance of design as it is simply inherent to every one of us. In this sense, this study, believing in the potential that the intuition has, argues that intuition is integrally linked with design activity, thus, acknowledges it as an inseparable part of design performance although difficulties arise in defining it.

1.1 Significance of the Study

As in the most accepted form of definition, intuition is an unintentional way of acquiring knowledge that is even beyond the one's will or control. Although it is a form of knowing that is not completely understood yet, apparently this explanation represents it as a naturalistic way of attaining a knowledge. Therefore, by researching

[1] This thesis is developed upon the author's published article titled as "The Unknown Position of Intuition in Design Activity" (Çizgen & Uraz, 2019).

intuition, it is expected to reveal discussions in relation to the naturalistic dimension of human-centred activities or performances.

The most significant reason for researching intuition is the potential that the 'intuition' has. The concept of intuition has been frequently discussed in relation to variety of human behaviours, since it is argued to have a significant presence in the most ground-breaking inventions as well as in the most ordinary ideas. Even though intuition is not a completely 'well defined' concept, it still can be potentially related with any kind of human action as covered in literature under various definitions. More importantly, as researchers confirm, intuition has a very central key role in human cognition and more and more aspects of it still keeps revealing.

In the case of design research, researching intuition in design performance, helps us to veil the mysterious and tacit dimension of design cognition and provides a more natural and alternative understanding towards design activity and its individualistic nature. Conducting such study not only contributes to the design research but may indirectly be useful for design education as well; since this study, focusing on 'designer's mind', highly intersects with the boundaries of design research areas such as 'design thinking', 'design knowledge' and 'design methodology'.

1.2 Problem Statement

Intuition is initially solely discussed by the field of philosophy and later followed by field of psychology. Today, it is intensively considered in many scientific and non-scientific fields. Having a significant interdisciplinary research background, intuition has received major attention from scholars from numerous disciplines, and is mostly discussed in four areas; namely *situation assessment, act of creating, decision taking*

and *problem solving* (Dörfler and Ackermann, 2012). Although such concepts are also highly 'relevant' to be discussed in terms of designerly activities, intuition in design research has not been discussed at its most premier level.

Historically, the first generation of design research, which focused on methodizing design process, considered intuition as a 'slippery' concept, relied on more rational and systematic approaches and ignored intuition as a part of designer's cognition (Badke-Schaub and Eris, 2014). However, such inquiries failed shortly and many researchers pointed out that the systematic approach was not capable enough to represent what really goes on in the designer's mind during the process of design. Later generation of design research sought to provide more appropriate definition for design by decomposing it from other disciplines and finding its own dynamics (Cross, 2007). By doing so, they adopted a more subjective approach and focused more on practice-based design. With this quest, they concentrated on how designers think and concepts such as 'design knowledge, design thinking and designerly ways of knowing', which are truly unique and specific to design discipline, were introduced. "What these inconsistent terms share, is that they are based on a similar concept of knowledge that is gained and applied via practical measures and that is, to a great extent, person and situation-oriented" (Mareis, 2012, p.64).

Within this research environment, intuition was starting to be introduced in the studies of researchers (Lang, 1987; Cross, 2007; Lawson, 1980; Schön, 1983; Eastman, 1970, Uraz, 1993). Such interest in intuitive aspects of design pointed out different and complicated type of knowledge; the 'tacit' dimension of design knowledge (Polanyi, 1966; Schön, 1983). Although such studies admired and underlined the intuitive mind as a part of tacit knowledge, due to its tacit and vague structure, second-generation

researchers hesitated to discuss the concept of intuition or explaining what intuitive cognition really is. Nevertheless, these studies had shed a significant light for today's design researchers.

Although "the tacit dimension of knowledge still presents a particular challenge to design research" (Mareis, 2012, p.62), there is a gradually rising interest towards tacit and thus, intuitive processes in design research (Burnette, n.d.; Rust, 2004; Kheiri et al. 2013; Kheirollahi, 2012; Jerrard et al., 2017; Ferronato et al. 2017; Taffe, 2017; Tovey, 1997; Davey, 2008; Durling, 1999; Fiscus, 2012; Taura and Nagai, 2017; Tonetto and Tamminen, 2015). Researchers following this path consider intuition as a necessary cognition in design. More significantly, the majority of these studies tend to argue that taking these concerns into account will reflect the realistic, undisciplined and personal nature of design activity (Cross, 2007; Dorst and Cross, 2001; Badke-Schaub and Eris 2014; Raami, 2015). Within such research environment, although there is a significant improvement in awareness towards intuitive and tacit processes in design, there still is a need for deeper understanding of the term intuition as well as intuition in design. Thus, this study in brief, aims to contribute to the gap within the intuition research and to the connection between intuition research and the design research.

1.3 Ambiguity of Intuition Concept

Intuition, not necessarily in design literature, "… seems to have been immune to scientific inquiry for centuries as it is too elusive to be defined and too difficult to be measured, it has been relegated to the field of philosophy for centuries" (Sinclair and Ashkanasy, 2005, p.355). This is due to the tacit nature of intuition that relies on non-conscious processes that are tough to understand, observe, articulate, verbalise,

identify and research. Thus, intuition is considered to be ambiguous phenomenon that often appears to be unexplainable and mysterious.

As it is acknowledged as an 'undefined and vague construct', intuition was usually considered as an untrustworthy concept. Currently, even though the topic of intuition has begun receiving increasing interest in scientific research including design research, for some authorities, intuition is still commonly considered an untrustworthy way of reaching information. Thus, academics hardly consider it as scientific concept and hesitate to deal with it, as it is considered as a random, subliminal and irrational type of 'knowing' that is not clearly definable or understandable. Therefore, the challenge in studying intuition, comes not only from the difficulty of dealing with ambiguous nature of intuition, but also from of the academic validity and rigidity on the concepts and the issues that are often accepted as invisible and non-conscious, as that is the case in 'intuition'. Evidently, still today, in design discipline, neither professional designers nor academics feel comfortable with expressing their thoughts on 'intuition' (Badke-Schaub and Eris, 2014).

Another ambiguity behind the intuition is that, it is a very personal type of cognition that everyone experiences differently. Same as the definition of design knowledge put forward by Mareis (2012), intuition too, is person and situation-oriented. By defining design knowledge in this manner, she might in fact be referring to intuitive dimension of design cognition. As it is underlined by numerous researchers, every designer experiences intuition in a personal and unique way during the design performance, although, such processes cannot be described even by themselves (Mäkelä & Numkulrat, 2011; Seitamaa-Hakkarainen, Laamanen, Viitala, & Mäkelä, 2013;

Uusikylä, 2008 cited in Raami, 2015). All of these characteristics make intuition and other internal processes extremely subjective and difficult to be structured.

Apparently, there are variety of definitions on the concept of intuition which do not share a mutual discussion ground. The term intuition is an umbrella term covering diverse and varying types of information, processes and outcomes that lack shared vocabulary and coherent concepts which is why researching intuition is challenging (Glöckner & Witteman, 2010 cited in Raami, 2015). The term intuition has different meanings for different researchers. To illustrate, while Dean et al, (1974) define intuition as 'judgment, insight, and gut feeling', Barnard, (1938) acknowledges it as 'hunch'. For Leavitt, (1975) intuition is 'extrasensory perception' and for Goldberg, (1983); Ray and Myers, (1986); Simons (1987) it means 'recognition' (Fields, 2001). Looking at these various definitions put forward by different researchers, it can be argued that these researchers could in fact be referring to different processes or even measuring different phenomenon (Fields, 2001). To illustrate, an example for this contradiction in terminology is that for some researchers, intuition is not the same as instinct nor it is equivalent to insight. Similarly, there are the ones who do not believe that intuition can be defined as a 'gut feeling' or a 'hunch'. On the other hand, these researchers could be describing the same phenomenon under different titles. Many authors and researchers conflate these concepts (Hodgkinson et al. 2009; Fields, 2001). Because of the variety and the contradictions in terminology, the term intuition is difficult to be tamed. Since the literature lacks a mutual conceptual framework, such non-consistent research environment still needs to be clarified.

However, despite the ambiguity of the research field and the difficulty in defining such an abstract concept, intuition and 'intuitive processes' still play a major role in understanding wide range of cognitive concepts related with non-conscious dimension of human mind such as wisdom and creativity.

1.4 Research Objectives and Questions

In this study, by researching this endless potential of the intuition, an alternative perspective to cognitive activities behind the designer's behaviour is aimed to be provided. To sum up, this research explores the 'intuitive' dimension of designers' behaviours and related theories on intuitive cognition.

In brief, this thesis is based on the hypothesis that, there is high 'correlation' with the intuitive behaviours and the designerly behaviours. In other words, this study argues that 'design activity' has a considerable intuitive dimension. With this objective in mind, wide range of terminology on intuition in relation to various human actions are investigated and examined in order to supply the possible connection with the designerly behaviours. Many faces of intuition addressing various cognitive abilities have been revealed. Taming such rigid terminologies in an open-ended manner in a framework, finding out how they resonate with the various designerly behaviours and observing them in an exploratory study are the major concerns of this study.

During long-lasting research phase of this thesis, in light of the main objective, other questions have also been developed. To illustrate, one of these questions is developed upon the contradicting and limited definitions in literature. Whereas some relate intuition with expertise – and believe that it is solely applied by experts, on contrary, others consider it as a much general human ability that exists regardless of high

experience. In this sense, even novices can rely on intuition. With the debate of "whether intuition is expertise based or not", this study, approaches the issue by investigating the performances of "novice and experienced designers" and tries to find out whether intuition is a cognition that exists depending on the level of experience.

Believing 'intuition is a cognitive ability inherent to every human being', this study is developed upon this hypothesis, and aims to cross check the supporting theories with the findings of exploratory study.

1.5 Research Approach and Method

In brief, the thesis is based on two main approaches; theoretical study and exploratory case study. The first part of the theoretical study is the literature review presented in Chapter 2, carried out with the aim of gathering necessary sources for the following Chapter. The second part of the theoretical study given in Chapter 3, covers a 'theoretical framework' that consists of re-conceptualization and clarification of the intuition theories where the perspective of this study on 'intuition concept' is presented. The exploratory case study on the other hand is presented in Chapter 4, covering the 30-minute artificial design sessions and the correspondence of the theoretical framework with the observed designerly behaviors. The exploratory case study has a key role in this thesis, as the hypothesis and the majority of research questions as well as the additional findings are discussed in this section.

Within the theoretical study section, the study adopts an epistemological research approach within the margins of science. As intuition is a multifaceted phenomenon, this study integrates various information, perspectives and concepts from variety of interdisciplinary scientific areas as well as the non-scientific research environments.

The study could not have been conducted solely in relation with the design research, since there is a lack of research or related references specifically based on intuition. Although there is a rising interest towards intuitive process, these studies remain insufficient and are not enough to support the understanding of 'intuition' that is acknowledged in this study. Since the area of intuition is insufficiently researched in the area of design, this study includes areas from other domains in which the concept of intuition is highly investigated. The study in this sense, searches for a sharable 'understanding of intuition' between different fields of design and other scientific domains in the area of intuition research. With this approach, the study aims to gain a versatile and contemporary perspective on understanding for designers' intuition. Combining various perspectives has also been essential when approaching or trying to understand varying intuitive ways of knowing and drawing the 'bigger picture' of the intuition concept.

As mentioned above, the theoretical literature study is followed by an exploratory case study. Unfortunately, while seeking the relevant methodology, the study struggled a lot since there is no exact methodology either for studying intuition or for identifying 'the intuition' in a complicated human performance such as design. As a result, this thesis had to be developed his own approach of exploration.

Lawson (2006) as cited in Uluğ (2012) in his book 'how designers think', remarks that there are four basic approaches that can be used in investigation of design activity. The first one is 'simply thinking' about design, the second one is observation of designers in action, the third one is interviewing designers and the last one is artificial experiment under controlled conditions. Uluğ (2012) discussed the disadvantages and

the advantages of these methods as follows: ‘Thinking about design’ is beneficial for creating design knowledge yet applying this method alone has a risk of remaining as a theoretical assumption or being too subjective. Yet this method according to him, can be used in investigation, in analysis process and interpretation of collected data.

‘Observation of designer in action’ approach on the other hand, is a beneficial method in modelling ‘the real design studio and design performance’. According to Uluğ (2012) during the cases, the observer should not interfere or influence the design process, and set the research goals and aim before the cases. The few disadvantages of this method are that the researcher should be careful during observing the designers’ performance and be careful on the selection of right offices / projects in order to provide ‘the necessary input to their research’. Also, another disadvantage is related with the designer and design offices as they might not incline to share design processes or reveal their creative processes during their professional practice. Among these disadvantages, the major problem of this method is time period of the real-life design tasks as the design process can take years to be completed.

Interviewing the designer as the third method, allows the researcher to investigate how architects think and design. Interview approach according to Uluğ (2012) can persuade well known architects and offices to participate in the research but the performance of this method is dependent on the designer’s interview performance and his or her will for cooperation.

Uluğ (2012) while discussing the structured and unstructured interview types, notes that as structured interview is based on standardized questions (beneficial for

quantitative method), and it is not suitable to reveal hidden inner thoughts. Unstructured interview on the other hand is based on open ended conversation and is useful for in-depth exploration, yet, due to the lack of focus and lack of structure, it might not be the best approach for the researchers. According to him, semi-structured interviews should be the preferred interview method as with few key questions the designer is set free to express his/her own ideas.

The last method that Lawson (2006) cited in (Uluğ, 2012) proposed is 'artificial experiment under controlled conditions'. This method can be classified as a quantitative research method which offers systematic scientific investigation that provides the fundamental connections between empirical observation and theoretical expression of quantitative relationships. Protocol analysis in this approach is the most widely used research method in design research which is universally accepted. The objective of protocol analysis is to investigate and represent external representations such as sketches, notes (video recordings), and verbal data (audio recordings). Along with the sketch performance of the designer, verbalized data (think a-loud method) has a vital importance for protocol analysis. Ericsson and Simon (1999) in their book, Protocol analysis, mention two different types of verbalisation. While retrospective verbalisation is 'recalling what one was recent thinking activities', concurrent verbalisation offers the participant designer to think aloud while designing and externalizing his/her cognitive abilities. Although, protocol analysis is the most accepted method in design, there are some significant weaknesses of this method and there is still room for error. Forcing the designers to verbalize might change their performance during the experience. Another weakness of this method is due to its very time-consuming statistical codification and analysis phase; therefore, it cannot be

applied to crowded case studies. Also, since the analysis significantly relies on verbalized data, the non-verbal period which may cover significant design moves, may be missed in investigation and analysis.

In terms of this study, all of these methods have both advantages and disadvantages. Researching intuition and capturing extraordinary experiences of intuition requires being flexible in order to providing appropriate and versatile representation of the subjective nature of the intuitive experiences. That is, it cannot be achieved with a quantitative and empirical method due to the nature of 'intuition'. Therefore, as stated earlier, this thesis had to develop its own approach of exploration by mixing and modifying the above methods. Due to this reason, a customized 'artificial experiment method' is used for 'creating design sessions' where systematic investigation and statistical analysis are strictly avoided. Simply thinking about design' is mostly performed in interpretation of qualitative data captured by the means of pure observations of artificial design sessions. Such ambition also excluded the necessity of 'think a loud method'; as it will be discussed in the further section, verbalized data is not helpful to trace intuition (Wilson,1994). Additionally, verbalization during the sessions might force to designer to think and express the ideas 'rational' concerns or might affect them to not the perform their usual process or thinking flow. Yet, 'retrospective conversation method has been applied with 'semi-structured interviews' right after cases and only the corresponding findings with the observed data are presented at the findings section. 'Designer observation method' was partially used, as the cases are performed at the participant designer's either home or office to provide comfort for them. At the beginning of the sessions, they were also told to imitate their natural design process.

1.6 Structure of the Thesis

The study investigates the issue under several sections. Each section has a specific contribution to a specific dimension of the concept of intuition.

In Chapter 2, the concept of intuition in general, the theoretical background and the related comprehensive literature, as well as the in-depth, up to date scientific understandings of intuition are presented. Thus, this section mostly deals with the following questions:

- What is intuition really?
- Are there types of intuition?
- How can various definitions of intuition be holistically defined together?

Thus, this section by approaching intuition from a wide angle, in which intuition is put into perspective with creativity, cognition, knowledge, consciousness, experience, strategic thinking, aims to provide a comprehensive understanding for multi-faceted aspects of intuition and data for creating shared vocabulary. Throughout the chapter 2, the study challenges working with the lack of a shared vocabulary as well as the variety of definitions on intuition.

Chapter 3 is based on the conceptualization of 'theoretical framework' covering the author's personal point of view on the concept of intuition. By doing so, this study re-conceptualizes various modes of intuitive knowing as well as related various intuitive processes. The theoretical components presented in the section two lay the foundation for discussions in the latter section. The theoretical framework put forward by this study is not meant to invent a new understanding for the concept of intuition but to

contribute to the field of intuition by re-structuring and re-conceptualizing the terminologies, identifying and clarifying various forms of intuition as a various mode of knowing, building a more coherent understanding of the processes of intuiting and seeks a holistic model – a unification of wide range of disperse concepts in a framework. Thus, this section is shaped around the questions of

- "How can the various concepts of intuition be organized in a framework all together?"
- "Can such concepts be identified and acknowledged in a more open-ended manner apart from their strict and limited conventional definitions?", in a way that they become available to be related with human behaviour.

The framework in this section handles the concept of intuition through different forms of knowing related to the various intuitive processing and the ways of intuiting. By taking a step further, the framework reveals four different functions of intuition through combinations of various concepts in the framework. Even though generalization of the concepts presented in the framework had to be done in order to tame the subject, the revealed functions of intuition still provide flexible and justifiable representations of the intuitive process.

Chapter 4 examines the concept of intuition in design by relating the revealed functions of the framework with the designerly behaviours performed in the exploratory study. Design moves and tendencies that go hand in hand with the features of the revealed functions are exposed through the observations of the design sessions. At first, beside the main research question: **'Does intuition differ among various individuals and**

various experiences?', this section struggled a lot with revealed questions during the exploration phase:

- 'How can the concepts in the manifested framework (the modes of knowing) be related with design?'
- 'How can they be identified, observed and understood in design activity?'
- 'How and under what conditions are these functions triggered in the process?'
- 'Are there any specific consequences and criterion that could be revealed?'
- 'Is there any kind of specific type of outcome of these intuitive functions in design process?'

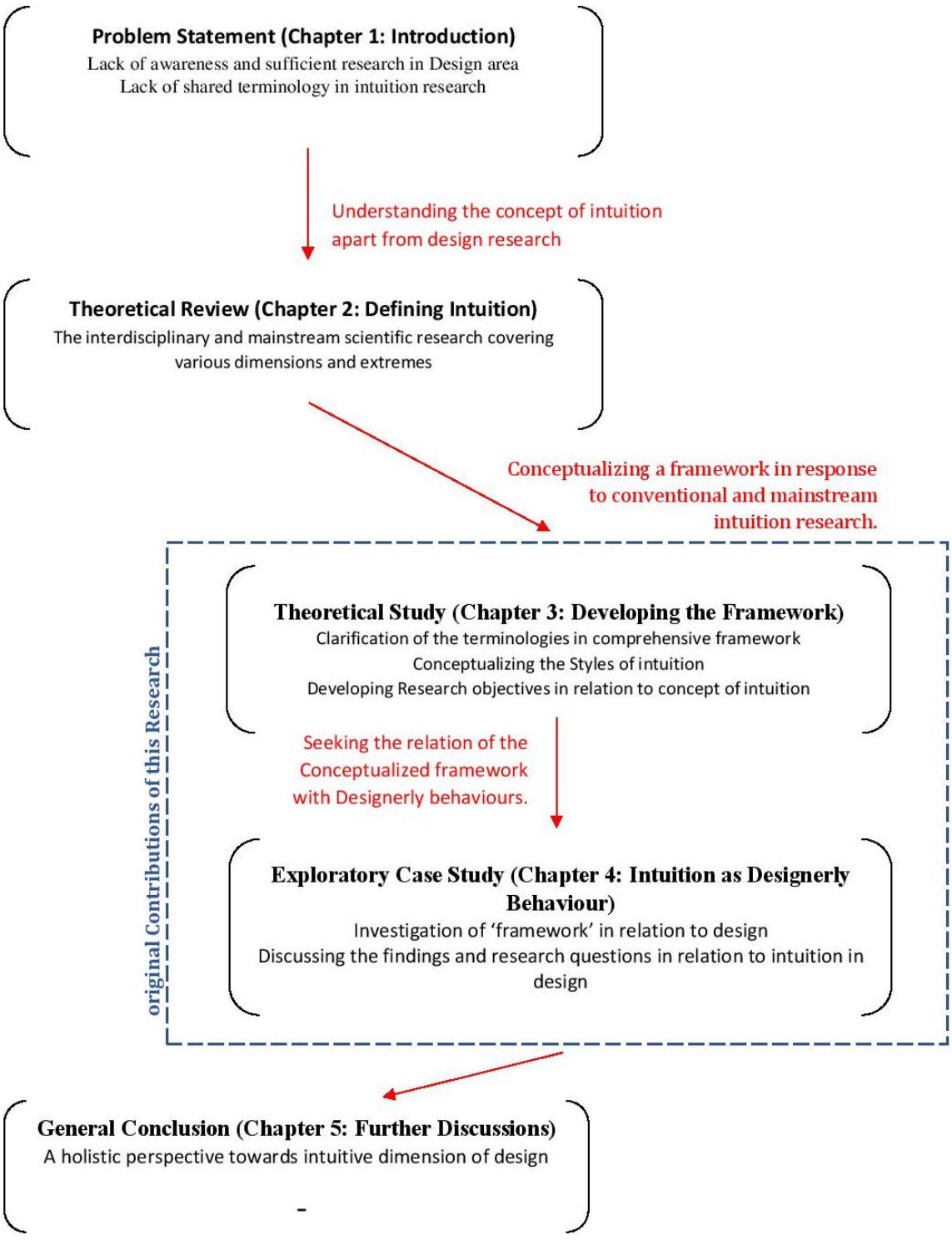


Figure 1: Journey of the research

1.7 Limitations of the Study

Unfortunately, as mentioned before, there is no exact methodology either for studying intuition or for identifying 'the intuition' in a such complicated human performances

such as design. Another limitation is related to the lack of previous studies that share similar ambition with this study on understanding intuition in design. That is, this study had to develop a personal research perspective towards the issue by making its own theoretical manifestation.

Another limitation is related to the focus of the study. Although the concept of intuition is frequently discussed in relation to dual cognition theories along with rational faculty of the human mind, rational faculty is out of scoop of this study. Although such duality in design is not rejected by this study, this research solely focuses on 'the intuitive dimension of design'. Since design activity is strongly believed to be a 'mental process' in which rational and intuitive processes intertwine, even the designer cannot tell or differentiate whether the information is acquired and processed through the intuition or reasoning faculty. In most cases, people tend to talk on the 'visible' actions that are often reasoning activities and on the other side, the intuitive activities remain 'hidden' since intuitive process operates at the tacit, subconscious level. One of the major claims of this study is that, every human action can be 'defined' in relation to both type of cognition (reasoning and intuitive). Thus, identifying whether it is processed by rational or intuitive faculty becomes matter of perspective. As from one point of view, it can be considered as intuitive and from the other point of view it can be identified as reasoning. It is very similar to looking at the one side of the 'coin' while you can always see the other way.

Last but not least, this study is not interested in rating "the degree of creativity", evaluating "the success of the intuitive outcome" or questioning whether intuition is reliable type of cognition. The study also has no intention or concern with whether or

not intuition is a superior or more accurate type of cognition compared to other ways of knowing.

Research on the nonconscious cognition has often focused on intuition as a learning process however, this study is rather concerned with how the intuitive faculty uses and accesses the information. Thus, how intuitive knowing is gained/learned is not discussed in this study. In other words, this study does not question how one attains/gains or learns the intuitive knowledge or in which process a knowledge turns into intuitive. Although recently intuition research started to focus on how intuitive approaches can be taught to some extent, how intuition can be taught or how design education can involve intuition are also out of the scoop of this study. However, this study will still informally contribute to design education by highlighting the importance of intuition and identifying its various roles in the performance of design.

Chapter 2

DEFINING INTUITION

In this section, the aim is to reveal the variety of definitions of intuitive knowing and define it as versatile as possible by starting from acknowledging it as 'direct knowing' as it is most central to many definitions. This section ends up with in dept review of the diverse and disperse definitions of intuition in literature including the ones that do not even meet at common discussion ground or may contradict from certain points of view.

Thus, in this section, the concept of intuition in general and the related comprehensive literature, as well as the in-depth scientific perspectives on the issue are presented. In this sense, this section unlocks intuition in relation to frequently discussed concepts such as creativity, wisdom, cognition, knowledge. In order to provide a comprehensive understanding for multifaceted aspects of intuition and to provide data for creating shared vocabulary in further sections, this section is supported by the definitions of intuition from interdisciplinary fields, mainly from the fields of cognitive and social psychology, social cognitive neuroscience and lastly, management and business.

2.1 Intuition in Short

Today, many researchers acknowledge intuition as an essential component of human cognition (Kahneman, 2011; Kahneman & Tversky, 1982). What they argue is that, every individual is intuitive although they may not know it, "since the nature of the human mind is inherently intuitive" (Laughlin, 1997 cited in Raami 2015). In other

words, people in fact use intuition every single day (Raami 2015). Even though intuition started to receive scientific attention only for the few decades (Bastick, 2003), it has always been part of our life due to the nature of the human kind.

In the simplest form, intuition is a way of knowing. In other words; a way of attaining a knowledge, a solution, an answer, an idea, a meaning or a sensation of a situation; that is hardly specific to any field or a discipline. Thus, the significance of intuition in literature is commonly discussed in any area that involves: problem solving, creativity and decision making. It's always a part of human cognition in everyday life as well as in professional world. Therefore, intuition, a versatile phenomenon, can be behind the ordinary daily life actions as well as the most vital performances in various professions ranging from the most influential art works to the most ground-breaking scientific innovations.

As stated above, intuition plays an important role in the performances of individuals from many different disciplines (figure 2 and figure 3). To illustrate, some practitioners who noted that intuition is an essential ingredient in their performances are as follows:

Figure 2: Disciplines such as music, athletics, art and acting (Fiscus, 2012)

Gromyko Semper (Draftsman)

"It all starts like magic... a sudden gush of inspiration, a hymn, a whisper, an idea comes to mind, conscious of unconscious... phantoms or spirits or whatever other names they are called... *premonitions* and visions... automatisms and paranoiac visages... sometimes they come to me when I'm reading, other times they go as empty vessels...then I begin to create..."

Albert Einstein (Scientist)

"The intellect has little to do on the road to discovery, there comes a leap in consciousness, call it intuition or what you will, and the solution comes to you, and you don't know how or why."

Catherine Ruane (Painter)

"Intuition for me is that gutsy crimp in my stomach that says... no that's not right, or yeah, that works. It is sort of like the patron saint of art."

Steve Macks Dilley (Ceramicist)

"I start with an idea (sometimes not) but it is the intuition that leads me. I know it is right and true when I can feel it in my 'gut'."

Figure 3: Quotes on intuition by practitioners from various disciplines

As it has been mentioned several times in this thesis, although the early design research lacks awareness towards the existence of intuition in design process, in reality, intuition is an essential component of human cognition and it has inevitably always been part of design practice and discourse, even in the times that it has been ignored or rejected in the design research, theory or education. Likewise, the practitioners from other disciplines, and numerous pioneer designers have also underlined that intuition has a significant role in their design process.

Frank O. Gehry (Architect)

"I had to learn the hard way to trust my intuition, my inner child. A very good friend of mine who works as a psychologist encouraged me to listen more to my inner self and not to look on architecture as the powers that be. "

Antoine Predock (Architect)

"My attempt to connect with 'the divine' in your terms makes me want to preserve certain instinctive, intuitive responses and to retain their power as a the original 'driving forces' in my work"

John Ronan ***(Architect)***

"I would say that my design process is basically intuitive …even in the most extreme examples… there is obviously an intuitive overlay, making intuitive judgements and so on, and that's really the part I that find more interesting."

Figure 4: Quotes on intuition by pioneer architects (Fiscus, 2012)

Fiscus (2012) states that Gehry, in his design process, is very much inclined to do intuitive sketches and thus, reaches his unique ideas with intuition. He further defines that in Gehry's process, by relying and trusting intuition, he achieves sort of 'loose searching', a flexible solution exploration with abstract ideas that mostly form the essence of his projects. On the other hand, he mentioned about 'Predock's 'clay modelling activity' that has been an architectural Form-finding exercise that unleashes his 'intuition'.

Fiscus (2012) in 'Ronan' case, suggests that when there is too much alternative options, there is definitely an intuitive decision-making deciding upon which models, schemes, are more appropriate. Fiscus (2012) states that Wright's intuitive approach is based on having an architectural solution that completely works out in the mind before committing it to the paper. This does give evidence that in Wright's approach, the entire process is introspective. Fiscus discusses that his imagination process consists of deep intuitive connections and considerations. Moreover, Fiscus (2012) pointing out to the Calatrava's sketchbook, discusses that Calatrava seems to follow an approach similar to 'Wright's. He also seems to intuitively imagine the concepts and initial idea in his mind rather than doing explorative sketching. Fiscus (2012), also investigates the Yeang's approach to design, saying his work is based on intuition-led process, and he mostly used intuition as decision making device.

It turns out that for every designer, intuition has different meanings and provides different experiences among everyone. Some of them call it: an inspiration, a

Ken Yeang (Architect)

I trust the gut feeling, the Intuitive hand, the intuitive feeling about the project… you can technically solve accommodation problems, you can solve problems of view and so on but which problem to solve first is a gut feeling… you can't explain it but you feel that's right and nine times out of then you are right."

Frank Lloyd Wright (Architect)

"… conceive the building in the imagination, not on paper but in the mind, thoroughly - before touching the paper. Let it live there – gradually taking more definite form before committing it to the droughting board. When the thing lives for you – start to plan it with tools. Not before…"

Santiago Calatrava ***(Architect)***

(on Frank Lloyd Wright) "… the most memorable thing is the deep intuitive quality revealed in his buildings. You feel this other dimension in his buildings of sympath with nature and you know it can ony come from intuition".

Figure 5: Quotes on intuition by pioneer architects (Fiscus, 2012)

surprizing idea that suddenly, unintentionally comes to mind. Some call it mental exploration by trusting 'one's' inner ear, inner child, inner self that sets the imagination free. Not necessarily among architects, what intuition means can differ and it can be experienced differently among people since it is a highly personal construct. Moreover, in different situations, intuition can be experienced differently even by the same person since it is also 'situation-oriented'. Ray and Myers (1989) defined such a

multifaceted phenomenon being regardless of specific fields or disciplines. According to them, it can be experienced in various forms and it might be what you every day call "… guesswork, insight, hunch, …*inspiration, vision, foresight, premonition, illumination, habit, encouragement, feeling, warning, ...* speculation, imagination, judgement (not the blame and criticism kind), gut-feel, sixth sense, a feeling in the bones…" (cited in Shirley and Langan-fox, 1996, p.249). Each label that is used to define intuitive knowing, however are adopted and developed further by specific studies in certain directions that represent different mode or process of intuition. Among them, having both academic and non-academic significance, numerous authors (cited in Dane and Pratt, 2007) associated "intuition" with *gut feelings* (Hayashi, 2001), *hunches* (Rowan, 1989), judgment (Klein, 2004) and *... insights* (Vaughan, 1979; Wild, 1938).

What these definitions at least have in common is, a way of accessing to some kind of 'naturalistic - innate' knowing that is some kind of 'second nature' or 'inner knowing' which suddenly comes from the heart somehow in a mysterious way. Thus, "…whether called insight, judgment, wisdom . . . or sixth sense, these skills help executives see things that other people don't see and incorporate factors which strict logical processes still cannot handle" (Harper, 1990, p.112 cited in Khatri and Nb, 2000). Nearly all of these definitions in their essence, acknowledged intuition as 'direct knowing' that does not rely on reasoning processes. Such understanding of intuition relies back in history in works of philosophers.

2.2 Intuition in Philosophy

In eastern culture, 'intuitive knowing' is linked to a higher knowing - a divine power, a compass of the soul that guides, informs, and directs you towards success (Robinson,

2006). Although such view frequently has been part of societies and cultures as a non-scientific discourse, it is often considered as a knowing that is beyond the capability of conscious mind.

“Do not get on to this plane, it will crash! Do not drive that way, something bad will be happen”. Based on this apparent sensation, whether a bad thing happens or not, or such sensation is right or wrong, there is global belief towards intuition that defines it as an ‘extra ordinary sensations’ related with a way of knowing the things that is beyond the human mind.

According to Goldberg (1989), sometimes with little hints and sometimes more strongly, intuition guides us to a certain direction or decision although the reason why may not always be apparent. In other words, as Goldberg (1989) stated: "If we follow it, we find ourselves doing things for no apparent reason, perhaps feeling somewhat foolish, wondering what on earth has possessed us" (p.72).

Some cultures and social beliefs adopt ‘this definition’ and link it with medium and physic skill as it is also originally associated with spirituality and religions respectively. This school of thought is mainly adopted by Eastern philosophy. For instance, for many Buddhists, intuition is a tool to engage with a different state of mind, which opens the doors to the greater kind of knowledge (Guenther, 1958). According to Osho (2005) an Eastern philosopher, intuition cannot be defined scientifically because it is not a rational and scientific construct which is related with the spirit of the body, not the human mind. Although there is a room for this particular thought, scientists have often perceived this type of intuition as mystical, mysterious and “out there” (Robinson, 2006). Literature, to some extent, covers this by defining

intuition as a ‘sixth sense, as a way of knowing without any indication. For example, a person can foresee upcoming danger or situation without any existence of a clue. “It is, therefore, not surprising that people who support this school of thought struggle to find a place in the academic community” (Francisco and Burnett, 2008, p.239) and thus, it is solely reduced it to mystical sciences.

Intuition is argued in light of more scientific concerns in western philosophy by the philosophers such as Plato, Descartes, Aristotle, Hume, Spinoza, Kant and lately, Bergson. Among them, specially Spinoza, Kant and Bergson’s definitions lighted up the path for today’s scientific researches on intuition (Palmer, 1998).

Among the western philosophers, definition of intuition put forward by Spinoza is the one that is closest to the definitions of intuition by Eastern philosophers. Similar to mystical sciences, Spinoza too, believes that intuition cannot be fully understood rationally or empirically. He also argues that although science can explain intuition in a broader sense, he thinks that it is even more than scientific knowledge, something which he calls “knowledge of God”. He considers intuition as the highest stage of human knowledge that is above the knowledge gained by the sense perception or the reasoning.

Kant similarly, put forward the concept of ‘pure intuition’ that is an absolute knowledge prior to logical thought or sensation. Kant points point out that, even though intuition is outside of conscious awareness, it is not beyond the consciousness. His approach to concept of intuition stands closer to mainstream science rather than mystical science. His theory along with Bergson’s is later discussed as ‘implicit inference’ in modern philosophy.

> *Similarly*, …two hundred and fifty years after Kant, at the beginnings of the twentieth century, Bergson had shown much more distinct ambition towards defining intuition by emphasized the importance of employing intuition rather than relying exclusively on the intellect or "analysis". He defines intuition as a 'direct (absolute) knowing' without applying 'analysis'. "In modern times, his theory of 'intuitionism' was adopted by logical positivism, which assumes that all knowledge comes from 'reasoning', any knowledge labelled intuitive is believed to originate from the reasoning process outside awareness. This has reduced intuition to unconscious inferences Deikman, 1998, p.180).

"Concepts such as Spinoza's high road to ultimate truth, Kant's 'direct knowing' or Bergson's attainment of direct contact with prime reality (Banerji, 1998; Westcott, 1968) bear relevance for contemporary science" (Sinclair and Ashkanasy, 2005, p.355).

Similarly, in psychology, Freud (1950) and Jung (1926) had shown much more distinct ambition towards relating intuition and unconscious which is almost adopted by all contemporary theories.

2.3 Scientific Inquiries

Western philosophers considered intuition as the purest way of knowing which signifies unconscious access to higher knowledge (Osbeck, 2001; Wild, 1938). "In the last decades, the idea that much of human cognition relies on unconscious mind started receiving interest in modern cognitive sciences" (Dane and Pratt, 2007). "Today, it is a well-known fact that, significant numbers of researchers think that substantial part of human thinking, including intuition, takes place in non-conscious, implicit and non-linguistic levels of the mind" (Kahneman, 2011; Lakoff, 1999; Varela, 1999 cited in Raami, 2015). According to Lipton (2005) more than 95% of human action derives from subconscious mind. Numerous authors also believe intuition comes from the

unconscious as well (Benderley, 1989; Fullan, 2001; Gladwell, 2005; Gigenzer, 2007; Khatri, 2003; Klein, 2003; Simon, 1987 cited in Francisco and Burnett, 2008, p.4)

Contrary to mystical science where intuition falls into the realm of the irrational or paranormal, advancements in cognitive science have shown tendency of providing scientific validity of intuitive processes, in which intuition is no more considered as paranormal or a mystical process (Simon, 1987; Prietula & Simon, 1989). Dual cognition theories had been significant achievement in disassociating intuition from an esoteric or mystical domain and defining it in mainstream science (Khatri and Nb, 2000). Therefore, among these studies, the most distinct definition of intuition is drawn by cognitive scientists with the dual cognition theories. They have put forward various concepts of dualities briefly based on two distinct information processing systems. These modalities are lately further discussed and acknowledged as intuitive and reasoning faculties which form the foundation of a human thinking as argued by the following researchers (Kahneman, 2011; Kahneman & Tversky, 1982). Although there are various dual process theories, which are all slightly different from each other, Hodgkinson et al. (2009) argues that one-side of duality in its essence is always related to 'intuition' while the other side of the duality refers to reasoning processes.

The very first well-known model is Freud's distinction of primary and secondary mental operations. In his model, Freud distinguished the primary system as associative unconscious while the secondary system as conscious rational (Freud cited in Badke-Schaub and Eris, 2014; Dörfler and Ackermann, 2012). Similarly, numerous studies had been carried out, representing the characteristics and building today's understanding of intuition and analytic system respectively. Some of these studies are: Neisser's (1963) sequential vs. multiple processing, Schneider & Schiffrin's (1977)

automatic and *controlled*, Nisbett, Peng, Choi, & Norenzayan's (2001) *holistic* and *analytic*; Lieberman, Jarcho, & Satpute's (2004) *reflexive* and *reflective;* Sloman, (1996) *associative* and *rule-based*; Dijksterhuis & Nordgren's (2006) *unconscious* and *conscious*; Hammond (1996) *intuitive* and *analytic;* Carver (2005) Smith & DeCoster, (2000); Strack & Deutsch, (2004) implicit & explicit; Chaik en's (1980) heuristic & systematic model; Jung's (1971) feeling & thinking and Bargh's (1989) automatic & non-automatic processing model. Lately, Kahneman's (2011) and Tversky and Kahneman's (1974) primary intuitive system and secondary analytical system model are pursued the idea of two separate systems.

In brief, these theories all share similar features to Freudian theory and regardless of their labels, nearly all of these theories are shaped around the same conceptual duality often labelled as Intuitive and Reasoning. Despite which theory is accepted as valid, they all are usually widely recognized upon processes that are related to intuiting and non-intuitive processing (Dörfler and Ackermann, 2012). Although these theories have significant differences, they all contain one information processing system that can be acknowledged as fast, effortless which does not necessitate conscious attention and on the other hand, another system that is slower, analytic and effortful.

Experiential vs rational systems which is later called as intuitive-experiential vs. analytical-rational systems, put forward by Epstein et al., (1996) and lastly, System 1 vs. System 2 by Frankish and Evans, (2009); Stanovich and West, (1998, 2000) cover nearly much of all the aspects of dualities listed above. The labels (tacit, natural, feeling, automatic, heuristics, implicit, holistic, associative, reflexive and unconscious) that represent 'intuitive process' in previous duality are all covered in

Epstein's theory, where all of them are associated with 'experiential system' and provide a comprehensive understanding for 'intuitive' faculty.

In brief, as also put forward by Freud in the 1900's, System 1 or Experiential system in their essence, is generally defined as rapid unconscious information processing system and on the other hand System 2 is the slower, conscious system (Salas et al. 2009)

Experiential system or System 1, is automatic and effortless, which means that it does not rely on cognitive effortful processing. According to Stanovich & West, (2000) with System 1 individuals unconsciously learn from their experience as well as reach personal perceptions of knowing (Hogarth, 2001). Meanwhile, by the rational system or system 2, individuals act upon rational intellect to apply analysis and develop ideas in an attentive manner (Dane and Pratt, 2007).

Table 1: Descriptions of systems by to Stanovich & West, (2000)

System 1	**System 2**
Associative;	Rule based;
Holistic;	Analytic;
Automatic;	Controlled;
Undemanding of cognitive capacity;	demanding of cognitive capacity;
Relatively fast operation;	Relatively slow operation;
Acquisition by Personal experience	Acquisition by formal tuition

According to Bargh and Chartrand (1999), the majority of daily action is processed by experiential system / system 1. Such rapid, effortless and non-conscious mechanism, make everyday tasks a lot simpler, since system 1, quite effective and conveniently

'doing the hard work', helps to manage majority our tendencies and preferences without even demanding conscious cognitive effort (cited in Dane and Pratt, 2007).

Table 2: Descriptions of systems put forward by Epstein (1994)

Experiential System	**Rational System**
Holistic;	Analytic;
Automatic;	Intentional;
Effortless;	Effortful;
Affective and Associationistic;	Logical;
Mediated by Vibes from past events;	Mediated by Conscious Appraisal of events
More Rapid; Immediate actions;	Slower; More delayed actions;
Slower and more resistant to Change;	Changes more rapidly;
Change with repetitive practise and Intense experience	Changes with the Strength of argument and evidence

Tversky and Kahneman, (1973, 1974) claimed that intuitive system is primary and rational system is secondary. Their proposal is that intuitive system and rational system work in a serial manner. Therefore, in their perspective, rational system 2 comes into play only when intuitive system 1 cannot overcome the situated task. Perspectives on serial way, suggest that intuitive and rational system operate in complimentary fashion in which one of them comes after the other (Badke-Schaub and Eris, 2014). More conventional perspective suggests that, although it is the System 1 that does the 'hard work', the rational system 2 has the final say in the process (Salas et al. 2009).

Although much of the early work from dual processing perspectives have drew how these systems work together, their perspectives display that a decision or human action is performed either by intuitive or rational systems. More contemporary perspectives

suggest that, human activities cannot be solely defined as standalone intuitive or rational since intuitive and rational systems operate in parallel based on complex interactions (Hammond et al, 1987 cited in Salas et al. 2009).

2.3.1 Intuition is Non-conscious

The characteristics of System 1 – the intuitive system, can be further expanded and definitions presented in table 1 and table 2 can be used to define intuitive cognition. One thing that is common for all intuition theories is that, researchers of non-academic and academic environments mutually define intuition as a 'direct knowing', which is not processed or controlled by consciousness. Among the literature – most pioneer researchers such as Jung, for example, defined intuition as "that psychological function which transmits perceptions in an unconscious way" (1971, p.567). He believes intuition operates at the subconscious levels of the mind (beneath the consciousness) without being limited and restricted by the facts of rational mind. Bruner (1962, p.102) defines it as, "the act of grasping the meaning, significance, or structure of a problem without explicit reliance on the analytic apparatus of one's craft". Similar definition is also put forwarded by Lieberman (2000, p.111), he defines intuition as "the subjective experience of a mostly nonconscious process—fast, a-logical, and inaccessible to consciousness—that, depending on exposure to the domain or problem space, is capable of accurately extracting probabilistic contingencies".

Hogarth (2001, p.14) defines it as "Thoughts that are reached with little apparent effort, and typically without conscious awareness; they involve little or no conscious deliberation". Lately, Sinclair (2011, p.357) defines intuition in a similar fashion declaring that intuition "… is a non-sequential information processing mode, which … results in direct knowing without any use of conscious reasoning".

Although the majority of the intuition research have argued that intuition is not a conscious process, there is no consensus on whether it operates at subconscious or unconscious level. Various researchers such as Epstein (1994); Hogarth (2001); Jung (1921); Reber (1991); and Simon (1987) have discussed intuition in relation to various level of consciousness; un-conscious, sub-conscious, pre-conscious. Although these terms are different from one another to some extent, what they have in common is that they all rely on non-conscious processes that operate outside of conscious mind.

2.3.2 Intuition is Fast

Nearly all of the intuition researchers acknowledge intuition as rapid - sudden knowing. Although there has been a debate about whether intuiting is *always immediate*, the majority of researchers consider intuitive processing as fast compared to rational processes. The 'speedy processing' feature of intuition is also taken to account by philosophers. Wild (1938, p.226) being one of them, defines it as "an immediate awareness by the subject, of some particular entity, without such aid from the senses or from reason as would account for that awareness". Rorty on the other side, (1967, p.204) define it as immediate apprehension. Furthermore, the speed feature of the concept of intuition has also been stated by management theorists. Kahneman (2003, p.697) defines it as "thoughts and preferences that come to mind quickly and without much reflection". Similarly, Barnard defines this feature as flashing sudden knowing that are capable of handling a "mass of experience or a complex of abstractions" (Barnard 1938, p.305), while Hogarth (2001) defines it as a "sudden unexpected thoughts that solve problems" (Hogarth, 2001, p.251).

Experientially, it may seem to "pop" into one's head in a very fast manner. People may be aware of their immediate response, but not the cognitive processes that behind it.

Gladwell (2005) in his book, defines this as ‘blink’ which is titled as power of thinking without thinking, while Duggan, (2007) calls it ‘flashing knowing’.

2.3.3 Intuition is Tacit Form of Knowing

Liberman stated that intuiting still maintains its mystery since the process behind it cannot be explained. As also noted by Seligman and Kahana (2009), this is because intuition operates upon ‘cognitive network of information’ that is located at the tacit levels of human mind (cited in Dörfler and Ackermann, 2012).

In this case, Shapiro & Spence distinguish the intuitive process and the outcome of the process, since, according to them, while individuals can not declare ‘how’ they come up with the idea or decision, the outcome of intuiting is available to conscious (Shapiro & Spence, 1997). Also, according to Nisbett and Wilson (1977), individuals, until the outcome of intuitive process appears in consciousness, are not aware of intuitive processes. Similarly, this definition is summed up by Agor (1984), Goldberg (1983) and Vaughan (1979) who stated that intuition is a process of knowing without being able to explain knowing how.

“Jung believes the intuitive process and how it accesses knowledge is also indiscernible and relied on tacit dimension of knowledge” (cited in Fields, 2001). This characteristic is illustrated with the classical debate, “knowing how” versus “knowing that”. Social sciences also seem to associate intuition with a ‘know-how’, a ‘knowing-in-situation’ that is referred as a type of knowing that is not available to declaration (Polanyi, 1958, 1966). According to Polanyi (1966), contrary to the motto of declarable ‘know-that, this type of knowledge is rooted in a tacit dimension of human mind.

2.3.4 Intuition is Holistic

Intuition, in numerous studies, is often described as a knowing associated with the totality of the situation while multiple facts are considered at once. For instance, Jung (1921) by referring to the definitions of Spinoza and Descartes in which they discussed intuition in a philosophy as holistic insight, defines intuition as holistic perception: mental function to see the big picture (cited in Harteis and Billett, 2013).

According to Jung (1921) it is immediate, unconscious, uncritical and indirect perception, dealing with whole rather than the parts. Epstein (1994) similarly, discusses 'holistic perception' as one of the features of intuitive faculty, which unconscious mind unknowingly integrates information to produce a holistic knowing. Such mental feature of 'intuition', also according to Jung (1921) puts "together isolated bits of data and experiences into an integrated picture" and immediately perceives "the possibilities and potentialities of both external and internal objects accompanied by ideas or associations tacked on by the unconscious".

2.3.5 Intuition is Affective

As researchers such as Shapiro and Spence (1997) argue, most of the time intuition is an affective knowing accompanied with emotions in which the intuitive process is reflected in consciousness has also reflections at emotional level. Thus, they discuss that, when one experiences intuition, it usually goes together with a feeling based on the forthcoming reflections of the future occurring actions.

For Shirley and Langan Fox (1996), in fact, intuition is defined as "feelings of knowing" (p. 564). Similar definitions put forward by other researchers are: "gut instincts" (Hayashi, 2001; Shapiro & Spence, 1997) "instinctual feeling of warning"

(Vaughan,1990) and "*feeling* in our marrow" (Barnard, 1938, p.306). These definitions also draw attention to the affective nature of intuitive knowing, the system 1.

Lots of researchers argue that intuition can be defined as a "gut feeling" (Harper, 1988; Agor, 1990; Vaughan, 1990; Harung, 1993; Mintzberg, 1994; Parikh, 1994 as cited in Khatri and Ng, 2000). According to Parikh (1994), relying on intuition is in fact acting upon the 'gut feeling'. As Agor's (1990) study suggests, this gut feeling is felt as "a sense of excitement" or "a bust of enthusiasm and energy". Similarly, Burnette, defines intuition "as subconscious cognition that comes into awareness as a "gut-feeling" or "hunch" about what approach to follow or what to think about or do" (Burnette, n.d).

In addition, according to Glöckner & Witterman, (2010) intuitive non-conscious processes such as associations, emotions and feelings play an important role in human decision making even like a sense of 'liking or disliking' (Glöckner & Witterman, 2010). As argued above, intuitive decisions go together with emotions and the feeling of certainty, the feeling that one is making the right decision or approach even when lacking the rational evidence or analysis (Shirley & Langan-Fox, 1996).

Bechara and Damasio (2005) allowing various affect related terminologies together, define intuition as a "holistic hunch", "a gut feeling" or a sense of absolute certainty (Calabretta et al. 2017).

Moreover, the intuitive knowing is often argued to be based on cognitive *schemas, that* are "inductively derived from emotionally significant experiences" (Epstein, 1996, p.170) That is, emotions and affect are significant inputs for the intuitive *processes.* In

this manner, Burke & Miller, (1999) describe intuition as 'affectiniated' knowing in which emotions are involved in the intuitive process and results as affect-laden vibes.

2.3.6 Intuition is Based on Vibes from Past Events

Burnette, (n.d) based on the all of these characteristics discussed above, define intuitive process as follows:

> an initial mapping of situated experience to information in memory is assumed to involve an emotionally charged, procedurally fast, parallel, broad scope, sub-conscious processing of neural structures that occurs in the brain before conscious thought emerges (Burnette n.d).

Therefore, as also mentioned by Barke-Schaub and Eris, (2014) even though a person is not able to explain the rationale behind an intuitive decision, it does not mean that there has not been any *rationale behind the thought* or it is a random process of guessing (Dane & Pratt, 2007).

However, in Burnette's definition, both the 'information that is processed' and the 'processing of the information' are not reachable. His assumption is, there is a connection between "situated experience and the information in memory".

Therefore, despite non-reachable mechanism and the theories that often label the source of intuition as 'unknown', according numerous researchers, intuitive process is based on previous experience and past events (Dane & Pratt, 2007; Gore & Sadler-Smith, 2011; Khatri & Ng, 2000; Simon, 1987). In line with others, Burke & Miller (1999: p.92) state that "A cognitive conclusion based on a decision maker's previous experiences…". According to them:

> Intuitive processes evolve from long experience and learning (Isenberg, 1984; Simon, 1987; Prietula & Simon, 1989; Agor, 1990; Kleinmuntz, 1990; Ray & Myers, 1990; Harung, 1993; Seebo, 1993; Parikh, 1994) and 'consist of the

> mass of facts, patterns, concepts, techniques, abstractions … (cited in Khatri and Nb, 2000).

According to Parikh (1994), intuition consists of 'accessing the internal reservoir of cumulative experience … developed over a period of years (cited in Khatri and Ng, 2000).

Similar to Burnette's definition, when an external signal is perceived, human mind non-consciously and reflexively activates a previously 'stored information', in other words 'internal reservoir of cumulative experience' or cognitive schemas/patterns.

2.4 Classical and Inferential Perspectives

Various authors and researchers have attempted to clarify what intuitive thought actually is, yet there is no consensus. Part of this problem results from the variety of phenomenon that can meet under the scope of intuition. While dual cognition theories cover intuition as one distinct type of cognition, researchers have discussed several types of intuition that exists within the boundaries of system 1, as all the types they described are developed upon distinct characteristics of system 1.

On this point, Epstein and Pacini claimed that, intuition can involve various levels of sophisticated information processing regarding the nonconscious, experiential system:

> At its lower reaches, it [the experiential system] is a relatively crude, albeit efficient, system for automatically, rapidly, and effortlessly processing information while placing minimal demands on cognitive resources. At higher reaches... the experiential system can be a source of intuitive wisdom and creativity" (Pacini & Epstein, 1999 p.463).

Researchers in broader context seem to be divided into two distinct points of view: Inferential and classical perspectives (Hill, 1987; Dane and Pratt, 2007; Sinclair,

2011). In their essence, followers of both perspectives came up with the question of ‘what is intuition really?’ Is it simply a case of rapid inference (the case in inferential), or does it represent a unique epistemic processing mode? (the case in classical).

In its simplest form, followers of inferential perspective define intuition as an automatized, analytical process that is quickened due to experience gained from practice and no longer require conscious attention (Westcott and Ranzoni, 1963; Hill, 1987; Neys 2012). This definition indicates the central features of intuitive information processing system; automatic, effortless non-conscious processing which based on previous experiences, yet lacks holistic, associationistic and affective components. In this sense, Sinclair (2011) considers inferential process as a convergent focus ‘with little or no involvement of affect’. On the other hand, classical intuition, which does not use analytical processes, is often called ‘holistic intuition’ since it is based on holistic, affective and associationistic feature of system 1, which is defined as a process of unknowingly integration of disperse information and deals with the totality of the situation rather than the parts" (Hill, 1987).

Despite which one is valid, both perspectives in their essence, rely on certain features of system 1, as well as significant philosophic and scientific backgrounds. While classical perspective still maintains mystical avenue of intuition (Ferguson, 1999; Franquemont, 1999; Vaughan, 1979), followers of inferential perspective, mostly focus on scientizing the mystery of intuition and how to tame it. Researchers, mainly in the areas of management and cognitive psychology have provided significant achievements in providing scientific prestige to intuition. This inferential stream of research defines intuitive process as:

> …in which environmental stimuli are matched with some deeply held (nonconscious) category, pattern, … mental schemas… or feature. Historically, this matching process has gone by numerous names, including *awareness* (Wild, 1938), *apprehension* (Rorty, 1967), *recognition* (Simon, 1996), *retrieval* (Agor, 1989 ;Shirley and Langan-Fox, 1996) unconscious *heuristics* (Bazerman, 1986; Bodenhausen, 1990; Kahneman, Slovic, & Tversky, 1982; Kahneman & Tversky, 2000; Tversky & Kahneman, 1983) and *seeing* (Osbeck, 1999)" (cited in Dane and Pratt, 2007).

By far the vast majority of scientific research fall into the category of inferential intuition (Dreyfus & Dreyfus, 1986; Klein, 1998, 2003; Prietula & Simon, 1989; Simon, 1987, 1992, 1996; Simon & Chase, 1973; Behling and Eckel, 1991; Brockman and Anthony, 1998; Isenberg, 1984; Blattberg & Hoch, 1990).

According to Simon, "intuition is subconscious pattern recognition that results from a rational, yet unconscious analytical thinking style" (Simon 1987 as cited in Frantz, 2003, p. 268). Building on a conceptualization of inferential intuition by Westcott (1968), Hill (1987) defines intuition as an "…automatized, analytical processes that allow a person to quickly know the correct response to a problem without conscious rethinking" (cited in Pretz and Totz, 2007). This view has reduced intuition to 'Rapid inference'. De Neys, (2012) also regarding the idea of 'rapid Inferences', has put forward the concept of 'rational intuition'. According to him, "…after years of extensive training, a professional logician might be able to solve logical reasoning problems in an entirely intuitive manner or with less deliberation". Sloman, (1996); Stanovich & West, (2000) also believe that, deliberate reasoning processes may become automated and intuitive in nature through repeated practice.

On this point, Isenberg (1984) believes that within this category of intuition, the vast majority of the lessons of experience are logical and are not necessarily non-conscious.

Contrary to conventional wisdom where intuition is set to be non-verbalized 'tacit' construct, Miller and Ireland (as cited in Dörfler and Ackermann 2012, 546) also define inferential processing as '… 'merely' subconscious application of learned rules' where one inherently knows and is able to declare the rationale relations of intuitive response. In line with these arguments, Neys (2012) argues "that people are actually intuitive logicians whose intuitive gut feelings are cueing the logical response" (cited in Khatri and Ng, 2000).

Unlike inferential perspective, holistic perspective commonly defines intuition as holistic, affective, associationistic, non-analytical, non-inferential, non-causal, immediate and uncritical type of processing (Hill 1987). According to Shirley and Langan-Fox (1996), followers of classical intuition researchers "stresses the importance of sensory and affective elements in the intuitive process" (Bastick, 1983; Epstein, 1998; Parikh et al., 1994; Petitmengin-Peugeot, 1999 cited in Sinclair, 2011). According to her, "more contemporary strategic perspective, on the other hand, stresses directness of knowing and ability to synthesize 'unconnected memory fragments into a new information structure' (Mintzberg et al., 1998: 164 cited in Sinclair, 2011). Despite which one is valid, they are both based on non-linear, non-sequential and holistic nature of intuition.

Unlike, Simon's approach in the case inferential intuition, where the situation and the stored memory match in a direct sense, associative feature of intuition provides recognizing various linkages among disparate stimuli that is, put forward by Epstein as *associationistic in system 1* (Epstein, 1994; Epstein et al., 1996). In this sense, Raidl and Lubart describe intuition as involving a process of "linking disparate elements of information" (2000-2001, p.219). Miller and Ireland, (2005 as cited in Dörfler and

Ackermann, 2012, p.546) define holistic hunch as "… a subconscious synthesis of information drawn from diverse experiences". On this point, classical intuition is based on more complex information integration process:

"Consequently, intuitive processing could be likened to a non-conscious scanning of internal (in memory) and external (in environment) resources in a non-logical, non-temporal manner in order to identify relevant pieces of information that are fitted into the 'solution picture' in a seemingly haphazard way" (Sinclair and Ashkanasy, 2005).

Therefore, the majority of intuition research based on holistic processing rely on classical understanding of intuition put forwarded by Vaughan, which is based on a knowing without being able to explain knowing how (Vaughan 1979).

2.4.1 Expert and Creative Intuition: Part 1

Both inferential and holistic (classical) perspectives in their extremes, are linked with different dimension of intuition: expertise/wisdom and global ability to create / creativity.

According to followers of inferential intuition, the relationship between intuitive behaviour and expert experience within a domain of knowledge is especially germane (Kahneman, 2011). This stream of researchers see intuition as expert-based cognition, labelling it as 'intuition-as-expertise' (Sadler-Smith and Shefy 2004), 'intuitive expertise' (Kahneman and Klein, 2009) and 'expertise-based intuition' (Salas et al. 2009; Blattberg & Hoch, 1990; Prietula & Simon, 1989). They commonly argue that intuition is most likely to be effective when the individual has high experience specific to a domain (Simon, 1987, Hogarth, 2001, Dane & Pratt, 2007).

Hogarth, (2001) defines this type of intuition as ‘educated intuition’. Experts in their latest stages of their carrier, develop sort of an intuition which is based on a deep and rich knowledge that comes from extensive domain specific experience. Baylor (2001) relatively, defines two type of intuition: immature and mature. Mature intuition, in her model, refers to expert’s intuition and is associated with inferential intuition since it is based on acquisition of analytical thinking strategies that become automatized through experience in a given domain.

On the other hand, Baylor (2001) associates immature intuition, which she refers to novice’s intuition, with holistic intuition. According to her, “*It* is a precursor to analytical thinking that people demonstrate prior to their progression through the school system” (Baylor 2001).

Sinclair and Ashkanasy (2005) note that, those who support sensory and affective elements in such intuitive process draw attention to a knowledge that exists outside the individual’s domain specific knowledge (Monsay 1997). Under this premise, according to Sinclair and Ashkanasy, (2005) holistic understanding of intuition is different from inferential processing in a way that, although it can cope with domain-specific tasks, it usually tends to operate with a non-domain general experience or complex cognitive associations (Epstein, 1991; Hogarth, 2001; Lieberman, 2000; Sloman, 1996).

Moreover, this holistic type of intuition that is based on associationistic and affective features is linked with creativity. For instance, according to Royce (1964), this type of intuition is based on…

> … The processes … that focus … on the processing of "new-formation" (Le., internally generated forms) rather than information. These processes have greater overtones of affectivity and unconsciousness, and imply a more imaginative-creative mode of cognition than either perceiving or conceptualizing / expertise based recognition" (Royce, cited in Hill, 1987).

Vaughan (1979) for instance, describes a certain type of intuition (he calls 'mental level of intuition) that triggers creativity, through the perception of patterns, ideas, insights, or images, while exploring the problem-solving situations that are not previously experienced.

An alternative typology to Vaughan's (1979) approach on intuition is put forward by Goldberg (1989), who categories intuition into various functions rather than levels and claims that intuition consists of intuitive discovery, creative intuition (cited in Shirley and langan-fox, 1996).

The role of the intuitive mind is said to be vital in creativity since many research related to innovative thinking and creative problem solving in cognitive and positive psychology fields claim that the act of creating is rooted in intuiting (Boden, 1994, 2010; Csikszentmihalyi, 1996; Bastick, 2003; Agor, 1989; Bunge, 1962; Fischbein, 1987; Root-Bernstein & Root-Bernstein, 2003; Keller, 1983; Larsson, 2001; Marton, 1997; Shavinina, 2003, 2009 cited in Raami, 2015).

For instance, Albert Einstein mentions the presence of intuition in relation to creativity in which he considers intuition as a way of achieving the new knowledge (Hermanns, 1983).

> (empirical) knowledge is necessary, too. An intuitive child couldn't accomplish anything without some knowledge. There will come a point in everyone's life, however, where only intuition can make the leap ahead,

> without ever knowing precisely how. One can never know why, but one must accept intuition as fact. With further enthusiasm for intuition the author finally states: For it is intuition that improves the world, not just following the trodden path of thought. Intuition makes us look at unrelated facts and then think about them until they can all be brought together under one law. To look for elated facts means holding onto what one has instead of searching for new facts. intuition is the father of new knowledge, while empiricism is nothing but an accumulation of old knowledge. Intuition, not intellect, is the 'open sesame' of yourself (Hermanns, 1983 cited in Badke-Schaub and Eris, 2014).

2.4.2 Expert and Creative Intuition: Part 2

Individually, the ideas of inferential, and classical perspectives are not new (Carlson, 2008). Although there is not any single theory that incorporates the both before, by the conceptualization of intuition through history to the new expert/creativity-forms, such concepts are discussed by the contemporary researchers. They acknowledge intuition under various labels, yet their categorisation of the 'types' are mostly shaped around 'Expert-based' and 'Creativity-based' forms. Among them, Duggan (2007) categorises intuition as Ordinary intuition, Expert intuition and Strategic intuition. Similarly, Raami (2015) names them as Everyday intuition, Expert intuition versus Visionary intuition. Crossan et al's Expertise based and Entrepreneurial intuition and Miller and Ireland, (2005)'s Automatized experience and Holistic hunch are also similar concepts that have been put forward regarding the same categorisation.

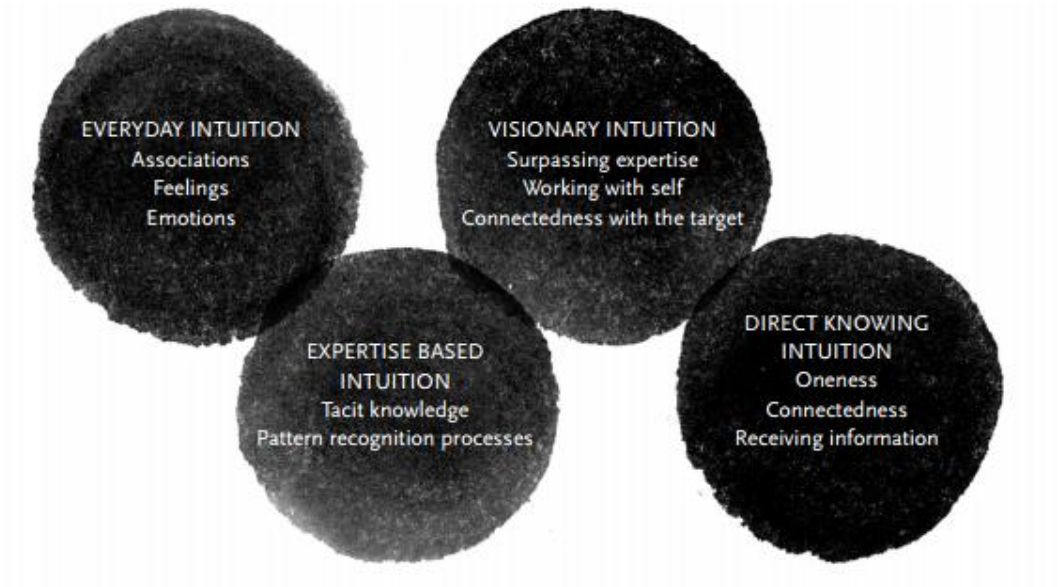


Figure 6: Types of intuition according Rami (2015)

While these significantly show similarity to 'expertise and creativity' discussion of inferential - classical debate, these categorisations add another dimension to intuition research based on the form of the intuitive process experienced at conscious level. What these above-mentioned categorisations especially in management field, at least have in common is, their expert-based intuition type refers to 'intuitive judgement' and creativity-based discussions are based on 'intuitive insight' among different labels.

According to Dörfler and Ackermann, (2012) 'Intuitive judgement are simply analysis frozen into habit and into the capacity for rapid response through recognition' which is frequently discussed in inferential perspective. Classical perspective, on the other side, draws a link to sudden arrival of intuitive 'insight' "… as the unconscious perceives and integrates complex information leading to a sudden illumination". That is, unlike intuitive judgement, intuitive insight is often a lengthy process that begins with deliberate, analytical thinking that precedes the incubation period (Hogarth 2001 cited in Shirley and Langan-fox, 1996).

These definitions add another dimension to ‘expert’ versus ‘creative’ debate, in terms of whether intuitive process is immediate knowing or a flash of insight which requires time and effort. A similar perspective put forward by Duggan in ‘blink versus Flash’. Strategic intuition(flash) is also different from snap judgments (blink). “These are technically expert intuition, a form of rapid thinking where you jump to a conclusion when you recognize something familiar. Expert intuition is always fast, and it only works in familiar situations” (Duggan, 2007, 6). On the other side, “Strategic intuition is always slow, and it works for new situations, which is when you need your best ideas” (Duggan, 2007, p.6).

The concept of ‘intuitive’ insight hardly falls within the intuition category, as some researchers seek to differentiate the concepts of intuition and insight. A lot of researchers, consider insight as not a form of an intuition for several reasons. Intuition is commonly defined as something that occurs instantly and it is emotionally laden; according to Oxford English Dictionary, intuition is an immediate and instinctive response, whereas ‘insight’ may require the application of various thought processes, and may not arrive instantly. Thus, according to opposing views, the definition of intuition should not include the sudden realisations that occur after incubation of thoughts. Rather, that phenomenon is thought to be insight (Shirley and Langan-fox, 1996).

Similarly, Osbeck writes that intuition, from a philosophical perspective, involves direct apprehension that is “not mediated by other reasoning or representation” (2001, p.123). This quality differentiates intuition from insight.

Mainly for an apparently exclusivist reason, numerous researchers hesitate to refer insight as a form of intuition. Lieberman (2000) being one of them, makes important distinctions between the insight and intuition. They claim intuition differs from the 'eureka moments' characteristic of insight:

> …. sudden insight also seems to rely on nonconscious processes, but when awareness is derived in insight, it is not a judgment, as it is usually the case in intuition. Rather, insight is a process where one suddenly becomes aware of the logical relations between a problem and the answer. In the case of intuition, usually there is no insight into the logical relations, but simply an impetus, judgement, hunch, or behavioural response.

However, even tough, these researchers refer to different characteristics and processes, there are ones who believe it might be possible that they are focusing on same system but labelling it differently. Some theorist in this sense, believe that it is the same unconscious – intuitive process that can operate in various manner (Duggan, 2007).

Researchers such as Dane and Pratt, (2007) claim that intuition and insight are related but not distinct constructs (Dane and Pratt, 2007; Hodgkinson et al., 2008; Hogarth, 2001). They redefine the distinction by putting forward that there is namely intuitive and non-intuitive insight, since there is also intuitive and non-intuitive judgement. Thus, not surprisingly, vast number of researchers discussing the 'intuitive creation' however, not very explicitly, acknowledge intuition in the form of an intuitive-insight (Sinclair, 2011). Meanwhile, the term intuitive-judgements frequently take place in expertise-based intuition research.

2.5 Chapter Conclusion

This section represents a comprehensive overlook on literature, and gives account to the various discussions and various perspectives. It has been acknowledged that, although intuition has a common 'characteristic properties to certain points of view',

some perspectives have evolved towards variety of directions and developed into types. Some have defined the same phenomena under same labels but associated different meanings to them, while others used different labels but discussed them similarly. In this sense, 'the chapter 2' defining intuition, was an attempt to represent how the discussions and the various aspects of intuition are shaped around the literature rather than arguing what intuition is or what is not which has never been the aim of this chapter or the thesis.

While the studies of dual cognition theories provide an overall and general understanding of the characteristics of intuition, the types that are further developed reflect the multifaceted dimensions of intuition. It should be noted that, the cognitive processes of both "expert-based" and "creativity-based" concepts or whether intuition is a form of 'judgement or insight' are accepted as valid in this thesis. Both debates are examined and developed in a different direction, which will help to investigate the concept of intuition further in Chapter 3 in two distinct dimensions: 'forms of intuition, and types of intuitive process.

Chapter 3

CONCEPTUALIZING THE FRAMEWORK

As discussed in Chapter 2, the intuition literature lacks agreement about what intuition is and what kind of processing it relies on. The sparse terminology consists of inconsistent or even contradictory definitions. Apparently, the intuition literature is mostly shaped around in two groups of overlapping terminologies. The first set of terminologies acknowledge intuition in a spontaneous judgment form that is related to pattern matching / recognition abilities that has been frequently discussed in the case of expertise-based intuition and inferential perspective. The second set of overlapping terminologies are based on intuition in the form of flash of insight which is related to synthesizing ability that has been frequently discussed in terms of intuitive creation and holistic/classical perspectives.

The main purpose of this section is to eliminate such heavily overlapping terminologies and discuss them in a more flexible manner. By doing so, this section aims to reflect the various of faces of intuition within the literature that have not been frequently discussed and thus, have remained hidden.

In this sense, this section discusses the dilemmas occurring by defining intuition in such a restricted manner; why is spontaneous intuition linked with inferential/expertise and why are ‘intuitive creation’ discussed along with ‘strategic intuition’ while it is also possible to discuss ‘spontaneous creativity’? Why is strategic intuition, ‘the flash

of insight', frequently associated with 'holistic/classical perspective', where it can also be linked to expertise-based perspective? There are so many gaps within these deeply rooted terminologies; why is for example, experts' intuition solely discussed upon 'matching process that relies on 'concrete existing schemas or patterns', while experts on the other side can still also rely on intuition that is based on new relation/connections? Why is this function set among the experts, and the other associated with novices? Moreover, since the holistic foreseeing comes with the level of experience, where experts process thousands of chunks or patterns of data intuitively at the same time, how is inferential/expert intuition position oppose to holistic/classical perspective, and thus miss the holistic feature'?

Despite conventional perspectives, a more versatile understanding of intuition also exists in intuition literature. Although they are less in number compared to the focused group, researchers are addressing more 'open-ended' and flexible definitions.

For example, Sinclair, (2011) apart from the conventional perspectives, discusses, spontaneous intuition in creativity, while also mentioning 'domain-specific experience in the form intuitive insight' (which is not the usual case since it is not frequently discussed in classical perspective).

Usually, the studies which attempt to cover many facets of intuition end up by focusing on the direction of one or two dimension of the concept, and ignoring or missing the other aspects of the intuition. This framework, rather differentiating what intuition is or what is not, aims to clarify and simplify the complicated definitions of intuition and seeks to form an association between the terminologies. The framework, inspired by Sinclair's (2011) 'compressive framework for intuition', proposes that more facets of

intuition can be revealed and such strict concepts can be discussed all together by reconceptualising these concepts based on the cognitive functions that they have, apart from their labels and features.

What is really important about Sinclair's, (2011) work, different from the others is, she acknowledges intuition, as a mechanism for achieving knowledge that varies as four different processes apart from previously discussed 'labels' and 'types'. Of course, similar to this study, her findings also rely on the literature that were discussed previously in Chapter 2. In her study, she revealed 'matching, associative, constructive and creative 'styles of intuition'. Her main ambition is inspired by Glöckner & Witteman (2010), who have "categorized the processes of intuition into four general types: "*associative intuition, matching intuition, accumulative intuition* and *constructive intuition"*. Each of these types or styles, is a mental activity that is based on a slightly different information integration process (cited in Raami, 2015).

A similar ambition has been followed in this study, and an updated version of these styles of intuition in the form of 'functions of intuition' has been put forward. The update covers-slight change in the concepts of styles. Also, the 'functions of intuition' provided by this study, has a clearer relation and clarified characteristics related to the frequently discussed aspects on intuition. Thus, the intuitive functions that are revealed, are based on intersections of polarities of the x and y axis, and feature the combination of their characteristics.

Both axes are relevantly based and shaped around the previously discussed debates in chapter 2. The x – axis covers 'form of intuition' as Spontaneous (top pole) and Slow (bottom pole) while, the y - axis focuses on type of processes that operates among

‘existing patterns’ (left pole) and ‘new relation or connections (right pole). In this sense, both edges of the x-axis (spontaneous and slow/forced) has a link to type of processes that operates among ‘existing patterns’ (left pole) and ‘new relation or connections (right pole) as it can be seen in figure 7.

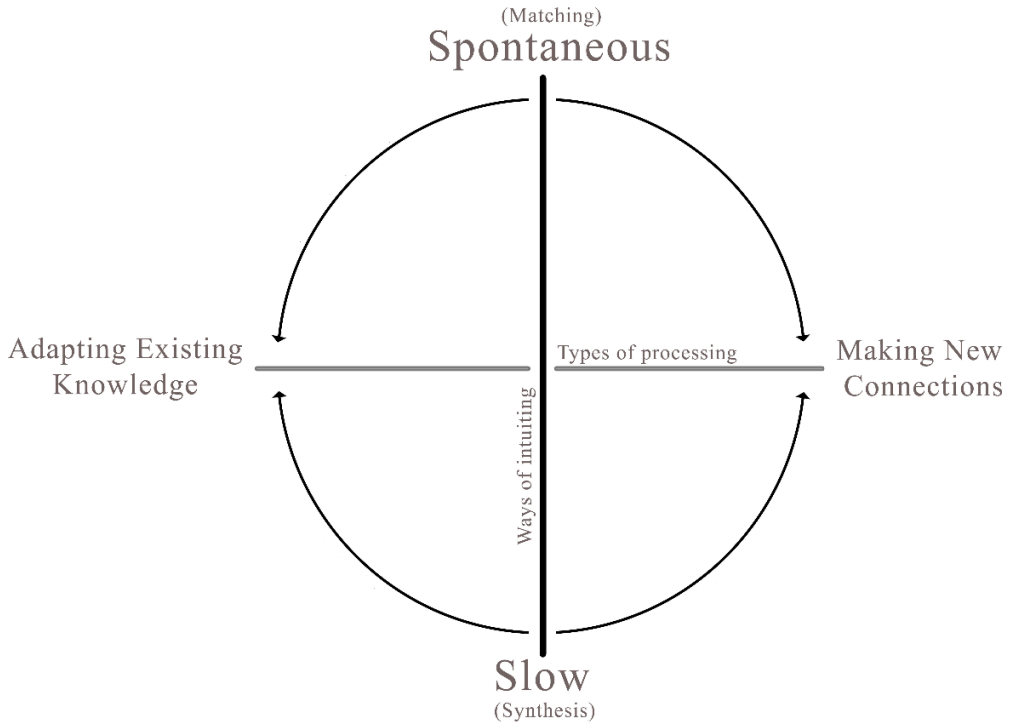


Figure 7: The conceptualized framework

3.1 Determining the Poles of Framework

At the very centre of the framework, by re-visiting the literature, the study conceptualizes the characteristics of intuition that are valid for all of the categories discussed within the framework. Intuition in simple words, is ‘a way of knowing’ that relies on *non-conscious processes*, widely accepted as *non-analytic process* (non-linear process), *holistic* (concerned with the whole rather than parts), *Affective* (can be felt along with senses) , *tacit* (one cannot explain how they arrived to the idea) and *mediated by the ‘vibes’ from past events* (hardly exist without pre-existing knowledge / experience) (Dörfler and Ackermann 2012).

In order to prevent a discussion on whether intuition related with sub-consciousness, unconsciousness or non-conscious, this study, has adopted the term non-conscious, encompassing all levels beyond an individual's consciousness (Sinclair and Ashkanasy, 2005). Hence, to clarify, the assumption of the framework is to cover all of the aspects of intuition that is being discussed in relation un, sub and non- conscious processes. Thus, the labels discussed in the framework are developed in order to reflect the 'non-conscious intuitive processes', as the framework solely reflects intuitive nonconscious processes, analytic / logical processing or any activities that are processed by reasoning faculty is out of the scope of the framework.

It should be noted that in this framework intuition is not acknowledged as non-logical mode of knowing which is opposed to rational or analytical thinking (Dane and Pratt, 2007). As Jung (1971) argues, intuition does not conflict with reasoning since they operate at different dimensions, therefore it should not be considered as a paranormal or magical process that is opposed to reasoning (Khatri and Ng, 2000). Therefore, according to this study, intuition is not the opposite of rationality, nor it is a random process of guessing. Dörfler and Ackermann, (2012) argue that "intuition is a-logical, meaning that it neither follows (logical) nor contradicts (illogical) the rules of logic" (Dörfler and Ackermann, 2012). Intuition in this study is just another dimension of human mind, which doesn't intersect/conflict with the reasoning mind.

3.1.1 The X-Axis: Forms of Intuiting

The x-axis of the framework is inspired by research debates such as Duggan's (2007) 'blink versus flash', Dörfler and Ackermann, (2012)'s intuitive judgment versus intuitive insight, although our perspective shows significant differences from their conceptualisation.

The vast majority of researchers in the field of management who commonly discussed intuition in decision making/taking contexts or tasks consider intuition as a form of judgement. According to their perspective, spontaneous form of intuitive knowing, the blink, is reduced to 'judgment', and Slow/forced form of intuitive knowing, the flash of insight or intuitive insight in their words, is solely discussed in relation to 'creation', 'creativity' and 'sudden arrival of innovative solution'. Spontaneous understanding of intuition in our model is not limited to 'intuitive judgement' nor creative performance is reduced to 'flash' slow/forced intuitive processes. They have used this definition to manage the distinction between intuitive judgement and intuitive insight and to draw a link with expert – creative debate. In our model that case is subtracted from the x axis and considered as another dimension. Therefore, that issue is discussed in y-axis, keeping the spontaneous and forced intuition labels flexible, free from any other labels. By doing so, they still have a link to both edges of Y-axis. In this sense, it has been possible to discuss both Spontaneous and Slow/Forced intuition in terms of behaviours related to intuitive expertise and intuitive creativity'.

3.1.1.1 Spontaneous Intuition (Top Pole)

To clarify what spontaneous intuition means, we followed the researchers who underlined this feature of intuition. The majority of intuition researchers such as Bruner (1962), Myers (2004) and Hogarth (2001) mutually define intuition as a spontaneous or immediate knowing. Kahneman (2003) in line with these researchers, defines it as "thoughts and preferences that come to mind quickly and without much reflection". According to them, intuition is more or less instantaneous, rather than derived and reasoned. Numerous authors acknowledge intuition as automatic, fast, immediate, uncontrollable, effortless knowing (Hodgkinson et al. 2009). According to Gladwell (2005), this occurs momentarily in the speed of 'blink' of an eye. As

mentioned by Whitfield, (2009) ‘experientially; it may seem to "pop" into one's head’ (6) and according to Vaughan, (1979) ‘we may register it as a thought, a feeling or through any of our senses’. Thus, the vast majority of intuition researchers consider it as an act of immediate recognition and perception through the matching process of cues or patterns (Simon 1987; Calabretta et al. 2016). Thus, in the framework, Spontaneous intuition is covered as speedy ‘matching’ process.

3.1.1.2 Slow/ Forced intuition (Bottom pole)

On the other hand, Slow/Forced intuitions refers to intuitive knowing that occurs after substantial effort, focus and incubation period (Duggan 2007; Duggan and Mason 2011; Bissett 2008, Rowan 1990). Such a belief originates from acknowledging intuition as flash of insight, as a moment of knowing defined as ‘A-ha moment’, also known as ‘intuitive flash’ or ‘intuitive insight’ (Khatri and Ng 2000, Dörfler and Ackermann 2012).

The idea of ‘forced’ intuition comes from the conscious and focused effortful thinking that is applied strategically to ‘force’ subconscious mind to reach deeper connections. This underlines the conscious processes that trigger the subconscious mind intentionally. The more favourable definition of this process can be mentioned as ‘an explicit effort which provides a window into unconscious. What these processes have in common is reasoning activity engaging at the beginning and having room for ‘insight’. Myers (2002) describes this cognitive facet of intuition as: “phenomenon of insight arising suddenly, especially in cases of longer, deliberate and unsuccessful thinking about a problem – and often after a period of incubation and illumination when thinking activities have been stopped” (cited in Harteis, and Billett, 2017).

Like spontaneous intuition, forced intuition is a non-analytic process, which relies on the same unconscious mind, however this time, it is not based on rapidly matched ideas or memory patterns but is a time-taking non-conscious *synthesizing* process which results in the creation of new knowledge, new understanding' (Mintzberg et al. 1998). However, intuitive insight similarly has a degree of subjectivity and, one can demonstrate the 'arrived' insight to some extent, although the way of arriving at this solution may not be available to declaration.

For Fiscus (2012), in this process, while the conscious mind deliberately focusses on the situation and incubates, intuition operates 'subconsciously' in the background and seeks relations. Once it finds connections, new information (novum) leaps into the awareness. Burnette (2008) draws importance of 'intention' and how the associative mechanism of intuition adapts itself to the focus of intention: "When recognized as appropriate to an interest or concern, an intent organizes the application of relevant information in memory through an associative network mapping the content, structure, process, and context of the memory". Francisco & Burnett, (2008) also mention that, without intention, intuition cannot be harnessed in a deliberate fashion.

Sadler-Smith (2012) mentions the famous phrase of Einstein on intuition and claims that such *sudden and unexpected understanding (intuitive flash)* of immediately incomprehensible problem may arrive at a seemingly magical moment that only comes to a 'prepared mind' after a long, hard pondering of a problem.

To summarize, both forms of intuition are valid. Whereas spontaneous form of intuition relies on immediate 'matching' function reflects the cases that intuition is nearly 'instant' prior to reasoning actions, Slow/Forced form of intuition is based on

'synthesis' function that results with a sudden knowing, yet it is respectively slow and requires incubation period and hard pondering of a problem.

3.1.2 The Y- axis: Types of Intuitive Processing

The y-axis of the framework is inspired by research debates such as (Hill, 1987; Dane and Pratt, 2007; Pretz, 2011; Sinclair, 2011) inferential – classical perspectives and expert-based - entrepreneurial perspectives. Poles of the Y-axis are based on underlying processes behind inferential and holistic/classical perspectives, however, the poles of Y-axis present significant differences compared to those labels.

In this sense, Y-axis covers intuition as 'a stored pattern that gets activated, or a new structure of information that is constructed …' (Raidl and Lubart 2000–2001, 219). In other words, it is an adaptation of past experiences to current situations or a vision enabling new perceptions and interpretations, and the search for the new (Ferronato et al. 2017).

These definitions, underline two types of processing. The former operates with the 'priori accumulated knowledge patterns' (Sinclair 2011; Salas et al. 2009), whereas the latter is '…act of linking disparate elements…' (Raidl and Lubart 2000-2001, 219). The left pole of the framework in this sense, represents the process of intuition which uses existing - pre-constructed patterns whereas the right pole is the process of intuition that is based on 'new connections' that are not pre-constructed. To be clear, it should be noted that, 'adapting existing knowledge' and 'making new connections' functions of intuition represented in figure 1 should not be misunderstood as a consciously determined activities but should be seen as non-conscious processes.

Avoiding using expertise and entrepreneur labels was beneficial in considering these intuitive processes apart from being specific to certain level of experience. Likewise, as Neys (2012) discusses, any logical practitioner can rely on their intuition, it is not just used by bunch of experts. Also, removing labels enabled to overcome the 'expert-based intuition type position as opposite to entrepreneur' the dilemma. By doing so, the idea that expert individuals while being experts, can be associated with entrepreneur behaviours at the same time has been unlocked. This has provided a new understanding that novices can also perform intuition as a process of 'adapting existing knowledge' with decent amount of domain experience (formerly defined in expert-based intuition), and also on the other hand, experts can 'make new connections' (formerly entrepreneur processing).

What is also different than inferential and classical perspectives is that, recognition/ matching function which is frequently discussed in inferential perspective, cannot be limited to 'logical inferences' where such view lacks holistic and affective component of intuition. Although the idea of 'logical inferences' is not excluded in framework, as was previously discussed the holistic component ought to be central to all the modes that is being discussed within the framework.

The left edge of y-axis, cannot be related with Inferential perspective since 'rapid inferences' definition of intuition in Inferential and expert-based perspectives are highly associated with spontaneous and automaticity components. Therefore, the left pole is reconceptualized in a flexible manner as 'processes based on preconstructed pattern' since a more versatile definitions is required to maintain the relation with forced/slow intuition similar to the relation with spontaneous intuition.

Moreover, in order to avoid the matter of subjectivity on determining what defines the degree of expertise, using the terms expertise and 'creativity' or the criteria that define the creative behaviour were avoided.

3.1.2.1 Process that Operates Among Pre-constructed Schemas/ Patterns (left pole)

The intuitive process that operates among pre-constructed Schemas/patterns (left pole) hardly exists without the prior knowledge. That is, this processing depends on availability of the schema or patterns. Thus, researchers are divided into two. The first group defines intuition as a 'domain' specific construct whereas the second group argues that intuition comes from much 'vague / broader type of experience' naming it as 'vibes' from past events (Sinclair 2011) such as experiences that are the "accumulated memory of past impressions, actions, and achievements" (Harung, 1993, p. 41).

Seemingly, first groups' ambition has shifted to acknowledge intuition as a recognition of perceptual pattern linked to an action, which relies on domain specific experience acquired over years of practise and study. Their idea of intuition expertise is gained through repetitive practises, which has reduced intuition to concept of 'analytics' frozen into habit' (Klein 1998; Simon 1987). Kahneman, (2011) defines it as a sort of mental schemas that are hard to learn, but once settled, difficult to be changed.

"As with Simon's conceptualization, intuition is assumed by Pretz and Totz (2007) to be based on automatized, analytical/explicit processes that allow a person to quickly know the correct response to a problem without conscious rethinking" (as cited in Carlson 2008). This occurs because when a person is repeatedly presented with the same (familiar) problem (situation), one is able to respond without having to

consciously rethink the appropriate action (Carlson, 2008). In sum, this process is based on internalized patterns that it does not require any deliberate thinking and on deeper probing, it can be verbalized' (Sinclair and Ashkanasy, 2005).

3.1.2.2 Process that Operate Upon New Relations/ Connections (right pole)

In line with this perspective, significant number of researchers define intuition as '…subconscious act of linking disparate elements…' (Raidl and Lubart, 2000-2001, 219) Miller and Ireland, (2005) also argue that intuitive process is 'based on subconsciously combination of information drawn from diverse experiences in a complex way'. Crossan et al. (1999) and Miller and Ireland (2005) argue that it is an ability to make novel connections and discern possibilities which enable decision makers to connect patterns in a new way (Sinclair and Ashkanasy, 2005). The majority of intuition researchers, who are in line with this view, believe that there is no language to describe the process (Sinclair and Ashkanasy, 2005). As contrary to 'pattern based' perspectives, researchers such as Sinclair (2011) consider intuition to exist regardless of high-domain specific experience. Although they don't oppose the idea that intuition is related with the 'vibes from the past events', according to them it does not certainly rely on repeated behaviours. They consider it as a cognitive ability to process information with much comprehensive and complex memory (general experience). Thus, even individuals relying on this type of intuition can also cope with the domain specific tasks regardless of their low/none domain specific experience (Sinclair 2011).

3.2 Revealed Functions of Intuition

By interpreting Sinclair's (2011) 'integrated framework of intuition', our assumption is to relate spontaneous and slow/forced ways of intuiting with the processes of adapting existing knowledge and making new connections. Following Sinclair's (2011) approach, this study adopts a similar ambition and conceptualize similar

concepts in a way that both spontaneous matching and slow synthesis models are connected with both adapting existing knowledge and making new connections processes. By doing so, four non-conscious intuitive functions can be revealed (figure 8). Each of these functions are based on different feature of intuition and a slightly different information processing.

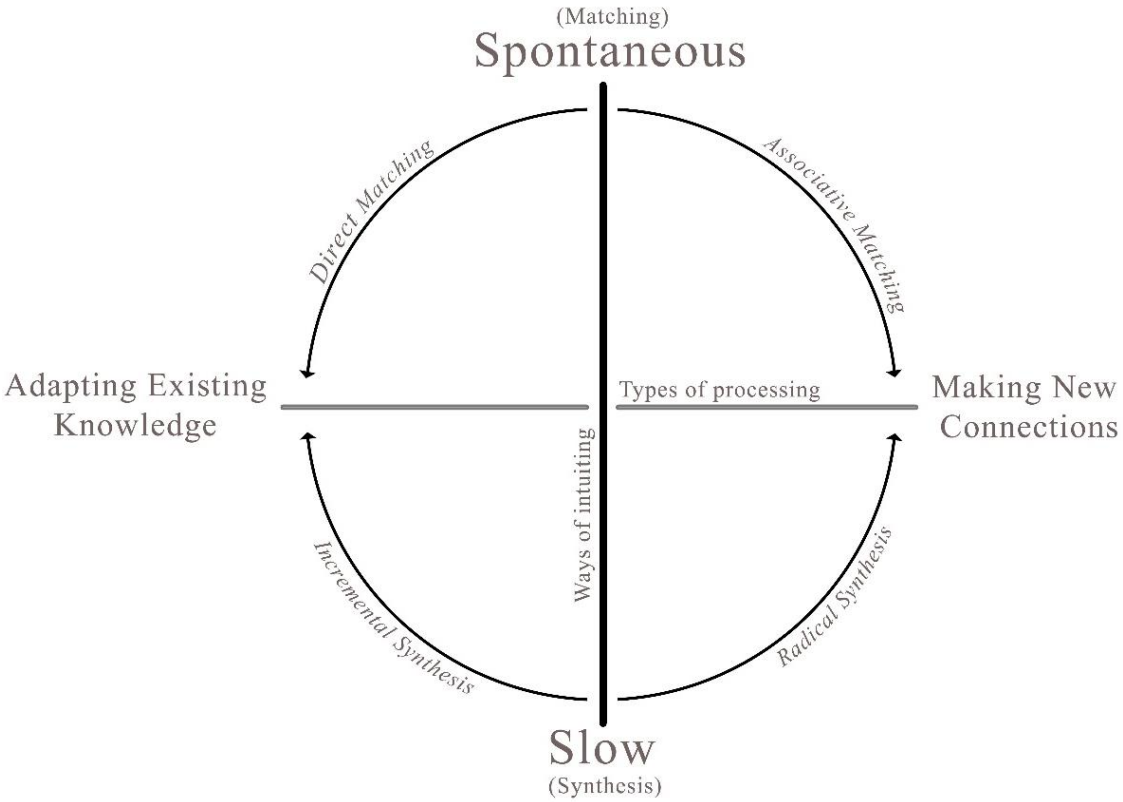


Figure 8: Revealed functions

3.2.1 Direct Matching

As displayed in the figure 8, *direct matching* refers to the spontaneous way of intuiting, defined as an automatic response based on quick recognition of past patterns in appropriate matching situation or content (Simon 1987, Westcott and Ranzoni 1963). According to Simon, (1987) the situation triggers stored patterns in the memory and provides an immediate response relevant to the case (as cited in Kahneman 2011).

3.2.2 Associative Matching

Associative matching on the other hand, is an on-the-spot visionary recognitions or free associations obtained from the non-conscious integration of diverse cues. Such cognition relies on more complex non-conscious matching that are not necessarily explainable. 'The fact that intuitions seem often to appear without a clear reason is due to the subconscious nature of the associative processes and to the fact that they allow very distant content areas to be put together' (Raidl and Lubart 2000-2001).

3.2.3 Radical Synthesis

At the right-bottom quadrant, *radical synthesis* covers tacitly integrated novel way of producing knowledge that did not exist before (Dörfler and Ackermann 2012). Mintzberg et al. (1998) defines this as a subconscious act of synthesizing '… of unconnected memory fragments into a new information structure…' (as cited in Sinclair 2011, p.5) that did not exist before.

3.2.4 Incremental Synthesis

Incremental synthesis, on the left-bottom quadrant, relies 'on a new arrangement of established convergent patterns' (Dane and Pratt, as cited in Sinclair 2011, p.9). In other words, it can be described as the subconscious process of 'reshuffling' (i.e., re-structuring, re-grouping or re-combining) the existing information, to 'connect information in a new but predictable manner …' (Sinclair 2011, p.6). In this sense, in line with Prietula and Simon (1989), Sinclair and Ashkanasy (2005) define intuitive process as a non-conscious synthesis of past professional experience and expertise.

3.3 Chapter Conclusion

By reducing the conceptual ambiguity and the burden on the previous debate, the concepts were disassociated from their labels and the framework was conceptualized based on underlying cognitive functions. Thus, avoiding and removing labels made it

possible to focus on the essence of intuition and the underlying processes. By forming a framework, besides seeking associations between previously discussed debates, the effort was to clarify the definitions of intuition and acknowledge functions of intuitive cognition to be discussed as non-conscious acts behind the designerly ‘behaviours’.

Chapter 4

INTUITION AS DESIGNERLY BEHAVIOR

Intuition is within our everyday life. Every human being is intuitive whether they recognize it or not; it is not an option but an integral part of our cognition. That is, intuition naturally has a significant presence in design activity, yet difficulties arise in describing its mystery. Intuition, having a significant interdisciplinary research background, ranging from arts and humanities to science, has been a major interest in numerous disciplines. However, even though the notions of intuition that has been discussed in previous chapters are highly relatable to 'designerly' activities, as a research topic, intuition has only been superficially discussed in design research. Considering intuition as a 'slippery' concept, mainstream design Research seems to ignore intuition as an integral part of designer's cognition.

This chapter claims that, most of the 'designerly' actions can be discussed and defined in terms of intuition, since designers' mind and thus design thinking is inherently intuitive in its nature. However, this does not mean the absence of reasoning processes or the design process is standalone intuitive and not rational. Throughout the years, researchers, by believing and focusing on such rational dimension of design activity, has shaped design-practise research around the most explicit form of behaviours and actions. Such approach is of course valid and applied for a reason but in its essence, it solely represents one dimension of a 'design activity', which may be the most visible and tameable one. On the other hand, this study believes that the design activity, can

also be perceived through a perspective which outlines intuitive aspects. Such perspective is believed to be the other dimension of the ‘coin’ which has been feared to be considered as valid for centuries.

The idea of coin metaphor is to help to acknowledge both issues as a matter of perspective while the ‘design activity’ can be considered through both ‘the rational processes’ and ‘intuitive processes’ at the same time. This can be applied even for a single behaviour. From one perspective, it can be acknowledged from rational point of view, while it can also be described upon its intuitive dimension. This time, rather than following the most conventional research perspective to design, the standpoint of this research is based on the ‘other side of the coin’. That is, the mental process and the activities that have been performed by the designers are investigated and acknowledged in terms of ‘intuition’.

Despite the ambiguous nature of the concept of intuition, there is a gradually rising interest towards unconscious processes in late Design Research. Researchers following this path–consider intuition as a necessary cognition in design. More significantly, the majority of these studies tend to believe that taking these concerns into account may reflect the realistic and personal nature of design activity. In its essence, this chapter seeks to know-what makes intuition integrally linked with design activity.

Therefore, this study, to focus on intuitive dimension of design, initially converges the overall concept of intuition with the designerly activity and latter discusses the previously discussed models of our framework more in depth in relation to designerly behaviours. By doing so, this chapter seeks to point out that intuition is integrally

related to design and it has a vital role in the process even if it has been denied, ignored or disregarded in the history of design literature. Thus, this chapter is shaped upon following questions:

- How can intuitive functions be observed in design activity? Do these functions match with any kind of behaviours?
- Do intuitive functions differ among expert and novices?

4.1 Convergence of Design Behaviour and the Nature of Intuitive Behaviours

Historically, the first generation of design research, oppose to the view of claiming "the process of designing is so complicated, mysterious, and enigmatic" that is beyond mind's understanding (Mehran 2012, p.3), and stand against the idea in which the designer's mind is set to nothing but a "black box" processing information in a mysterious way (Mehran, 2012). By doing so, with the quest of describing the designers mind as 'glass box', they focused on methodizing design process, relied on more rational and systematic approaches and ignored intuition as a part of designer's cognition (Badke-Schaub and Eris 2014). However, such inquiries failed shortly, and many researchers pointed out that the systematic approach was not capable enough to represent what really goes on in the designer's mind during the process of design (Alexander, 1964; Jones, 1977). Second generation of design research on the other hand, sought to provide more appropriate definition for design, by decomposing it from other disciplines and found its own dynamics (Cross 2007). By doing so, they focused on how designers think and concepts such as 'design knowledge, design thinking and designerly ways of knowing', which are truly unique and specific to design discipline, were revealed. "What these inconsistent terms share, is that they are based on a similar concept of knowledge that is gained and applied via practical

measures and that is, to a great extent, person and situation-oriented" (Mareis 2012). By this definition, according Mareis, the researcher is referring to a kind of knowledge that is personal and truly unique among designers in a way they experience and feel it (Mehran 2012). Thus, it does differ among person to person and doesn't easily meet at objective rule based common ground. Also, by the referring it as 'situational', Mareis is addressing that 'this kind of knowledge' has a connection with the situation' and is shaped upon the 'personal interaction' between designer and the situation itself. All these definitions point out to different and complicated type of knowledge; the 'tacit'/intuitive dimension of design knowledge (Polanyi 1966; Schön 1983).

Within this research environment, theories and terminologies that are subtlety correspond with today's concept of intuition were introduced in the studies of pioneer researchers (Lang 1987; Cross 2007; Lawson 1980; Schön 1983; Eastman 1970). Schön (1983) was one of the researchers who introduced a new approach to cognitive design theory, formulated his view on design in terms of "reflective activity" and put forward notions such as "reflective practice", "reflection-in-action", and "knowing-in-action". Schön (1983) argues that "competent practitioners usually know more than they can say … *and* … they exhibit a kind of knowing in practice, most of which is tacit" (1983, pp. viii).

Schön, (1992) based on Dewey's reflective conversation with the situation, metaphorically defines the design process as ongoing 'conversation' between designer and solution which calls for new reflection-in-action. Schön's reflection-in-action refers to knowing-in-action/situation in which 'situativity' in this context qualifies as "situated action" and "situated cognition", which also confirms what Mareis has come up with recently.

Also, according to Cross, (2007) “acknowledging the ‘dialogue or conversation’ that goes on between internal and external representations is part of the human recognition that design is ‘reflective’"(cited in Rahimian, 2012, p.325). Schön mentioned that during that conversation, the situation ‘talks’ to designer, the designer ‘listens’ and they respond in actions; The situation talks back, and the designer replies again…this conversation goes until the solution is finalized. His theory clearly suggests that, not only problem-space but also solution-space during the process resonates with the designer’s mind until the final solution is reached.

Cross, (2007) claims that, designer, from the beginning of their life-long education, develops design-codes that automatically gets activated during design process. Similarly, to Schön, further describes that “these codes translate ‘messages’ either way between concrete objects and abstract requirements”.

The idea of conversation, the dialogue, the situation ‘talks’, or ‘translates messages’ clearly has a direct link with the mechanics of intuition discussed in previous chapters, where the cues in the situations trigger such internal experiences or draws new associations.

From the stand point of this thesis, their approach raises a possibility on the fact that most of designer’s ‘knowledge’ and ‘the performance’ can be acknowledged as being intuitive in nature. That can possibly be why some design researchers, such as Eastman (1970) may have defined design as an intuitive activity back in the day.

Their approach also identifies a room for this study’s approach to intuition since their definitions are highly in line with the previously discussed concept of intuition and the

functions that have been put forward in Chapter 3. What both Schön and Cross argued above, subtlety addresses various intuitive features that become activated along with designer interactions with the design task. That is, their view is highly in line with this theoretical study in chapter 3 and their approach and attempts are significantly important for how this study deals with the understanding of the various modes of intuition in design.

Majority of designers and design researchers today tend to consider design process as an internal mental activity. Hence, "…studies of design activity have frequently address that 'intuitive' features of design ability to be the most effective and relevant to the intrinsic nature of design" (Cross, 2007). Thus, the term 'intuition' is often acknowledged as a valid form of cognition to cope with the design task (Öllinger & Goel, 2010; Pretz et al., 2003; Schön, 1983, as cited in Pohjannoro, 2016). As also Lang (1987), Schön (1983), and Lawson (1994) point out, the intuitive mind has a vital role in design process. Although many scholars and even the pioneer names of design research acknowledge intuition as an integral part of design, unfortunately, literature does not provide a deeper understanding and there is no empirical method that claims to directly address intuitive behaviours in design, researchers barely identify intuition in relation to a behaviour. Even if the literature covers presence of intuition basically in problem solving and decision making to some extent, questions arise towards in which form and phase it does appear in the process. Considering both non-formulable nature of design and the 'tacit and momentary' aspects of intuition, we believe it can potentially be anywhere in any form in the process.

In this regard, the tacit dimension of intuition still presents a particular challenge to design research. In order to track designer's intuition, it is naturally expected from

them to explain what is really happening in the design process since they are the ones experiencing it. However, as Schön put forward, explicitly putting it into words is more difficult for them. According to Kim and Kim (2007), designers, even when they are asked to verbalize their thoughts during design session, "...fail to express what's in their mind, and even trying to do so, they perceive design problems and generate solutions in such a tacit manner, that it's just impossible to explain." Badke-Schaub and Eris, (2014) discussed that designers tend to rationalize their actions when they had to verbalize it. The designers in Badke-Schaub and Eris's study, (2014), reported in the interviews, and confessed that, even if they follow their intuition during their practise, most of the time they have ended up with discussing the rational dimension of the design product, because the rational aspects are more convincing to clients. That is because rationality is easy to meet at common discussion ground. Also, eventually, designers have to explain and defend their design projects. In most of the cases, they choose the most sense making, objective and logical information rather than what has really happened and what they actually felt during the process. Although they can express the ideology and rational behind their design, they cannot truly reflect why and how they reach to that ideas. Also, Brawne, (2013) noted that it is potentially impossible to capture what is really going in the designer's mind and thus to identify their intuition.

Moreover, due to its 'inconstant' and 'flexible' structure, intuition is not possible to be defined in relation to specific design moment, behaviour or activity. Thus, the presence of intuition in design activity cannot be reduced to a specific form of action or a certain time in process. Most studies carried out in this manner still remain hypothetical and subjective in the attempt of identifying or observing the presence of intuition in design.

As discussed in previous chapters, intuition potentially takes place anytime in any form in the process; ranging from rapid logical inferences to creative insights. That is why, it is highly 'unprincipled' and highly difficult to be identified.

According to Badke-Schaub and Eris (2014), intuition is a non-observable hypothetical construct that can be defined as "an abstract concept used in a particular theoretical manner to relate different behaviours according to their underlying features and causes" (Heiman as cited in Badke-Schaub and Eris 2014). In this sense, following a similar approach, we try to trace intuition in exploratory study, by observing the 'underlying features of behaviours' which correspond with the features of the 'matching, associative matching, incremental synthesis and radical synthesis functions of intuition. By doing so, investigating the underlined features of design behaviours, we seek to assign a meaning to the connections between the performed behaviours and the 'direct matching, associative matching, incremental synthesis and radical synthesis functions of intuition.

Features of above-mentioned intuitive processes have been frequently defined in 'situation assessment', 'idea generation' and 'decision taking' activities or tasks respectively. These activities tend to show similarity with the activities that have been used to define design process in literature. Relevantly, Designer's performance has been commonly discussed as having three main activities; problem defining (analysis), solution generating (synthesis) and decision making (evaluation) (Lawson 1980, Zeisel, 1981, Cross, 2000, Kheiri et al., 2013) which already correspond to the activities that intuition is defined on a theoretical level. In line with our perspective, Bastick, (1983) suggests that the designer is able to intuitively grasp/evaluate the situation, generate ideas or decide what to do (cited in Shirley and Langan-Fox, 1996).

In this sense, limiting the focus solely to these activities and discussing the presence of intuition in these activities, is expected to provide a consistency to degree of certain point by taming the wide range possibility to the most apparent ones.

To clarify the focus of following case study, **problem defining** actions refer to the act of grasping a meaning, apprehension of a situation, while the designer identifies the possibilities and understand the design challenge at hand. In other words, it is act of 'reframing and personalizing the problem', as well as assessing the ins and outs of the condition or conceiving the vital details (Duggan, 2007, Badke-Schaub and Eris, 2014). According to Burnette, the designer intuitively knows what approach to follow or what to think about or do once faced with a situation (Burnette, n.d).

Solution generating on the other hand, is an action in response to the 'framed problem'. Whether it is an idea or a solution, or an answer, intuition is a capable of 'producing' the necessary response to the given situation. According to Lewis and Lovatt (2013), this happens in sudden fashion and the ideas arise in the millisecond of time.

Lastly, the **decision-making** action is the evaluation and the assessment of the outcome. As Goldberg (1989) also notes intuition "…informs us whether to go or not go, in terms of yes or no. Ideas come to feel more or less true, and tentative conclusions seem more or less correct" (cited in Hill, 1987). According him, intuition can operate as "…discriminatory function that leads to the feeling of certitude that is experienced with intuitions". Badke-Schaub and Eris, 2014, also mention that it is the designer's intuition that creates the feeling of satisfaction and tells the process is done or the

solution has reached to a decent level in which the design can proceed to the next step, and the process can be finalized.

All these activities are expected to cycle (loop) repeatedly until the solution space reaches the final form. Researchers acknowledge them as processing in systematic sequential order as well as in a random iterative manner. Of course, this section is not interested in how they operate in order, but expects to observe intuition in terms of these activities.

4.2 Exploratory Study

In order to trace intuition, an exploratory study was conducted with twenty architects. Half of the participants were novice architects with maximum 10 years of active work experience whereas the other half were experienced architects with minimum 30 years of active work experience. The two group of participants, the novice and experienced architects, were chosen in order to find out whether the role of intuition differs among designers with different levels of experience. What was asked from them was to generate a 'preliminary design proposal' in a 30-minute design session. During the sessions, they were asked to provide a sketch drawing in the form of a plan, section and elevation in 1/500 scale. Throughout the design sessions, participants were asked to verbalize their design moves as long as they were comfortable with it. In another words, they were not forced to verbalize every decision they make. As Wilson (1994) discussed by referring to work of Ericsson and Simon (1993), verbalized data may not be highly beneficial for tracing the intuitive behaviours, however, it can be used for identifying their thinking flow. Thus, the analysis of the design sessions is mainly based on pure observation of the designers sketching performance. For data collection procedures, participants' design performance and the verbal data were recorded via a

video recording device. The camera captured participants' hands and the sketch performance, avoiding their face so the gestures and face mimics are not included in the investigation.

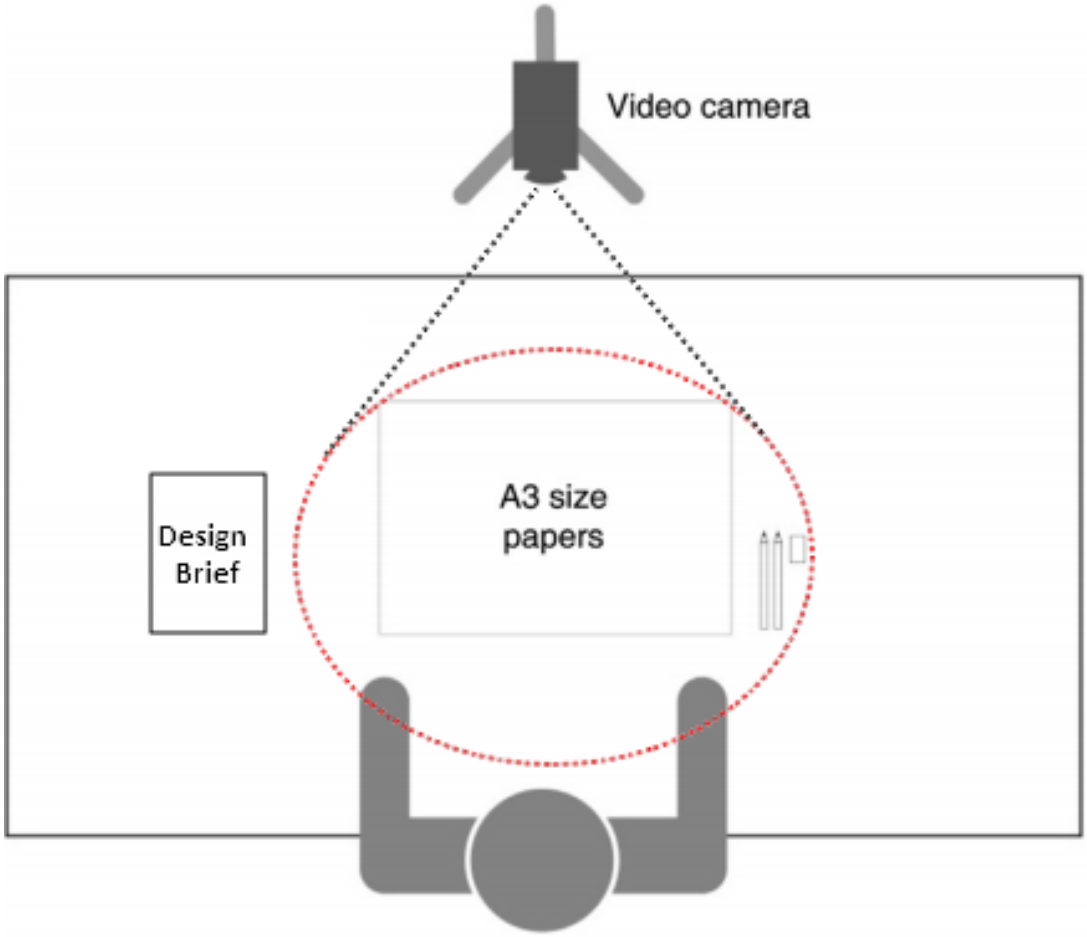


Figure 9: Design session setting

During the sessions as seen in the figure 9, along with Design brief (figure 10), A3 size 1/500 and 1/1000 site plan, drawing tools (scaled-ruler, pencil, tracing papers) were given to participants. The exploratory study was conducted at participants' usual work places to ensure that the designers' usual and natural design performances were being observed. At the beginning of the design sessions, each participant received the design brief along with contextual information about the site in a written format.

DESIGN TASK: A Preliminary Design Proposal

Exhibition and Conference Hall for Faculty of Architecture

Function requirement:

- An Exhibition Hall, representation of graduate projects (60-80 project)
- A Conference Hall,
- A Lobby

Site Location:

- Eastern Mediterranean University Campus, Famagusta, Cyprus

Verbal information will be given about Campus Plan, Distant from the faculty of architecture, Entrances to Emu Campus, Important vistas from the site (sea view), brief topographic and climatic aspects of the site.

Duration: maximum 30 minute, the participant can conclude the task in a shorter period of time.

Figure 10: The design brief

The design brief was an exhibition hall for architecture students in the campus of Eastern Mediterranean University. The design task was intentionally chosen to be 'an exhibition hall for architecture students' since it was thought to be challenging and enthusiastic for the participants to work on. Brief program was given to the designer;

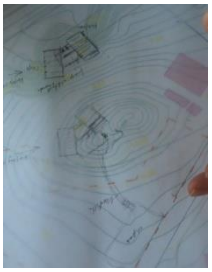
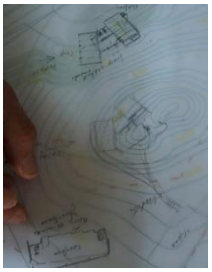
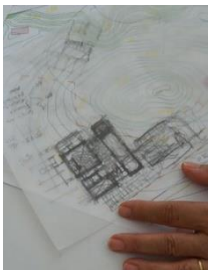
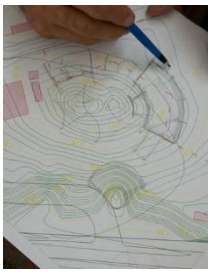
however, it should also be noted that, it was not obligatory to follow the given program and there were no specific requirements related to the output of the design session. In other words, the participants were free to interpret the design brief and to generate solutions based on their understanding. This loosely defined design task was believed to provide a kind of open-ended design environment and a freedom to designer to be productive in terms of imagination rather than being directed or guided by 'heavy program requirements'. This is because the participants might have barely understood 'the design task with heavy requirements', and spent lots of time in analysis and hardly respond to it in the given 30 minutes. The only limitation was the timing of the design session which was limited to a maximum duration of 30 minutes. During the design sessions, participants were informed that they could conclude the design sessions once they were satisfied with their proposals. The open-ended design task and the maximum 30-minutes design session were planned to somehow positively guide the designers to think intuitively or to trigger participant designer's intuition. Also, this setting might force them to hurry, (To think fast) and would guide them to perform their usual process rather than trying something else. Once again, this study aims to focus on the observation of various intuitive functions. Therefore, it is not interested in the quality of the end product of their design outcome or how good or bad their proposal is, but is rather concerned with how the participant designers think or take action. In this sense, to identify intuition in the underlining features of designer's behaviour, design moves were examined and interpreted qualitatively by two observers (by the author himself and the Supervisor Assoc. Prof. Dr. Türkan Ulusu Uraz) separately from each other and only the overlapping findings are presented in this study. Thus, among the 20 participants, only 19 participants are represented within the study (1 participant was eliminated). At the end of their design session, unstructured interviews were also

carried out with the designers. The questions in interviews are shaped according to the thinking path that participant designers went through. If the designer approached the design task upon ‘patterns/chunks of knowledge’, questions were asked accordingly to reveal those design moves. Questions such as: “how can you relate your solution to your previous experiences/knowledge?”, “is there an explicit connection?”, “have you ever thought upon similar thinking patterns before?” were asked. On the other hand, if the designer approached the design task as new experience, questions were developed in order to investigate their action, questions such as: “how can you relate your solution to your previous experiences?”, “was this a new experience?”, “can you guess or foresee if the generated ideas need alteration and development or change in time?” were asked to the participants. Although the informal interviews provided significant data, in order to prevent possible miss-guidance of the designer’s explanations, only the interview data that correspond with the observations are presented along with the discussions.

4.2.1 Findings of the Study #1: Revealing the Intuitive Functions

In light of the underlying features of performed behaviours, it was revealed that there are certain design moves and tendencies that go hand in hand with the features of direct matching, associative matching, incremental synthesis and radical synthesis functions of intuition. The findings of the exploratory study suggest that when designers are able to perform these intuitive functions, whether intentionally or unintentionally, they get into a certain mode of design. In other words, it can be their intuition that shapes their design tendencies. They either follow the flow and automatically perform upon spontaneous features of intuition or strategically apply slow/forced intuitions as described in the framework.

Table 3: Timeline of the design sessions of 19 participants.

00:06:00	00:12:00	00:18:00	00:24:00	00:30:00
Experienced participant #1				
				
Experienced participant #2				
				
Experienced participant #3				
				
Experienced participant #4				
				

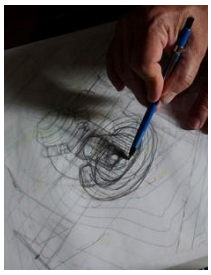
00:06:00 **00:12:00** **00:18:00** **00:24:00** **00:30:00**

Experienced participant #5


Experienced participant #6

Experienced participant #7



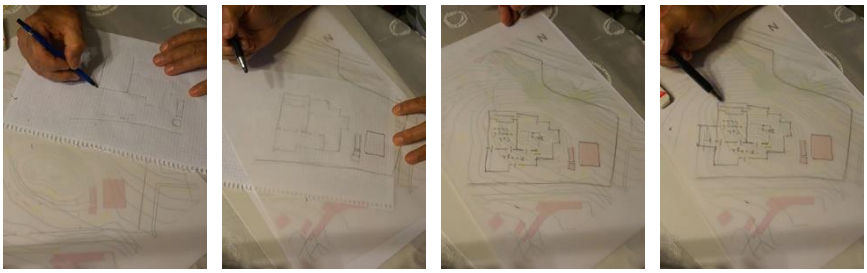

Experienced participant #8



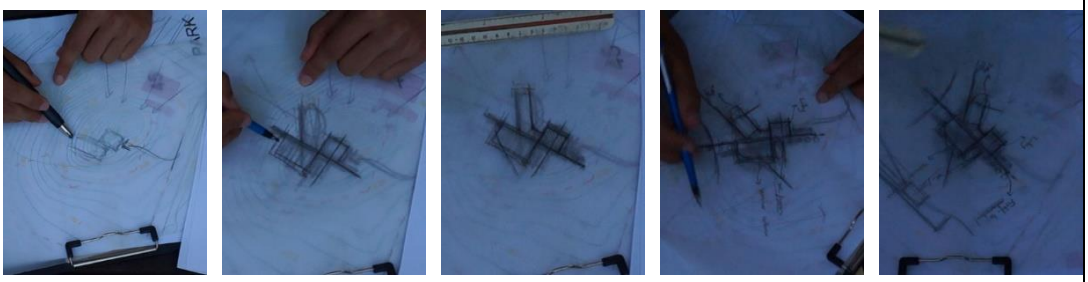

00:06:00	00:12:00	00:18:00	00:24:00	00:30:00

Experienced participant #9

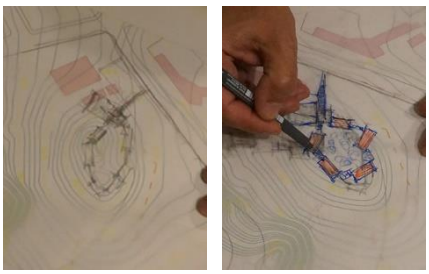
Experienced participant #10



Novice participant #1



Novice participant #2



00:06:00 **00:12:00** **00:18:00** **00:24:00** **00:30:00**

Novice participant #3


Novice participant #4


Novice participant #5





Novice participant #6





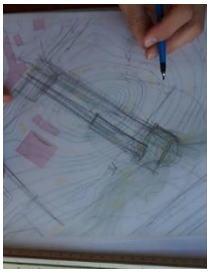
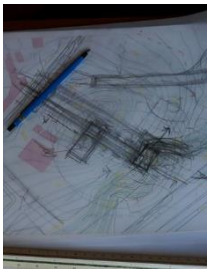
00:06:00	00:12:00	00:18:00	00:24:00	00:30:00
Novice participant #7				
				
Novice participant #8				
				
Novice participant #9				
				

Table 3 shows screenshots taken from participants' design sessions at 6th, 12th, 18th, 24th and 30th minutes representing the process that they went through within the 30 minutes. As some participants reached satisfaction with their preliminary proposal earlier in time, they concluded their design sessions before the maximum time limit.

The overall investigation of cases shows that major differences among the cases is the time taken to reach the essence of the main idea behind the preliminary solution and associated design thinking behind the design moves. Therefore, observation of the similarities and differences within the cases suggests that each session has its own design variables in terms of "time (in reaching to preliminary idea) and design moves (style of approaching to design problem". Although the table 3 expresses the idea about the overall process of participants performance, our observation suggests that each case should be investigated within its own timeline, as every session has its own breaking points and thus, own key moments.

In order to reveal design moves that go hand in hand with intuitive functions, the best representative cases are picked and discussed in this section. Because of the nature of the intuition, during the investigation phase of the cases, not every case was able to reflect such explicit representation of intuition. It should be also mentioned that, chance of comparing or finding the overlapping key moments of intuition or the presence of intuition was difficult since one finding hardly matches or is similar with the other one. In some cases, there was a tiny moment that partially addressed a link to intuitive functions and in some cases, intuition was not likely to be observed in a moment but the process itself reflected the clues about the intuitive functions. In other words, every finding was investigated in its' own conditions and mostly interpreted with the overall understanding and the ambition behind the design moves through the process.

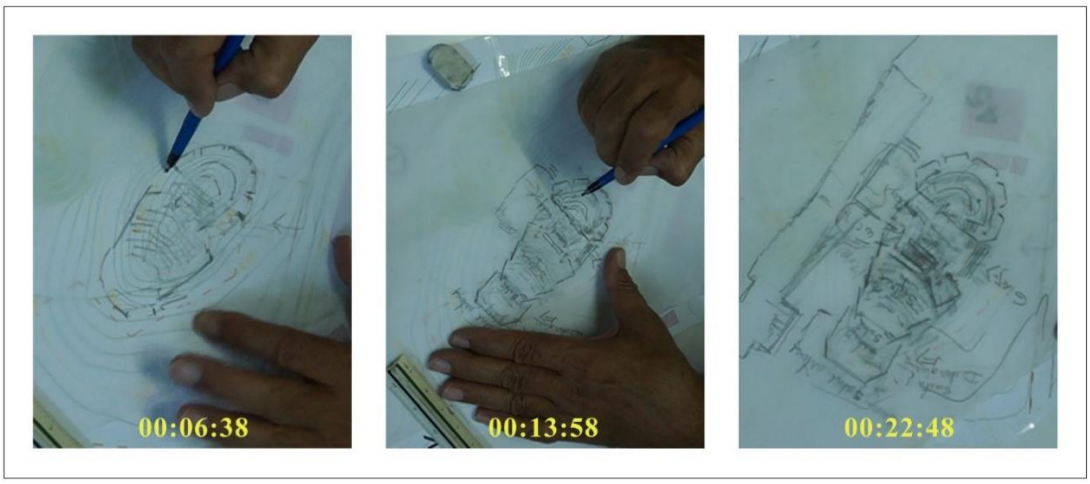


Figure 11: The design session by experienced participant #1

According to the results obtained by the observations of the design sessions, it can be argued that participants during the design process partially or dominantly relied on *direct matching*, which is reflected in their behaviours as they spontaneously relied on their past design experiences and acted upon immediate, effortless, explainable and reliable chunks of ideas. Participants who followed this approach dominantly reached early solutions in a very fast manner within maximum seven minutes and the path they followed is also reflected by the detailed solution, the confidence and the 'certainty' (being sure about the proposed solution) of the sketch performance illustrated in figure 11. In this case, the designer generated a detailed and precise proposal in the very beginning which was consistent throughout the design session. The observations also revealed that the designers naturally tend to perform smoothly when they recognize the solution immediately. It simply happens because of the effortless nature of *direct matching* which does not demand cognitive effort. Hubka and Eder argue that designers are set to jump to solution (as cited in Badke-Schaub and Eris 2014), similar to Cross (2007), who also claims designers are solution-focused, and states that such feature is in their nature. This feature allows "… the designer to quickly see/recognize/conceptualize the problem in a meaningful way" (Badke-Schaub and

Eris 2014, 362). Thus '*direct matching function'* in this sense, provides spontaneous solutions with a feeling of certitude, keeping the design process within the safe lines, avoiding mistakes and providing fast solutions based on previous schemas and patterns.

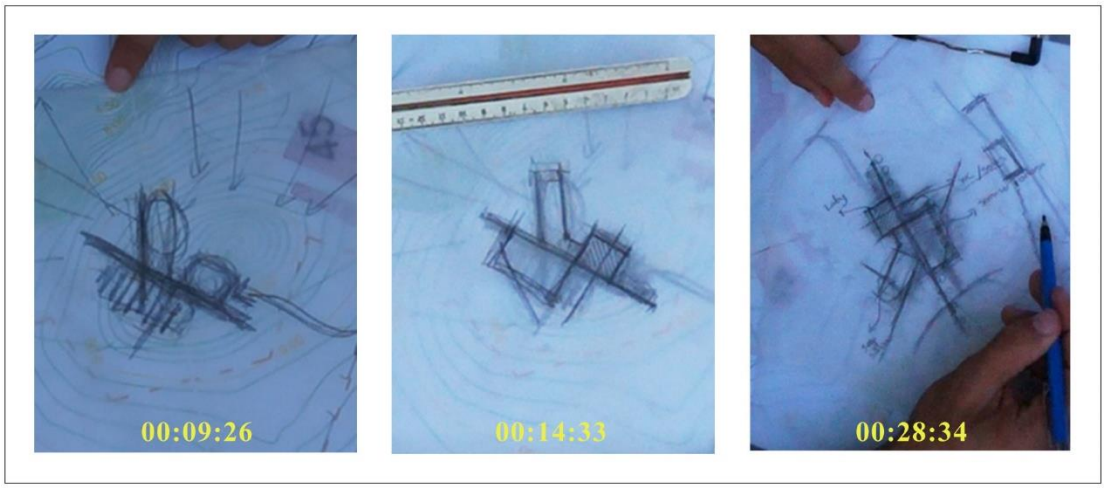


Figure 12: The design session by novice participant #1

Another performed intuitive function by the participants was observed to be *associative matching*. The findings obtained from the observed sessions showed that designers performed without thoroughly thinking and making judgement in order to be productive and welcome the fresh, 'interesting' and 'exciting' ideas. Because such ideas are respectively new and may lack logical references, it may be the reason why the designers themselves either didn't intend to or were not able to completely explain the causality behind their ideas during the design performance and informal interviews. Participants following this path avoided to think in details and kept exploring solution space in a very abstract – conceptual manner acting upon on the spot 'hunches or free association' reflected from cues in the situation. Throughout the 30-minutes design session, they focused solely on developing ideas and scenarios with spontaneous ideas, as illustrated in the case shown in figure 12.

Our findings also show similarity with the literature which argues that this tendency also seems to fuel subjectivity and thinking outside of the box (Badke-Schaub and Eris 2014). For instance, Lewis and Lovatt, (2013) define this as an act of improvisation, happening on the spot such an instantaneous way, welcoming the surprises, by naturally eluding the analytic mind, without any preparation and self-criticism. According to Raami, (2015) "In order to make room for intuition so that it can take the leading role and generate fresh unique ideas and solutions, a person needs to turn the dominance of their reasoning faculties 'off'" (p.143).

As Kickul and Gundry (2011) also state, intuition experientially, provides a way of dealing with the unknown. Our findings correspond with the findings of Ferronato et al. (2017) who argues that "use of intuition … in design, relates to the ability of designers to transform their procedures in immediate and experimental ways, emerging through associative connection in order to approach the unknown … and the creation of unexpected connections". In this sense, as vastly mentioned in the literature, this understanding of intuition is superior in coping with ambiguous nature of ill-structured problems (Raami 2015).

The case shown in figure 13, is an example of the '*incremental synthesis*, During the interviews, Experienced participant #3 explained that he did not prefer to go with immediate solutions but looked for a new solution. Another finding observed during the sessions shows that a similar behaviour was performed when designers could not immediately solve the problem but needed time and effort.

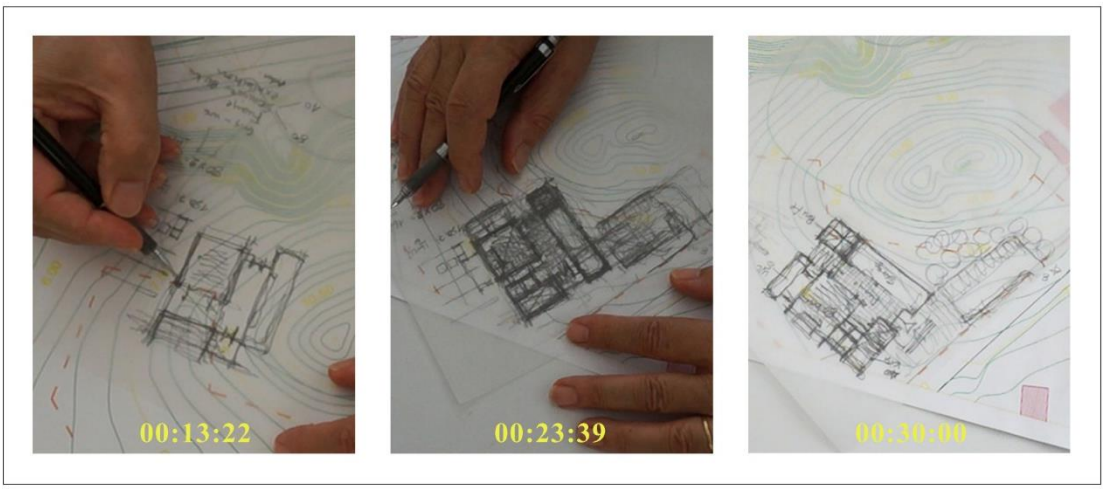


Figure 13: The design session by experienced participant #3

Based on the information gathered in the interviews, even though the participant has significant experience on the similar design briefs, he preferred not to follow his previous examined solution even if it was available but rather sought to provide new interpretation to the design task based on the lessons and the schemas learnt from the domain specific experiences. During the design session, he generated a new solution in a predictable manner by re-constructing existing knowledge. This mode corresponds with the *incremental synthesis function*, establishing new arrangement in light of the accumulated patterns. Klein, (1998, 2003) also defines this as a re-organization of the chunks of information into a new interrelated pattern.

During the sessions it was also possible to observe participants that performed *radical synthesis* function which, according to Sinclair (2011), is a deliberate act of abandoning the 'known' and seeking surprisingly novel ideas (Dörfler, as cited in Sinclair 2011). It tends to offer deeper insights and genuinely unique ideas which bridge seemingly unrelated information. During interviews, Experienced participant #4 clearly mentioned that, he was not following the initial idea that appeared in his mind at the very beginning and sought to generate a solution that is more sophisticated

and interesting (figure 14). The designer followed this behaviour in order to get out of his comfort zone and to find his own challenges with the desire of alienation from familiar references. Duggan (2007) acknowledges that to create something unique and simply new, designer should ignore immediate 'matching ideas'. In this scenario, even if the designer is able to perform the action spontaneously, the designer should aim to make radical innovations and go beyond the current paradigm (McCrea 2010).

Figure 14: The design session by experienced participant #4

The other participant (novice participant #9) who showed the same design tendency, intentionally conditioned himself to generate something unique. We observed that both of the participants forced themselves consciously to elude the analytical details and think in an abstract manner. During these cases, the participants mentioned that they intentionally avoided to finalize the solution, kept the solution abstract and avoided getting into details, to open their mind to the new possible flash of ideas. The arriving sudden ideas were also observed in their expressions during the design sessions, where the participants suddenly jumped from problem space to solution space with the arrival of the genuinely interesting idea. Such captured moments also correspond with findings of Dorst and Cross (2001). They argue that such leap can be defined as a

bridging moment where the designer shifts from the problem to the solution with suddenly appearing truly unique idea. Therefore, if one seeks a novelty or going beyond existing paradigms to surpass the limits of known, '*intuition'* is imperative as Raami, (2015) points out. Nelson & Stolterman (2003) also argue that "design knowledge tends to emerge from conscious not-knowing, therefore, in the process of designing, an initial state of intentional ignorance or emptying of the mind is needed to be completely open to a prevailing situation" (cited in Raami, 2015 p.29).

4.2.2 Findings of the Study #2: Inclination to the 'Intuitive Functions'

During the cases, it has been found that, either there is certain circumstance that trigger the designers' intuitive response or their intuition is shaped by their own ambition. Therefore, inclination to the intuitive functions can come along with the choices of designer but also can be conditioned by the situation itself. Thus, this section discusses inclination to the modes under two conditions; the interaction of designer with the problem and the designer's disposition.

4.2.2.1 Problem Consideration

Although, the same design task has been given to all participants, it has been observed that whether the problem is considered as well-defined or ill-defined is up to designers' perception of the problem. The unconscious perception of the situation at first sight directly affects the mode of the intuitive response and in which intuitive functions the designer inclines to. Similar to Goldberg (1989), this study also found out that, it relies on designers' personality and mind-set which determine whether they perceive the problem as well-defined problem or ill-defined problem. And as it has been discussed above, their perception highly shapes which intuitive functions are going to be triggered.

Our findings also correspond with Cross's and Schön's attempts. According to Cross, (2007), when designers are solution-focused (well-defined case) or either problem-focused (ill-defined case), they automatically activate their design codes that are related with their type of focus.

Schön's assumption is also based on the reflective form of knowing-in-action:

> When a practitioner reflects in and on his practice, the possible objects of his reflection are as varied as the kinds of phenomena before him and the systems of knowing-in-practice that he brings to them. He may reflect on the tacit norms and appreciations that underlie a judgment, or on the strategies and theories implicit in a pattern of behaviour. He may reflect on the feeling for a situation that has led him to adopt a particular course of action, on the way in which he has framed the problem he is trying to solve.

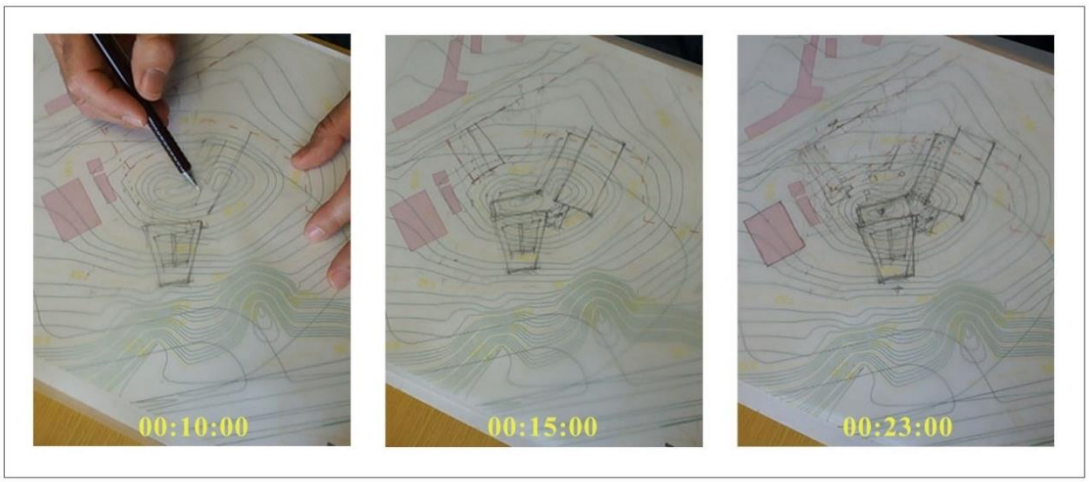


Figure 15: The design session by experienced participant #8

During the design sessions, it is observed that the 'left-side' functions of the framework (Direct matching and incremental Synthesis) are performed when designer approached to design task as 'well defined problems'. Literature also highly discusses direct matching and incremental synthesis functions as they have a capacity to operate mostly in tameable or well-known situations. Getting into these modes, directly determines the direction of the process.

Another dimension of unconsciously inclination to intuitive functions is also related with the ‘familiarity of the problem’. As Badke-Schaub and Eris (2014) puts forward, intuition in order to act in well-defined cases, requires relatable experiences with the faced condition. In figure 15, experienced participant #8, frequently repeated his priori experiences and his rule-based accumulated knowledge while approaching the design task and was concerned with what the design solution ‘should be’ rather than what it ‘could be’. The findings of the study show similarity with this definition as the performed ‘left side functions (direct matching and incremental synthesis) observed to be resting on the availability of the ‘accumulated schema’ in necessary context with necessary priori connections’. Regarding that, Baylor (2001) and Bruner (1960) cited in McCrea (2010), in referring to these ‘functions’ noted that “availability of intuition” rests on the ‘familiarity’ of the situation or at least relatable priori experiences.

Whereas ‘direct matching’ is based on familiarity with domain and patterned knowledge in more direct-static sense, on the contrary ***‘associative matching and radical synthesis’*** is based on more sophisticated enigmatic familiarity (Ex. Metaphoric associations). That is why ***‘direct matching and incremental synthesis’*** is more efficient in routine situations, while ***‘associative matching and radical synthesis’*** can tolerate ambiguous conditions in the attempt of cueing new relations and are triggered in when situated condition is unfamiliar. According to Schön, this capacity to respond to surprise through improvisation on the spot is what he mostly meant by *reflection-in-action.*

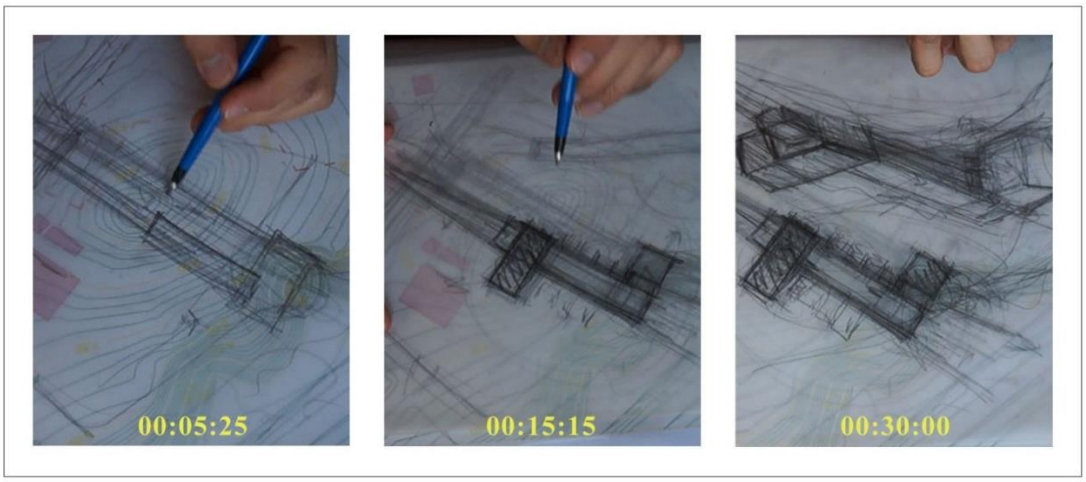


Figure 16: The design session by novice participant #9

Whilst well-defined situation guides the designer to act upon their 'patterned knowledge', with their 'known', ill-structured problems call for associative matching and radical synthesis functions. These functions are observed in performances when the designer approaches to design problem as an ill-defined problem. Our findings also show similarity with Kickul and Gundry's (2011) and Sinclair's (2011) claim, as the right-side functions of the framework (**associative matching** and **radical synthesis**) were comfortable at operating with the 'unknown' and has tolerance for ambiguity and complexity. Thus, these functions are set to be more effective in an unstable environment than in a stable environment. In figure 16, novice participant #9 left the solution space open for change by tolerating the unknown direction it will be developed into.

In light of this, Schön, (1983) mentions that, "practitioners themselves often reveal a capacity for reflection on their intuitive knowing in the midst of action and sometimes use this capacity to cope with the unique, uncertain, and conflicted situations of practice" (1983, pp. VIII-IX). Thus, relying on intuition is often necessitated by the ambiguous nature of design task (Öllinger & Goel, 2010; Pretz et al, 2003; Schön,

1983 cited in Pohjannoro, 2016). According to Raami (2015), “Most of the problems faced by designers are like this: entangled knots with countless variables and uncertainties” (p.33). When such subjective (open-ended) and complex environment of the design event is considered, it is inevitable to acknowledge intuition as a necessary cognition in design process.

> An unstable environment, however, poses three challenges to face oriented information processing or data analysis: (1) time constraint on collecting data/information; (2) need to collect a large amount of data to deal with environmental instability; and (3) lack of reliability of the data or information. In fact, designers face an even more fundamental problem, which is to know what data are relevant (Khatri and Ng, 2000, p.8).

Based on this argument, Technically Associative matching and Radical Synthesis are triggered in the absence of adequate information and without precedent or when there is insufficient, contradicting, or too much information.

> Agor (1990) has identified several conditions under which the use of intuition is appropriate: (a) there is a high level of uncertainty in the environment; (b) there is little previous precedent for action in the face of new emerging trends; (c) there are limited or no ‘facts’; and (d) there are several plausible alternative solutions to choose from with good factual support for each option (cited in Khatri and Ng, 2000).

Direct matching and incremental synthesis also discussed by Goldberg (1989) with his own ‘labels’, differ from Associative matching and radical synthesis, as they involve facts and provable information rather than alternatives and possibilities. Also, while direct matching and incremental functions seem to be performed as convergent activity where they lead to certain answer, associative matching and radical synthesis are performed as divergent focus leading to more than one certain answer. Left functions generate the direct outcome specific to a problem, while right functions generate subjective ideas that are appropriate to the situation but are not necessarily right or wrong.

4.2.2.2 Designer's Disposition

Whether the problem is tameable or not, in such subjective environment of design, designers are able to consciously shape their vision. Thus, in this case, how to conceive the problem is a matter of perspective of the designer since the design work can be familiar and unfamiliar or the case can be "well-defined" or "ill-defined" simply by their consideration. In this sense, even in the most unfamiliar conditions the designer is able to find a familiarity to some extent and/or simply ignore the familiar references in familiar situations.

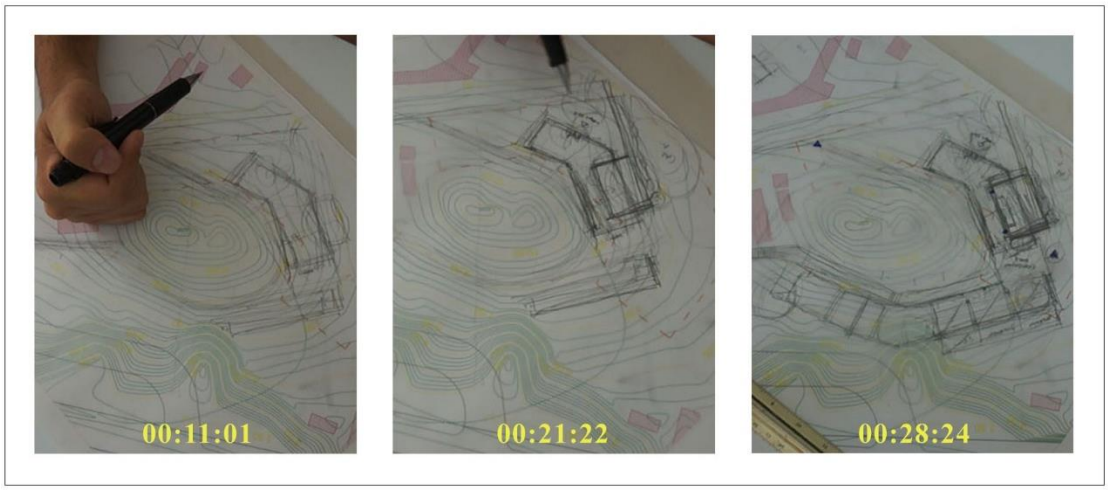


Figure 17: The design session by novice participant #6

When there is 'priori experience' in their mind, because of the ease and sense of righteousness in the mind, designers naturally prefer to lean towards the left side of the framework. This arises from high self-esteem of the designer, or simply because of the effortless nature which does not demand cognitive effort. That is because, even in complicated and unfamiliar situations, designers seek to familiarize the problem to the certain extent. This means that the designers make use of the already existing 'schema' not only in the routine but even in new situations (Lang, 1987; Badke-Schaub and Eris 2014). In figure 17, after his session, novice participant #6 mentioned that the

proposal he designed turned out to be very similar to one of his previous projects although he didn't plan to copy or be inspired from his previous works.

On the other hand, the designer might also prefer to rely on *spontaneous* models simply because there might be no need for effortful action. According to Jutla (n.d cited in Badke-Schaub and Eris, 2014):

> This may be because the problem has hundreds of independent constraints … *(needed to be holistically perceived)* … or that some of the constraints are purely about aesthetics or feelings. Sometimes it's because you can't spend your time analyzing every single problem you come up with … *or even you might don't want or prefer to do it*.

In other cases, this happens also in the opposite manner, assuming as they can still act upon spontaneous intuitions, the designer might not be satisfied with the spontaneous outcomes. In this sense, radical synthesis is triggered not only in non-familiar situations, but also applied intentionally with the desire of alienation from familiar references (in Figure 18). In this scenario, even if the designer is able to perform the actions with spontaneous capacity, the designer strictly aims radical innovations or simply achieving a knowledge beyond the current paradigm.

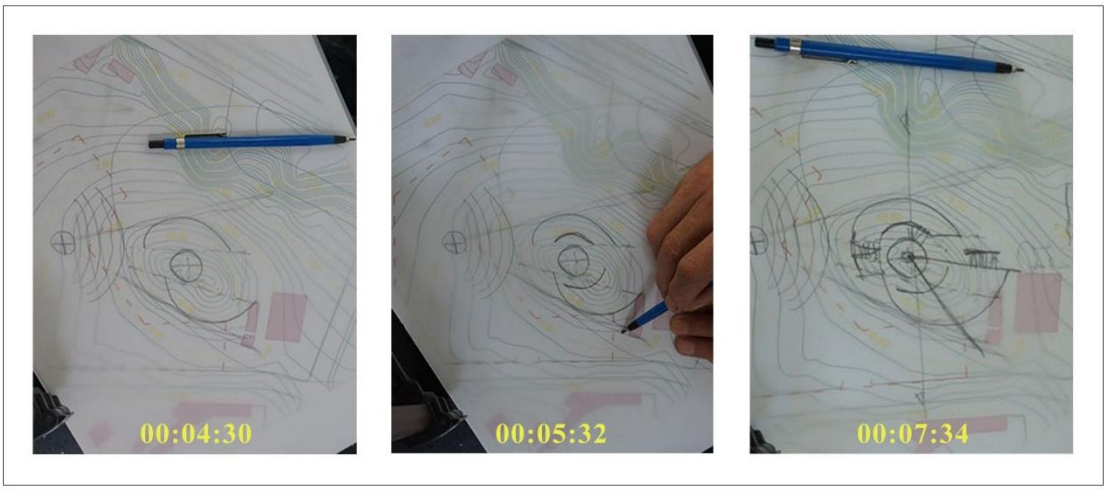


Figure 18: The design session by experienced participant #6

4.2.3 Findings of the Study #3: Do Functions Correspond to any Specific Behaviour?

By investigating all of the functions in design session, the exploratory study verifies the validity of the intuition functions in the framework that have been put forward by this study. However, mainstream literature on intuition is shaped around two forms: judgment as a sort of intuitive apprehension / decision making and on the other side 'act of creating' defined as 'intuitive creation'. The ambition in which the functions are presented as abstract and flexible concepts, pays off in articulating intuition as colorful as it can be.

Beside radical synthesis and direct matching functions, which are frequently discussed in literature, incremental synthesis and associative matching functions were observed during the cases. Based on the theoretical assumptions, although it was expected to observe the 'direct matching' and 'associative matching' in problem defining and decision making, and 'radical' or 'incremental' synthesis in solution generating phase, it has been observed that, intuition simply, can be anywhere in any form during the design process. Each of the direct matching, associative matching, incremental synthesis and radical synthesis were observed to act in 'problem definition – solution generation – decision making' activities.

Contrary to conventional wisdom, findings also show that synthesis functions can be performed in such problem defining and decision-making behaviors whereas direct matching and associative matching were observed to be beneficial in solution generation activities. To illustrate, there were some situations as the designer benefited from 'intuitive synthesis' which plays a key role in developing an understanding of the situation. Or vice versa, there were also cases in which the designer, spontaneously

drawing upon previously learned information, associated (direct matching) with that situation to arrive to a solution.

4.2.4 Findings of the Study #4: Revealing Design Modes in Relation to Functions of Intuition

In light of correspondence of the functions and the underlined feature of designers' behaviors in sessions, we have managed to interpret four types of 'designerly attitudes. These attitudes are: 'Following the shortcut, moving within the boundaries, going with the flow and getting into challenge' which correspond with the direct matching, associative matching, incremental synthesis and radical synthesis functions respectively as discussed in the previous sections (figure 19). The findings of the exploratory study suggest that when designers get into the mode any of these 'attitudes', whether intentionally or unconsciously, they automatically perform upon subconscious with the styles as described in the framework. acts bounded

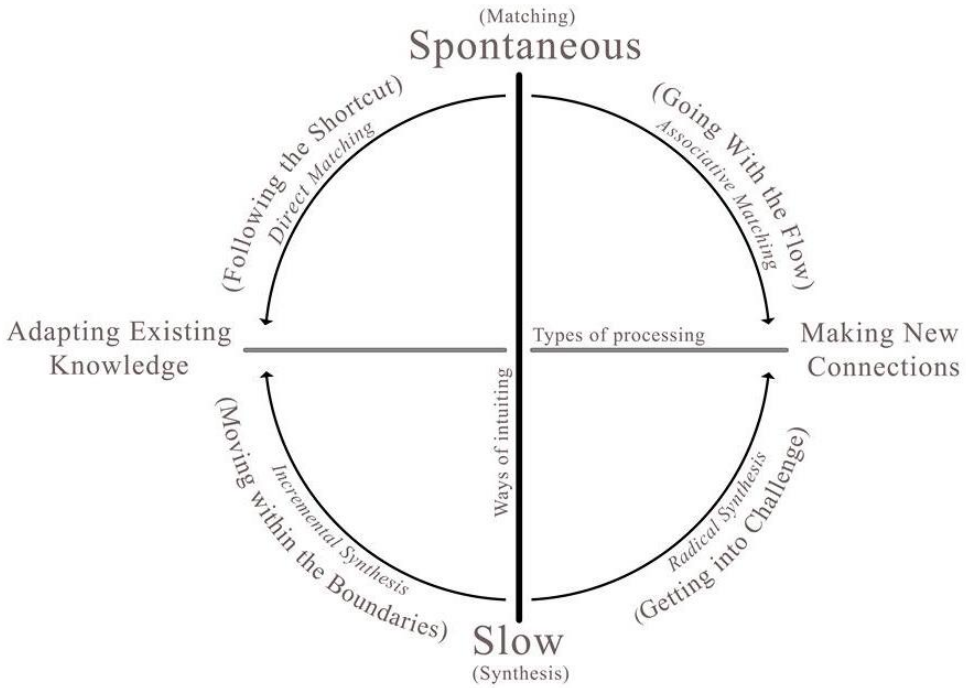


Figure 19: Revealed design modes in relation to intuitive functions

These ‘attitudes’, in vertical level, reflect the modalities of ‘the intentionality’ and ‘spontaneity’, same as it has been discussed in the framework section. On the other hand, in horizontal level the left and right-side attitudes reflect the modalities of ‘safe’ and ‘risky’ as well as being related to ‘convergent and divergent’ type of focus. Safe and convergent side of the attitudes means the designers’ mind is set to operate upon ‘trustable’ and known ‘default’ elements limiting the possible upcoming challenges that will be a surprise during the design process. On the other side ‘risky’ and divergent pole refers to the designers’ approach to the problem with open-ended manner, meaning which way the ideas will be finalized remains unknown (surprise).

A very similar perspective was put forward by Cross (2007). He identifies two different flow of design process, as “defaults” and “surprises”. He differentiates ‘default’ and ‘surprise’ as follows: ‘default’ means the routine acts where the designer experiences the design process in a usual way while ‘surprises’ on the other side, refers to the ‘the unusual flow of the process’ in which the designer meets new challenges, ideas or solutions.

As Cross argues, every design process has defaults and surprises within itself and the designer experiences both modalities in a single design process. It should be noted that, the following modes are based on the extracted portions and does not represent or cover-the complete 30 minute of design sessions.

In brief, ‘following the shortcut’ attitude was performed in sessions as the designer was willing to take the easy and trustable way by directly adapting the ‘known’. During the sessions experienced participant #5 mentioned that: ***“I have followed what I know***

and the solution came out by automatically'… 'once I saw the site and function list, I knew what to do'.

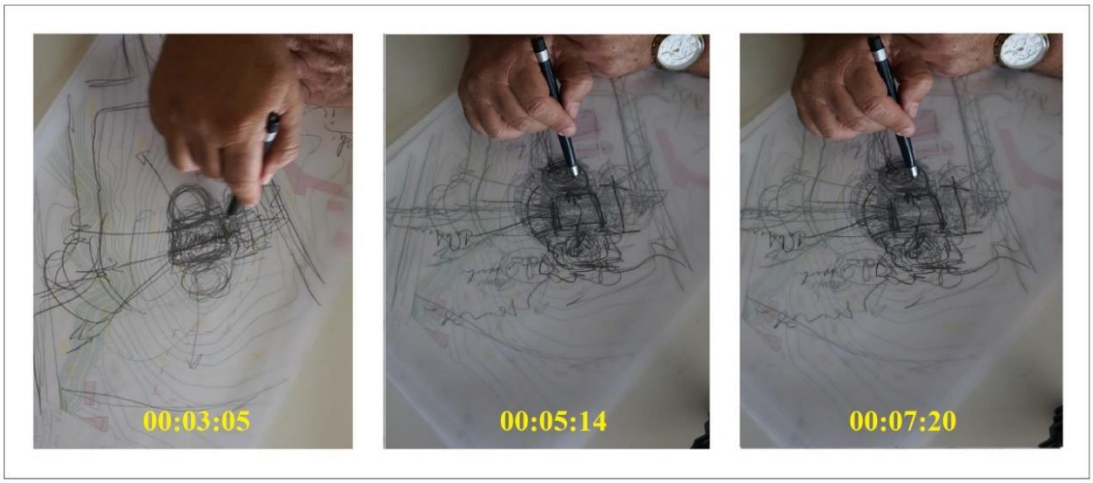


Figure 20: The design session by experienced participant #5

In line with this verbalized data, it can be argued that, the designer was not only sure about how to approach and manage the problem, he was also sure about what the final solution will be. In other words, he knew the solution that he proposed will be perfectly appropriate and the necessary answer to what is required from the design task. However, while the designers who have followed this attitude reach fast and detailed, as well as reliable and safe solutions, it has also been observed that their approach arguably may lead to 'conventional solutions'.

'Going with the flow' attitude on the other hand, is acting with gut- feeling in which the facts and the appropriateness of the ideas are very loosely considered. Designers, following this attitude, get into sort of a spontaneous imaginative / explorative dimension, where ideas arrive intrinsically. During the design session, designers underlined that such state of mind is like 'day-dreaming' (seeing a vision with the mind's eye). Novice participant #7 in this regard, mentioned that, ***"Intuition in my***

office practice is crucial. It is about trusting and not thinking. The thinking part comes later...” Similarly, another participant noted that… ***“of course, the solution needs to be developed architecturally, but I would have lost the ideas if I focused on finalizing the task.”***

Figure 21: The design session by novice participant #7

Novice participant #7 also mentioned that ***“Intuition, simply is a path that I walk, the direction I go, pulled this way or that. The amalgam of inspirations, ideas, curiosity, vision.”*** While the designers who have followed this attitude reach spontaneous interesting ideas in the sense of improvisation, some of these actions resulted as ‘blind guessing’. Thus, although, it boosts productivity and freeing, opening up the mind for fresh associations, it may be missing the necessary appropriateness in some conditions and may mislead the designer.

‘Moving within the boundaries’ attitude on the other side, is acting with the limits of known while seeking an alternative. However, this mode is still based on pondering on the problem and the effort spent with attempts of finding an answer, it is very similar to ‘direct matching’ in terms of convergent focus and being on the safe side. Even

though experienced participant #7 (figure 21) in sessions mention that ***"I didn't want to repeat myself."*** they also mentioned that they ***"…tried to apply what I have experienced and adapt them into this new solution."*** where the ideas they generate, are based on re-synthesis of past patterns into an alternative form.

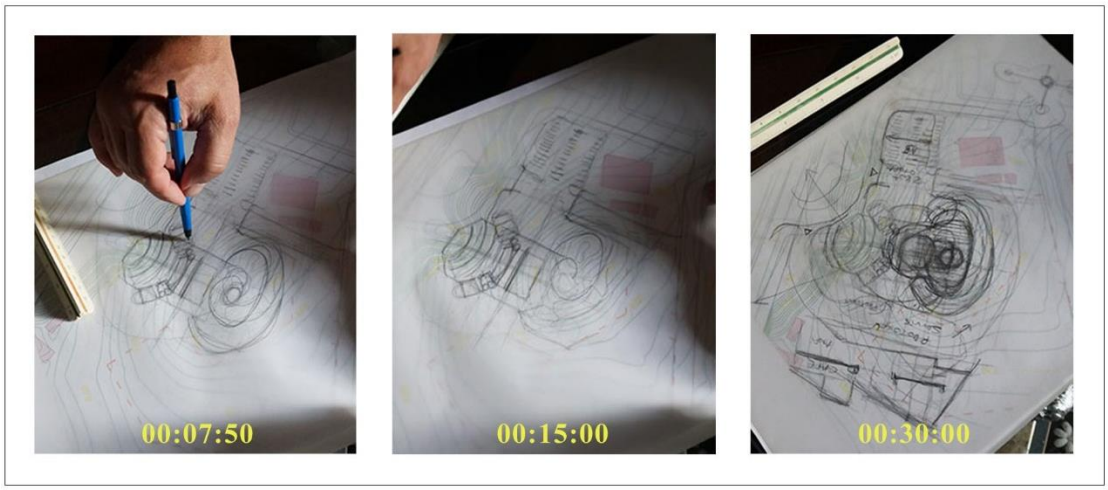


Figure 22: The design session by experienced participant #7

At the end, this pondering and exploring acts on the problem space results with insights based on the alternative versions of well-known schemas. Thus, this attitude remains less adventurous, limited in exploration, less likely to be a surprise, but more likely to be default which may lead to 'conventional solution'.

On contrary, 'Getting into challenge' is pushing the limits of the known rather than following a 'convenient approach', that is, this attitude is closer to divergent focus and risky side since it is based on 'surprising' insights that is truly unique idea / unusual solution. During the sessions, experienced participants #9 and #4, following this attitude mentioned that ***"…if I had done first thing that came to mind, I wouldn't have been creative. That would have been a conventional solution."*** The ambition that drives designer to search for a new and interesting outcome, may lead them to take

risks and explore the problem space with untested /new relations and visions (so called unreliable) which may result in ‘blind guessing’.

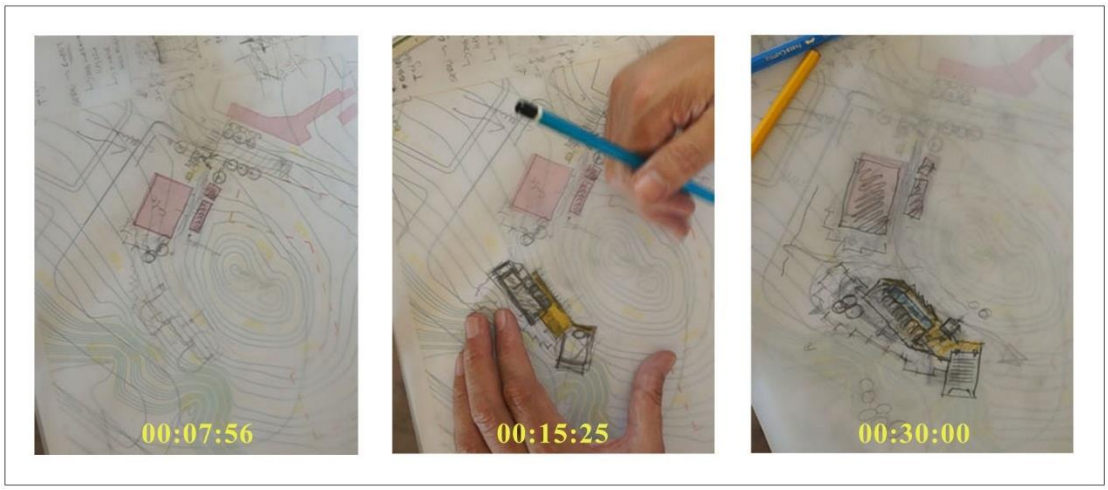


Figure 23: The design session by experienced participant #9

Table 4: Summary of the intuitive functions observed in design sessions

	Observed Design action	**Consequences of action**	**Criteria and condition**	**Supportive verbal data from the cases.**
Case of Direct Matching	*Immediate apprehension of the problem and responding to it with ‘certainty ‘and ‘confidence’ through the prior detailed schemas* *sense of righteousness.*	***Fast arrival detailed, reliable, safe solution*** ***May lead to ‘conventional approach’***	*Requires having similar or familiar schema/pattern to a situation* *routine or familiar cases (well-defined problems)*	***‘I have followed what I know and the solution came out by automatically’ (experienced participant #1)*** ***‘once I saw the site and function list, I knew what to do’ (experienced participant #5)***
Case of Associative Matching	*Immediate apprehension of cues in the problem and responding to it with fresh ‘unpredictable’ exciting ideas* *Tolerating the uncertain and ‘unpredictable’ flow of the process’*	***Fast arrival of interesting ideas*** ***May lead to ‘blind guessing’***	*Requires having priori knowledge relatable but not necessarily directly specific to the situation.* *Ambiguous and Unfamiliar situations (ill / wicked defined problems)*	***“once I started, things immediately made me recognize this interesting idea and I followed it.” (novice participant #1)*** ***“of course, the solution needs to be developed architecturally, but I would have lost the ideas if I focused on finalizing the task.” (novice participant #9)***

Case of Incremental synthesis	*Avoided immediate recognitions and Pondering the problem for a while.* *Discovering new solution in light of the prior detailed schemas.* *Ambition of seeking respectively new.*	***Slow arrival of insights based on seeing the well-known schemas in a new whole.*** ***May lead to 'conventional approach'***	*Requires having similar or familiar schema/pattern to a situation* *routine or familiar situations (well-defined problems)*	***"I didn't want to repeat myself." (experienced participant #4)*** ***"tried to apply what I have experienced and adapt them into this new solution." (experienced participant #8)***
Case of Radical Synthesis	*Avoided immediate recognition, and Pondering the problem for a while.* *Dedication of generating completely new knowledge.* *Ambition of seeking new without repeating yourself.*	***Slow arrival of insights based on truly unique idea / unusual solution*** ***May lead to 'blind guessing'***	*Requires having priori knowledge relatable but not necessarily directly specific to the situation.* *Ambiguous and Unfamiliar situations (ill / wicked defined problems)*	***"if I had done first thing that came to mind, I wouldn't have been creative. That would have been a conventional solution." (experienced participant #4)*** ***"Keeping the work at abstract level, provides me new insights throughout the process." (experienced participant #4)***

4.4 Discussion: Is Intuition Differs Among Experts and Novices

During the 30-minute design sessions, the majority of participants (12 out of 19) exhibited fluent performances, effortless and on the spot behaviours. They mostly relied on immediate intuitions rather than slow intuitions and that is assumed to be either because they were asked to imitate their usual and natural design process or they hurried because of the 30-minute time limitation. Several experienced and novice participants have mentioned that because of time limit "they couldn't concentrate or come up with satisfying solution". Novice architects were mostly observed to act upon '*associative matching'*, whereas the experienced ones relied on '*direct matching'*.

Experienced participants #1, #2, #5 and #10 seemed to take actions that are more likely to be defined as 'direct matching' while the cases of experienced participants #3, #7 and #8 can be linked to 'incremental synthesis'. Experienced participants #4, #9 and

#10 performed behaviors associated with ‘radical synthesis’ and only experienced participant #6 performed behaviors linked with ‘associative matching’.

On the other hand, novice participants #1, #2, #3, #4 and #5 performed actions linked with ‘associative matching’, novice participant#7 presented characteristics associated with ‘radical synthesis’. Moreover, while novice participant #6 seemed to take actions closer to be defined as ‘incremental synthesis’, novice participant #8 and #9 performed behaviors associated with ‘direct matching’.

Table 5: Statistical representation of functions performed by participants

Intuitive Functions	**Experienced Participants**	**Novice Participants**
Direct Matching	#1, #2, #5 and #10	#8 and #9
Incremental Synthesis	#3, #7 and #8	#6
Radical Synthesis	#4, #9 and #10	#7
Associative Matching	#6	#1, #2, #3, #4 and #5

Although left side *functions* seem to be specifically associated with the experienced and right-side functions are associated with novice behaviours in literature, our findings showed that both novice and experienced participants follow all type of functions in the framework regardless of their level of experience. Therefore, it can verify our assumption that these intuitive functions are not necessarily specific to novice or experienced designers.

There are cases in which the designer also naturally inclines to one way or rejects certain intuitive functions. To illustrate, the experienced designers were more comfortable with 'immediately adapting past experiences*'*, and 'search for an incremental solution*'* but had difficulties especially with '*associative matching'*. The reason behind this is that *'associative matching'* requires either bypassing the accumulated domain specific knowledge or being inexperienced domain-wise. Not naturally being able to do this, the experienced designers had to force themselves to apply *'radical synthesis*' to surpass the limits of the known (Duggan 2007). On the contrary, novice designers were also observed to adapt their previously experienced ideas to the design task, however, they were more comfortable while seeking new connections.

Experts however, seemed to benefit from their experiences, even when they followed the risky, right side function, they intuitively had their control-mechanism. However, novices on the other side, either because they were ambitious or inexperienced, when they followed the right-functions, they had to apply strong reasoning skills in order to test or develop since they could not naturally or intuitively do it. As Lawson, (1980) and Kim and Kim, (2007) also point out, as designers get more experienced, they carry out most of the tasks in a more tacit, unconscious and *spontaneous* manner. Our findings suggest that being highly experienced also provides unintentional control and limits the ability to bypass the previous experiences. In light of our findings, we can also claim that, when experienced architects rely on their intuition, they are more inclined to *'direct matching'*, which might condition them to follow a conventional approach. On the other hand, Fiscus (2012) claims that designers are prone to do 'blind guessing' by *'associative matching'* when they have low experience. Although such

claims imply sort of negativity, these aspects are actually “effective and productive features of intuitive design cognition” (Cross 2007). For experienced ones, intuition that relies on past experience helps them to keep the task within the safe-lines, avoid mistakes, accomplish it in very-fast manner and enable them to inherently know what the best solution or option is. And for novice ones, unwittingly and gropingly performed improvisation sessions helped them to think outside of the box and provided productivity while dealing with the uncertain cases. In this sense, we should consider the importance of intuition in two ways; it is efficient during the design process since it does not demand from cognitive capacity and is also a truly definite key to a productive performance. At the end, intuition in design ensures neither the quality nor the success of the design outcome but provides productivity.

4.5 An Attempt for Further Investigation

Although we explained the cases in light of single intuitive function that are related to each design session, we followed that path in order to provide clearer and more descriptive definitions of design moves that go hand in hand with the intuitive functions. In their essence, we have to mention that none of these cases are developed upon pure single intuitive function. Usually more than one intuitive function took place. As each function has its own role which guides the designer to act accordingly, most of the time these functions complemented rather than contradict each other. For example, in several cases, the designer benefited from past domain experiences as well as being able to notice new relations (making new connections function) in a single process. Also, even in the most *radical* solutions, some portion of ideas were achieved by *direct matching*. There were also some cases where *associative matching* function operated hand in hand with *radical synthesis* during stage of pondering and exploring the problem, until the arrival of flash of insight. Similarly, complimentary role of

spontaneous intuition to slow intuitive process could be mentioned with the *direct matching* and *incremental synthesis* where the new idea is based on the prior schemas. Also, even the fast-intuitive functions (*direct and associative matching*) found out to be operating parallel to each other at the same time. Yet, identification of these multiple existence of functions in every case was not so easy and sometimes not available. Such further attempt also have risks of falling to become 'too subjective' due to for being personal interpretation.

Despite nearly in every case there were signs of diverse intuitive functions, in several cases these signs are more obvious than the others. In the following cases, a more detailed and focused investigation was applied to picture multiple functions within the cases. For this attempt, experienced participant #9 and novice participants #7 were analysed.

Figure 24: Screenshots taken from the design session of novice participant #7 at 00.05.56 minute

In very early stage, between the minutes 00.00.00 and 00.05.56, the designer tried to feel the site by trying to capture an idea about the ‘slope’ of hilly site.

At 00.06.01 minute the designer had an insight (an aha moment), a holistic vision on how to use the topography and the full image of the entrance / glass façade along with the form/surfaces of the building. His vision includes ‘digging the half of the hill site’ and integrating/ unifying the building to the topography by hiding it within the hill and imagining it to look like as if the building is the continuity or a part of the hill.

Figure 25: Screenshots taken from the design session of novice participant #7 at 00.06.25 minute

Around 00.06.25 minute, this vision immediately triggered spontaneous intuition, covering a spontaneous vision of internal space organisation, the sea view from the lobby, and the staircases that take the user downstairs into the exhibition hall section.

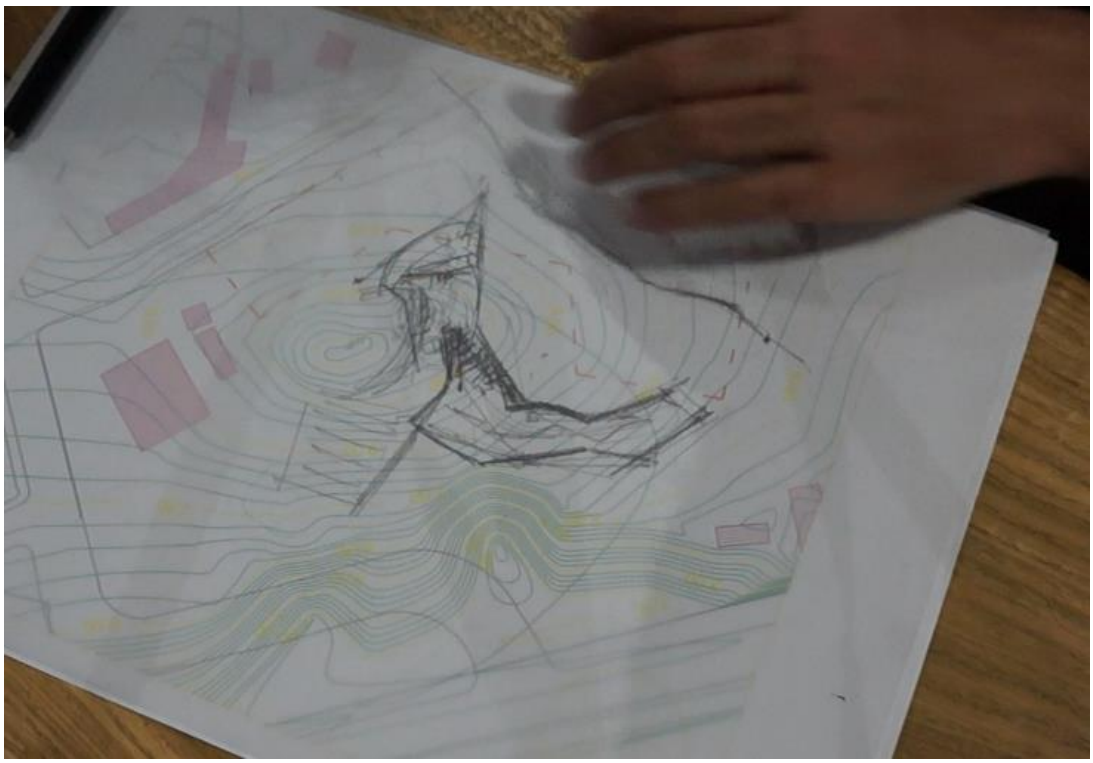


Figure 26: Screenshots taken from the design session of novice participant #7 at 00.10.20 minute

Around the 00.10.20 minute, ‘suddenly’ the staircases that lead into the exhibition hall turned into a ramp. And also, a way that might lead to conference hall section was suddenly transformed into a mezzanine floor that provided an overall vision of exhibition and the sea view from above floor through the exhibition sections’ glass walls. The lobby space got more detailed, yet the connection of the lobby and the hilly site remained unknown.

Figure 27: Screenshots taken from the design session of novice participant #7 at 00.11.32 minute

During 00.13.32 minute, the designer had clearer vision of the façade of the building.

Figure 28: Screenshots taken from the design session of novice participant #7 at 00.12.21 minute

At 00.12.21 minute, in order to solve the struggle of the connection between hilly site and the lobby, the designer simply decided to place retaining wall. Then at 00.14.00, after drawing the elevation (probably to check the vision he had at the beginning and to search for better connection with the 'lobby and the hill part') he suddenly had an aha moment, and the walls of the lobby that holds the topography turned partially into glass, and partially to the natural rocks that leap into the lobby. He noted that by this way, "the users will feel the building is part of the nature and the environmental setting (the sloppy site). The designer, at the same time, while concerning with the façade of the building, had a vision that there might be stairs in front of the building which take the users to the top of the building/hill for a sea view.

Figure 29: Screenshots taken from the design session of novice participant #7 at 00.21.00 minute

Between 00.17.00 to 00.21.00 minutes, he double checked the logical consistency of his ideas, and the possible disadvantages and good sides of his proposal, meanwhile simultaneously developing the idea of 'having slopping topography in the building' to 'terrarium like courtyard'. Also, he thought about the pedestrian access from the

faculty, which led him to a concern about the form and the secondary entrance next the conference hall.

The key moments that are presented above are summarized in terms of intuitive functions:

- 00.00.00 to 00.06.00: pondering about the topography and the building image
- 00.06.02: **Radical Synthesis** as (Aha moment) arrival of idea after pondering the topography problem
- 00.06.25 and 00.10.00: **Associative Matching** as spontaneous visions
- 00.12.21: **Direct Matching** as doing the safe thing
- 00.13.32: **Associative Matching** as a vision about the façade…
- 00.14.00: **Radical Synthesis as** (Aha moment) arrival of idea after pondering the hill/lobby struggle and the façade
- 00.17.00 to 00.21.00: **Direct Matching** as logically testing the ideas upon rational knowledge, and simultaneously **Associative Matching** as spontaneously arrived ideas.

Figure 30: Screenshots taken from the design session of experienced participant #9 at 00.05.25 minute

In another case, the experienced participant #9, analysed and thought about the space program at the beginning. He thought that, beside the ‘conference hall and exhibition hall, which are the main spaces, order to function properly, supplementary functions such as storage, changing rooms, and wet spaces such wc’s and small kitchen might be needed.

By doing sketching about these spaces individually, he later examined the dimensions and the outline of the spaces by detailed and scaled measurements apart from each other. He searched for a best layout for conference hall and exhibition space. He noted that: “unlike conference hall, the exhibition hall should be narrow and long enough rather than square, to provide better circulation”. He also added that: “we can have light from the north and vertical exhibition surfaces that position perpendicular to north direction. That would be the best layout for this task”. He latter calculated the size of

the display units, and the dimensions of the exhibition space. While doing that, he also simultaneously imagined the entrances to exhibition and mentioned that the “walls could be something flexible and open/connect to outdoor open-air exhibition space”.

At 00.05.25 minute, he was concerned about ‘people energy’ within the existing site/campus, and how to involve that living energy to his proposal. He was concerned about re-adapting the ‘existing café’ to the building complex.

Figure 31: Screenshots taken from the design session of experienced participant #9 at 00.07.10 minute

At 00.07.10 minute, he had an insight about how to deal with his concern. He mentioned that “I have a feeling of creating a street a-like space and small square that connects to dormitories”.

Between 00.07.00 to 00.08.00 minutes, he was concerned about how people around the building complex and people from the architecture faculty will use the square and the re-adapted social spaces.

Figure 32: Screenshots taken from the design session of experienced participant #9 at 00.08.31 minute

At 00.08.31 minute, while deciding where to place the conference hall/exhibition hall, he simultaneously generated the idea of extending the 'street idea' to a direction where topography of the site remains calm (at the same level with the street level). He mentioned that he alternatively would have tried to place building to hilly section, but his initial idea was the 'safer' approach.

Then until 00.15.00, while working on the spaces, he was concerned about the "energy at the street concept" (density of the people at square and café) and linked that "energy" with exhibition and outdoor exhibition section.

Figure 33: Screenshots taken from the design session of experienced participant #9 at 00.15.01 minute

At 00.15.00-minute, the designer re-organized the lobby and the conference hall according to site with rational rule-based concerns and cross checked with the initial investigated space dimensions.

Figure 34: Screenshots taken from the design session of experienced participant #9 at 00.16.20 minute

At 00.16.20, while developing the space, the designer did lots of rational cross checks, as well as simultaneously pondering how could the exhibition spaces, lobby, and outdoor exhibition and the square (the street idea) be connected.

Figure 35: Screenshots taken from the design session of experienced participant #9 at 00.17.23 minute

At 00.17.23 he had a vision about how to extend ‘the street idea’ through the context.

Figure 36: Screenshots taken from the design session of experienced participant #9 at 00.21.31 minute

At 00.21.31, he had an insight, related with his concern at 00.16.20. He mentioned that “exhibition, café section and outdoor exhibition section should all be integrated into one space and linked with the pedestrian access from faculty of architecture”.

Figure 37: Screenshots taken from the design session of experienced participant #9 at 00.25.45 minute

At 00.25.45 he was concerned about the image of the building complex. In his vision, the concrete façade along with glass panels fit perfectly with this green environment and with the functions of the building.

The moments that are presented above are summarized in terms of intuitive functions:

- 00.00.00 to 00.05.00: **Direct Matching** as Rule based sketching on space organisations and a sign of associative matching while imagining the spaces.
- 00.05.25: Pondering about the problem of involving the campus into project.
- 00.07.10: **Radical Synthesis** as (aha moment) arrival of unexpected unique idea
- 00.07.00 to 00.8.00: sign of associative matching while imagining how people will use the social spaces.
- 00.08.31 and 00.15.00: **Direct Matching** as following the safer option and logically cross checking the ideas with initial measurements.
- 00.16.20 **Direct Matching** as exploration while pondering about new concerns.

- 00.17.23 **Associative Matching** as spontaneous a vision about ‘the street idea’
- 00.21.31: **Incremental Synthesis** as (aha moment) the insight about integration the spaces
- 00.25.45: **Associative Matching** as a guessing about the form and material of the facade of the building

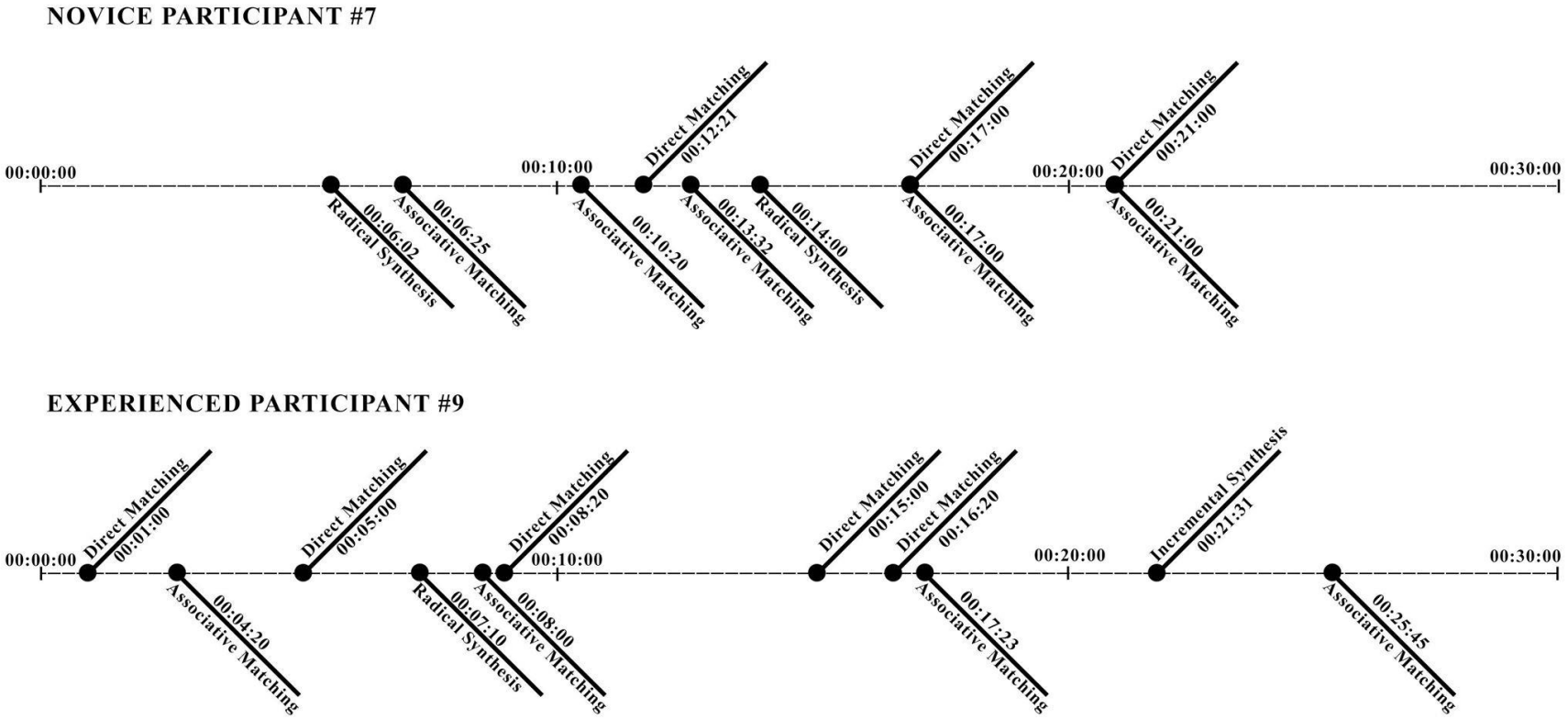


Figure 38: Usage of functions in the timeline of design sessions.

Although in the previous sections these two cases along with the others are examined in light of single 'intuitive function' which involved and played a significant role during the development of the main idea behind their proposal or the dominating function through their process, this section shows multiple functions that get involved in the various moments of the sessions.

During the analysis, it was conventionally expected to find out a certain time, period or phase for the preference of intuitive functions, that match with the conventional design idea (which starts with divergent-explorative phases and concludes with convergent phases). Despite this expectation, our findings suggest that we cannot provide such generalisation for intuitive functions as such thinking flows of the participant designers were very random and complicated, and each intuitive function can be anywhere and anytime in the process.

Further investigation on the other hand can be carried out with a more crowded case study with more participants, where the researcher can explore which function is more likely to take place at the beginning of the design process and what happens at the later stages. Such a study can also look at which moment these functions dominantly appear and whether these findings differ expert and novices. Further studies can look for answers to these questions and for verified findings, future studies can be teamed up with field of neuroscience for 'identifying "the processes where multiple functions are involved".

4.6 Chapter Conclusion

This section by mainly dealing with the main purpose of this study, searching whether intuition differs among expert and novices, had gone over several research questions

and pathways. In the end, by the means of the case study, the intuitive functions, along with the designerly behaviours, the criteria and the conditions that trigger these functions, their corresponding behaviours and modes, outcomes or consequences have been explored. But above all, the section simply reflected how deeply intuition can be defined in relation to design.

By investigating all of the functions in design session, this section also provided validity for the framework that has been put forward in Chapter 3. Thus, while providing the significant contribution to designers' cognition in design, the study also puts forward a new perspective on the concept of intuition'.

Chapter 5

FURTHER DISCUSSIONS

Researching the potential of intuition in design was important and interesting, yet it was difficult and challenging at the same time. During the journey of this research, the ambition of unlocking the potential of intuition and revealing how the intuition concept is so significant in design activity was the driving force while dealing with this ambiguous research environment.

Intuition in design research, although addressed in many studies, remained insufficient for the inquiry of this study. In order to reach to a deeper understanding of intuition, the study had to cross the boundaries of other research areas. Various and even contradicting interdisciplinary definitions were investigated to draw a comprehensive understanding of the concept of intuition. By doing so, to tame such a broad research area, the perspective of this research is limited to the most frequently discussed explicit definitions of the concept of intuition. During the phase of conceptualizing the framework, in order to tame disperse faces of intuition, a sort of reduction, generalization and categorization had to be applied while interpreting the various types/styles/functions of intuition. Although the framework is structured in a way that covers any kind of intuitive form, it still is possible to say that we might have missed an understanding of ‘intuition’ that is valid for a person whose intuitive performance may not fit in the framework.

On the other hand, we strongly believe that intuition potentially can never be fully understood with such reductive method as simply reducing it into types or forms does not reflect what we believe intuition really is. Apparently, the study approaches the subject with such manner for a purpose. Although it is pretty obvious that the method which is used in this research does not reflect the nature of intuition, relevantly, the research is carried in that manner in order to explore and reveal styles of framework that cover the variety of use of intuition in literature. The main ambition behind the scenario of creating the styles is not the belief that there are literally four intuitive styles since there could be many more styles revealed within the intersections of the polarities in framework. The main ambition with the framework was to show how intuition can flexibly be suspended into various extremes. In this sense, the presented framework and the styles/functions was beneficial as they explicitly show how intuition can be part of various designer's abilities and simply any kind of design thinking.

We have faced many challenges and questions that leap to the surface throughout the study. Forming the framework in chapter 3 in light of the literature review in chapter 2 was our major challenge in dealing with the compressive and ambiguous research environment of the intuition. At the same time, it was the starting point, a key moment, where the study 'framed its own perspective on the subject', 'took some important decision that stands against conventional theories' and 'set further questions and the hypothesis that needed to be explored in chapter 4'.

'Our framework', besides gathering the various intuitive understandings together, develops key concepts by leaving the pervious labels and strict definitions, and deals with the actual essence and the function of the intuitive activities. This helped to leave

behind the type of intuition that is labeled as ‘Expert’ intuition and stands against the followers of that who believed that intuitive recognition or matching ability’ is only available to expert practitioners. At the same time, we also stand against the association of ‘creative’ intuitive abilities with ‘novice practitioners’. By doing this, we had the hypothesis that, intuition is a flexible ability that belongs to everyone regardless of their level of experience. Our assumption suggests that, novices can do ‘so called expert intuition’ and in the same line, experts can also do ‘so called novice intuition’. This ambition becomes the major hypothesis that has been explored and verified in the explorative study among the experienced and novice designers. The findings show that contrary to conventional wisdom, both experienced and novice designers apply diverse intuitive functions while designing.

It is also observed that intuition covers a large portion of designerly activities, even the extremes ranging from the most ‘usual-conventional to the most unusual ground breaking designers thinking. To illustrate, intuition can most likely be performed at beginning of the concept development phase through associative matching and radical synthesis functions. However, these abilities/ functions can also un-expectedly appear any time in the process, even towards the end. The same undisciplined characteristics of intuition is also valid for direct matching and incremental synthesis. Throughout the investigations, we have learnt that each design activity has its own cognitive path and intuition in these activities are simply unique to the moves and moments as the designer experiences the design situation personally.

In the further investigation section (chapter 4, section 4.4) observations also clarify that intuition is too personal and situation oriented that it can even change among the same designer. Various behaviors and moves that designers applied are defined upon

the four intuitive functions in that section. And by investigating and comparing two participants' work among the cases, it is once more verified that none of these functions can be generalized and specified as certain moments or time in the design process. It is also observed that inclination to these 'intuitive functions' can be intentional or triggered by the conditions of or by the 'vibes' from the situation. This makes intuitive functions able to be performed anytime – anywhere in the process which happens not necessarily controllable or determinable by the designer him/herself. It is much like a knowing that occurs by the natural connection with the design situation and the designer's mind. By this connection, designers resonate with design situation in their inner world and are able to see or know things in the mind's eye upon un-controllable vision, an imagination, a sensation or a perception.

At the end, our work is nothing but an exploration of the intuition in design. Moreover, the study can be defined as an attempt of developing a method for investigation of intuitive activities in design. Above all, the main contribution is to provide a bigger picture of intuition in which intuition is inherent to every human being, and it is directly integrally linked with any kind of design activity and particularly thinking ability of designer. By acknowledging it as a human quality, a construct that is inherent to every designer, that everyone possesses to the certain point of degree. By doing so, intuition can be acknowledged as something that everyone experiences personally in her or his unique way of design thinking performance.

At this point, this study, by directly linking intuition and the design thinking, points out that that design activity has significant intuitive dimension whether the designer is aware of it or not. Thus, this conclusion is important as it shifts the position and the role of intuition in design activity to beyond the understanding provided by previous

design research. This achievement directly contributes to the field of design cognition by taking their ambition on intuition one step further. Existing studies on design ability of designer underline the nature of design thinking which consists of two different types; intuitive and rational thinking (Lawson, 1980). Lawson, puts forward that both types of thinking exist by complimenting each other. Intuitive thinking, according to him, can be experienced in the form of abstract/flexible and explorable improvisation/imagination, rational thinking on the other hand, can be experienced upon more concrete and more objective (rule based) thinking patterns. According to Lawson, it is the necessity of design task that designer performs both these abilities to a varying degree. Thus, design thinking actually is the ability of being able to perform both types of thinking and also its being told that, skilled designer, can easily swap between these dualities smoothly.

Cognitive abilities of designer that provide the designer to think either way, are discussed in two groups. Such categorization polarized design thinking into dichotomies such as: convergent/divergent; focused/ flexible; linear /lateral, serialistic/ holistic, propositional/ oppositional, field-dependent/ field-independent (Cross and Nathenson 1981). In their view, similar with Lawson (1980), Cross (2006), intuition is usually discussed in terms of right side of these dualities and they solely associate intuition with artistic abilities or artistic dimension of the design process. Their view locates intuition as opposed to reasoning.

Our proposed framework on intuition appears to be very important on this matter. While they linked intuition with the right side of the duality, their ambition almost matches with what we defined at the right side of the framework. The importance of the framework stands at this point. Our framework also proposes that the left side

functions can be matched with the kind of knowledge what they called as ‘rational thinking’ at their left side of their duality. That is, we provided an understanding that ‘intuitive cognition’ can process ‘rational kind of information’, meaning that, the design thinking researchers might be mistaken by linking rational information solely to the territory of ‘reasoning - rational faculty’ and reducing intuitive thinking to the ‘right side of the duality’. Yet, their studies have provided a significant and necessary research ground that lighted up the path for today’s further discussions. Without their contributions, conducting this study would not have been possible.

Therefore, this study proposes that, intuition rests at the essence of the design thinking. Our view gravitates the intuition to be effective in all types of design thinking, rather than reducing it to a certain dimension of design. At this point, it is also possible to mention that the functions/styles of framework that has been proposed and discussed already cover these polarities in their essence.

In other words, all these cognitive abilities can be discussed in terms of intuitive dimension as well as the reasoning ability. In this case, this study draws a conclusion that both intuitive and reasoning are different dimensions of design thinking as they operate parallel, are interrelated and neither of them have to follow or contradicts each other. Thus, intuition in this study, is acknowledged as just another dimension of human mind, which does not intersect/conflict with the reasoning mind. At this point, the thesis draws a holistic picture of the design thinking.

It is believed that, this study beside contributing to the concept of intuition and provided an alternative perspective and understanding on undisciplined nature of design ability by addressing the intuitive dimension, subtlety contributes to the design

education. We agree with Cross (1990; 2002) as he underlines that through better understanding the nature of design ability, design educators may be better able to nurture it, this study therefore sees nature and nurture of design activity as complementary interest.

The nature of designers' ability and the development or the nurture of this ability has always been mutual concern of design education and design research. In the era of institutional architectural education, at the beginning of 17th century, according to Beaux-Arts academic traditions, designers were considered to be gifted with the skills and abilities that are not necessarily obtainable by education. During that era, the design abilities of students, considered to be equal with the ability of drawing and representation technique and the architecture during that era, considered to be a branch of Fine-Arts. Beaux-Arts' design ambition is based on 'final/end product' that is developed upon 'well-known, high quality images, forms, characteristic' that existed in that period. This ambition gravitates a type of architecture that is expected to be formed upon 'accepted' and 'ordinary' elements, that is, the designing usually consists of mimicking and re-applying well-known 2D forms taken from historical repertory. In light of our study, Beaux-Arts' ambition of repeatedly teaching the student the well-known solutions, schemes, patterns, falls within the intuition that is considered at the left side of our framework.

On the other side, while modern architecture was rejecting the historical forms and seeking for new architectural language, it was well-understood that, the design practise and more importantly the design education cannot be based on existing norms and styles. With this concerns Bauhaus School of Art and Architecture was established in

1919, by considering the integration of architectural education with various art-based disciplines, focused on nurturing design abilities that are based on creative and abstract thinking. In this sense, intuitive abilities that correspond with right-side functions of our framework highly matches with Bauhaus' ambition. Their tradition is based on discovering designer's own imagination, inner self and potential.

Bauhaus' contribution to design education is important, since todays' formal education is frequently criticized as it does not develop a strategy in education that gives account for 'intuition'. Contemporary design education, however, differs among institutions, lacks awareness towards intuitive values, and focuses more on aspects of rationality by teaching systematic and analytic approaches. Bauhaus's humble attempts in design education that emphasize the development of artistic nature, intuition and creativity of designer candidate in a such personal and intellectual way, came to an end in 1933, after the institution was closed. Afterwards, in the 1950's the rising scientific concerns in the design profession were reflected both in design methodologies and later followed in design research and education, which has little relation to Bauhaus's ambition in the 1920's.

Of course, today, systematic and analytic thinking are matter of tools and strategies that the designer candidate needs to develop, but along with others, our humble ambition is to remind that, todays' design education helps to develop the designer intuition only in a certain way (regarding the left side of the framework), paying not enough attention to the more significant aspects of intuition (regarding the right side of the framework).

Sir Ken Robinson – cites Picasso – by saying that every child is born an artist, but it is more important to keep it that way, as we get older. But what if we don't kill the childish side of our self? How can we maintain it? Do we really kill our creative mind? Some students may be self-taught, and are lucky to develop such intuitive understanding by themselves but there are also ones who do not develop or discover their skill sets. Our concern is that, the pedagogy of intuition in which designers are able to connect new relations, imagine the unknown (the right side of the framework) is left upon, 'indirect' learning of the designer candidate. Therefore, design instructor's will or awareness on this matter is highly important. Thus, future design research, as already there is certain ambition in researching such matter, should focus on strategies that develop 'intuition' in such a way and may consider to investigate Bauhaus on this matter.

We believe the abilities which correspond with intuition of the 'right side of the framework' are the necessary skills that every designer should have. We believe that such abilities are the virtuous dimension of design activity, concerned with much more than the ambition of achieving the most correct solution, but value the affective dimensions of 'design' reflected in the solution.

By the intuition behind their thoughts, designers maintain their own difference and productivity at the ideal level. This ambition is beyond thinking with priori pattern and templates, and very much associated with seeing new connections and visualizing unique visions with the mind's eye.

At the end, this thesis, by picturing the 'unprincipled nature of design activity and designers mind', addressing the 'subjective nature of design and acknowledging it as

‘affective performance’, believes that it is the designer’s intuition (that corresponds with right sided) what makes design activity so special, so unique, so personal, and so virtuous. Moreover, it is the responsibility of the instructor to teach to students how to communicate with design task in that manner, and how to value, maintain and follow their intuition rather losing it by obeying the facts. This is pretty much related with educating “free minds”.

If we have to say the final words, we should acknowledge intuition as designer’s personal way of dealing with the design task. In other words, how the designer develops a sort of special bond with design task, communicates with the design problem, or how the task ‘vibes’/resonates with them. Thus, according to us, it is the perceptual connection between designer and the design task. This definition elevates intuition in design to the very heart of the design activity.

And as it has been said in the beginning, it is inherent to every one of us. It’s not a method or an approach but an innate driving force that leads us to perform to some extent. At the end, intuition in design ensures neither the quality nor the success of the design outcome but provides personal productivity. It is simply very important to understand intuition and its presence in design at least in three aspects: personal productivity, nature of the designer’s mind and the personal dimension of design activity. It is what makes the designers different from one another.

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