



■ The design thinking process

■ Thesis by Julia Vragar

■ Rietveld Academie 2015



Table of content

Introduction	1-2
The design project (in context based work)	3-6
The process	7-8
Design as a mental activity	9
The design thinker	
Logic and reasoning	10-11
Exploration Exploitation	12-14
Reliability and Validity	15
The knowledge funnel	16
Organization	17-19
Design thinking in organizations	20
Conclusion	21-22
Bibliography	23
	25-26

My interest in design is focused on my own ability of identifying a problem and defining new connections between not related fact or observations. A travel back and forth between different angles of a problem with the interest in why I made a decision. I have experience in my projects how the solution is created in the designers mind where small observations of a situation are put into a different order which in itself are the new solution. I identify my design process with the term 'design thinking' because of my own ability of integrate thinking, which is based on to see two sides of a problem with the search for the definition of how they are connected. The conclusions can be interpreted as intuitive, but this is a systematic way of thinking which can be difficult to explain in a rational way. I experience how my own way of reasoning can be used in organizational work at a company but my arguments are subjective and need to be defined in theories.

This thesis will be an investigation in the definition of design thinking in relation to how it can be used in the organizational structure at a company. The integrated and systematic way of reasoning will be defined from the angle of the design thinker in order to show similarities with a business based on analytical thinking and rational proof. I will not refer to my own process but every word is related to my own experience of what design is but in the costume of a design thinker. The structure of the text will follow my own progress in design, from context based work towards an interest of developing the profession of design in organizational work at a company. This thesis will answer the question, "What is the potential of design thinking and how does a designer communicate this with a field that is based on deductive logic?". The definitions and explanations of how design thinking can be used in a rational environment will base a practical work that focus on

how I as a designer can communicate the integrated connections of the design thinker to a language understandable for field based on deductive logic.

The design project (in context based work)

"The project is the vehicle that carries an idea from concept to reality."¹

The focus point in design has shifted from solving a problem to working with a project. Gedenryd describes how the problem has changed from being given to becoming a part of the designers' job to define. "The evaluation from design to design thinking is the story of the evolution from the creation of products to the analysis of the relationship between people and products, and from there to the relationship between people and people"². A design thinker does not try to solve a given problem, his or her aim is to identify and find an improvement of the actual cause. Therefore a design process is not a straight line from problem to solution. The problem-setting is set by a designer after identification of the problem and not by the initial brief. Tim Brown describes that the structure of a project goes through different stages that include a beginning, a middle and an end. The clear structure of a design project helps a designer to anchor it in the real world.

Tim Brown describes design brief as "a set of mental constraints that gives the project team a framework from which to begin"³. The constraints are helping designers to keep track on realistic limits according to budget, technology and market segments. If the conditions are changing during the process, the constraints will follow the new circumstances; they function as guidelines

1) T. Brown, Change by design (New York: HarperCollins publisher, 2009), 21.

2) Ibid, p.42

3) Ibid, p.23

and not as fixed requirements. Tim Brown bases constraints on what is possible in the nearest future (feasibility); what would be a sustainable business strategy (viability) and what would benefit the people (desirability). Together with the constraints the brief should be made to give a clear structure for the project. "A design brief that is too abstract risks leaving the project team wandering about in a fog"⁴.

Problem-setting is defining the reason of why something is not functioning. Like in the following example, when there are cigarette butts in a schoolyard and no one uses the custom-made cigarettes' bins. The product itself in this case is not a problem, what causes the mess in the schoolyard is the behavior of people - the reason why they are not using the bins. The design team will have to understand the actual cause of the problem by observations of the behavior and interviews. They will investigate the users' awareness of their own behavior as well as the placement of the bins in order to understand the actual cause of the problem. In a design project with less clear objectives the design team will research the situation or context from a broader perspective, but with the same techniques.

"In design there is not an already-known goal; the designer creates the goal in creating a solution concept"⁵. In the beginning

4) T. Brown, Change by design (New York: HarperCollins publisher, 2009), 24.

5) Based on interviews with members of the UK-based 'Faculty of Royal Designers For Industry' made by Roger Davis. N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 10.

of a project the objectives tell the direction in which the client wants to solve or improve, and this can be changed during the process. A solution concept is based on the understanding of the problem-setting. "Designers recognize that problems and solution are closely interwoven, that 'the solution' is not always a straightforward answer to 'the problem'." ⁶ According to Pappus "you begin by having something you want to solve or prove, and work backward from there, rather than forward" ⁷. Pappus' observation can function as a mental tool to start in the actual cause and work backwards from there to integrate problem and solution.

The end-result is not the end, every situation and company are in a constant change, and a designer who works towards a final end-result will create a design for now, but not for tomorrow. The end-result should be treated as a beginning of a longterm change that will develop over time. Designers' job is therefore to create a new framing in which the context and people in the situation will improve after the project is done. Gedenryd describes a solution as a false ending. Every solution will have a new discovery improving what the designer has thought was the ending. Tim Brown described how every project has an end and are not infinite. The travel back and forth between problem and solution has a time frame where the final solution will be presented. Time

6) N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 10.

7) Greek mathematician Pappus of Alexandria, around AD 300. H. Gedenryd, How designers work (Lund: Lund University Cognitive Studies, 1998), 65-66.

is the element that will tell if the solution serves its propose.

"Designing with time means thinking of people as living, growing, thinking organisms who can help write their own stories." ⁸ To add the time into the solution concept is to go back to where the investigation of the problem-setting has started – to the point of how people act. Their reactions and change in behavior will tell if the solution was right or not.

8) T. Brown, Change by design (New York: HarperCollins publisher, 2009), 136.

"It seems clear that designing requires sophisticated skills in gathering and structuring information"¹. Inside the design process there is a constant exchange between generating possibilities and making decisions. Naming is the activity of gathering data to identify possible aspects of the problem. Framing is the activity of making choices towards a solution concept. This is the main work for a designer - to identify, categorize and select – a parallel activity of naming and framing. An experienced designer asks for less information, because of the constant process of his own observations. With a good skill of processing data the designer has an ability to integrate framing early in the process, which means it can narrow down and set relevant priorities "to generate solution proposals, which in themselves begin to indicate what is relevant information"². A designer who keeps gathering data without processing it will go around in circles and not be able to produce any relevant work until the end of the project. The immediate quick reaction and processing of the observation will therefore benefit the project towards a successful solution concept.

Divergent and convergent phases work between the solution and problem definition. New possibilities show up in the divergent phase, while selection and decision are made in the convergent phase. Tim Brown describes the process of a design thinking as "a rhythmic exchange between the divergent and convergent

1) N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 120.

2) Ibid, p.121

phases"³. A post-it note in brainstorming is used for idea generation, but helps the design team to make choices and identify new patterns when the divergent phase exchanges with a convergent stage. Tim Brown argues that "in the divergent and exploratory phase of design thinking, deadlines take on an extra level of importance. They refer to the process and not to the people. The deadline is the fixed point on the horizon where everything stops and the final evaluation begins."⁴ He continues with saying that an experienced project leader knows how to turn the idea generation into decision-making and he has the judgement to understand when the management input of reflection and selection is valuable.

Tim Brown describes how analysis and synthesis are "the natural complements to divergent and convergent thinking"⁵. Henrik Gedenryd describes analysis as thoughts and synthesis in the act of extracting patterns from raw information, which is a creative act according to Brown – "the data are just that - data - and the facts never speak for themselves"⁶. The balance of analysis and synthesis is equally important in the process of creating opportunities and making choices.

3) T. Brown, Change by design (New York: HarperCollins publisher, 2009), 68.

4) Ibid, p.83-84

5) Ibid, p.69

6) Ibid, p.70

Design as a mental activity

Henrik Gedenryd describes traditional cognitive theories with the view that design can be done in the head and not necessary as a physical outcome. Seeing design as a mental activity supports the idea of a designer who works within the organizational task of a company. Donald Schön called design a "reflective conversation"¹. In every part of the process there is always a travel between two opposite components. Exploration with experimentation; divergent with convergent; analysis with synthesis. The parallel dialogue on different levels happens constantly in a design process, and sketching and other visualization tools are used to make an action of the mental activity. Therefore what is going on behind should be treated as knowledge. Gedenryd himself points out that cognition is the interaction between mind and world. Which is what a designer does for example with sketching: it functions as a temporal storage for the designer while working with a problem towards a solution. The interactive conversation that occurs in sketching can be a valuable tool in visualization of an idea and can help the communication in a design team. The constant change of phases and processing of information is a quality itself. A designer with a visual language serves its function to improve our environment, but the design thinking with its cognitive abilities to create solutions and identify new possibilities is a quality that many business people know, but are not convinced or know how they can apply this knowledge in their company without losing economical value.

1) N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 120.

The design thinker

Tim Brown describes the design thinker as a t-shaped personality – talking about the ability to make new connections. Many integrated thinkers have backgrounds in different fields and their multitask knowledge make them put the information in a different order. When a designer works with one element at a time, a design thinker works with all the components at once to create a balance. Design thinking is the capacity of integrated thinking, not necessarily the knowledge of designing. The complexity of finding new connections from masses of raw information is the basis of the integrated mind. Nigel Cross describes design intelligence as "an intense, reflective interaction with representations of problems and solutions, and an ability to shift easily and rapidly between concrete representations and abstract thought, between doing and thinking"¹.

Design thinkers do not see one way against the other, they identify connections between the components. The integrated mind works closely with a problem and a solution, and the understanding of them both is important for finding the right solution.

The design thinking tools are based on mental capacities and on what Roger Martin describes as the personal knowledge system, which consists of mastering your stance, tools and experience. Stance is how we relate to the world in relation to ourselves and what we want to achieve. A design thinker's stance is based on an optimistic mindset, because he or she sees as an individual how they can change the world. This mentality has

1) N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 136.

Logic and reasoning

a positive effect on our action and gives designer a direction of where to go. To structure our thinking designers will apply mental tools to take advantage of their thoughts. Samuel West² describes the importance of applying a method to structure your work. This method can be seen as a tool to catch and take an advantage of the idea. "The tools are efficiency vehicles: without a conceptual tool kit, you would have to tackle every problem from first principles"³. A designer can use past knowledge and relate to already known theories and processes to identify and recognize a problem and quickly apply a method of improving the situation. Tools can be used to solve and understand a situation and our stance will tell what is necessary to apply to reach our goal. Experience is a part of our personal knowledge system and will develop over time. Our sensitivity is connected with our experience and will notice small differences when two components are similar, but not the same. By experience we develop our skills and learn how to procedure a task to serve its purpose. Sensitivity and skills are trained by repetition of a task of gathering the specific knowledge we need to make a good result. New experiences and gained tools will effect our stance and change how we relate to the world. With experience a designer will get confident to discover new possibilities and expand the working fields in order to explore new ways of using his or her knowledge. Design thinking is not necessary about design or context based work. It can be used in the organizational work in business as well.

2) Interview with Samuel West; psychologist specialist in creativity.

3) R. Martin, The design of business, (Boston, Massachusetts: Harvard Business press, 2009), 154.

"The concept of 'intuition' is a convenient, shorthand word of what really happens in design thinking"¹. Design researchers prefer to use the term 'abductive logic' to describe what is happening in a design process. Which describes the integrated mind of the design thinker who identify new connections from a given situation. Intuition is an action based on gathered knowledge engaging designers' secureness in making decision without having a rational proof. Experienced designers² describe how they through gathered knowledge react on what they already know. To take the client onboard the designer needs to be clear the communication of which connections he or she made to be sure that the client understand the reasoning behind the new conclusion. Marc Fonteijn³, describes how he prefers to work with clients with an understanding for design thinking. Instead of convincing a client in a specific question, to collaborate with clients with a similar mindset proof will be gathered over time and more people will join.

There are two kinds of organizations which are common in business: intuitive and analytical organizations. Deductive and inductive types of reasoning tell how something really is based on an average research result and proved value. With this reasoning

1) N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 10.

2) Based on interviews with members of the UK-based 'Faculty of Royal Designers For Industry' made by Roger Davis. N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 10.

3) Interview with Marc Fonteijn, at the service design company 31 Volt, Utrecht, Holland.

companies base their decisions on 'old knowledge'. Intuitive ideas and innovation can frighten analytical organizations because they want to prove the value beforehand. A company based on this reasoning can grow in size and scale but they will not be able to develop over time because of their lack of innovation.

The other kind of organizations are companies based on intuitive thinking. Individual creative leaders use innovation to create the organizations where the ideas come quick, but are not put into a system. Those companies see analysis as something that kills creativity. But without any logical system it is difficult to anchor the ideas in reality to make them survive over time.

Therefore abductive logic is the line between analysis and intuitive work. The early pragmatist Charles Sanders Pierce did not believe that deductive and inductive reasoning could prove new ideas. He implemented abductive logic, which is the reasoning of the designer: it was based on understanding that new ideas start in the recognition of a data that can not be put into an already known model. He meant that a new idea starts as a wondering that leads to observation and identification of a new pattern. This reasoning will not prove what is already there, but it will tell what possibly could be true. In the parallel work of naming and framing a designer responds and organizes the data constantly. From a small observation the data will be processed in order to identify new patterns and connections.

A result can not be proved beforehand no matter of which reasoning that have been applied. A decision based on deductive logic is proved by old knowledge but this can not guarantee a successful result. With abductive logic the design thinker base

their decision on actual situation. If a company applies design thinking into their business, they will not get a already proof result, they will develop a company with a strong platform for new investigations and improve their value for a longterm.

Exploration Exploitation

In design process the exploration turns into experimentation, where exploration consists of identifying new patterns and experimentation will test the idea. The difference within the business is that the exploration goes into exploitation. Exploration will search for new knowledge and exploitation will use the knowledge. A business based on only exploration will survive in a short time, because their ideas do not reach stability. A business based on exploitation will reach success in a longer term, but will not be able to adapt with time because of the instant use of the same knowledge. To survive a company needs to keep on developing in order to keep up with the fast changing market. A combination of exploration and exploitation will help companies to find stability in new ideas. The administration of business occurs in exploitation phase that will help a company to make the most advantage of the knowledge it already has.

Companies that on early stage go from exploration to exploitation have a good potential to survive in a long term, if they continue adding exploration constantly. James March¹, a management theorist, describes how companies focus on either exploration or exploitation because of the difficulty of combining them simultaneously, such strategy will not benefit the organization. "Devotion to exploration is the invention of business, a risky proposition and the reason that nine of ten entrepreneurial start-ups expire in less than two years. Exploration alone is unstable business"². The same is for a design project which stays on the stage of naming of new possibilities: a company needs to frame itself and build up a stability with exploitation in the administration of their business.

1) R. Martin, The design of business, (Boston, Massachusetts: Harvard Business press, 2009), 18.

2) Ibid, p.19

Reliability and Validity

The business world is based on decisions that are reliable; they produce predictable outcomes in the spirit of analysis. Validity on the other hand speaks to the future and needs time to be proved. It can not be based only on analytical numbers as in case with reliability. Validity succeeds better with an add-on of a subjective judgement and therefore less popular in a rational environment. A valid result will reconsider context and small nuances of the question and not answer the middle point. A reliable conclusion has a proof and goes quicker. Where large amount of data can be taken apart without human impact, therefore no extra layers of interpretation will be added. Without excluding reliability a company which switches between them (just as with exploration and exploitation) will find a good balance between future and past.

What gains value for a company is narrowing down possibilities and focusing on a few components that will give efficiency. A similarity in the design process is going early from naming to framing, narrowing down opportunities to generate solutions closer to the problem. Constraints are used by the designer as a tool to frame the problem to benefit the working process.

Roger Martins' term for how a company can take advantage of knowledge without losing its value is called the knowledge funnel. It describes how to identify a new market opportunities and how to systemize them into actions. He describes that the beginning of the first stage is the exploration of a mystery, which can be anything according to its context. In a mystery it is difficult to know what to point out from the large amounts of data that are collected at this phase. There is a economical value in the working time by a quick transformation from the mystery into the next stage: a heuristic to gain efficiency in the process. The transformation from a mystery to a heuristic and to the last stage algorithm is dependent on the organization's cognitive experts which are expensive assets of the company. The first two stages need a higher level of experience than the last stage because of the larger amount of information that needs to be reconsidered. Therefore the abductive reasoning that a design thinker possesses and the experience of processing information are qualities that useful in the knowledge funnel formation. To travel along the knowledge funnel is a expense for the companies and therefore a lot of them prefer to work mainly with an algorithm which needs less experienced personnel with lower salaries. To run an algorithm is when the information is narrowed down to be runed by itself without further investigation of the mystery. If the company only focuses on the same algorithm, the organization will keep the mysteries undiscovered and with a limited amount of innovations.

A short-term working method is to only run the same algorithm through a computer code instead of the knowledge funnel. This is a cost efficient solution, but it will stop the company from being interesting on a long-term basis on the market. Using a

computer to create a schedule is a perfect way of implementing a computer code, because judgment will not benefit the result. In other processes where a subjective judgement can add nuances to the mathematical result an algorithm created by personnel is a better practice. An efficient company will use a computer code for routine-based work and the capacity of every employer for a good working climate, where the personnel have the opportunity to learn more.

When a company grows in size it holds onto the type of administration of business where they use analytical thinking as a safety measure. "There goal is not to drive out innovation but rather to protect the organization against the randomness of intuitive thinking"¹. This is related to reliability principle where the decisions can be proved beforehand. "The average manager has been trained and rewarded to look to the past for proof before making the big decision"². They see heuristic and the transition to an algorithm as a big risk because of the value of the new discovery can not be proved beforehand. This is similar to a design project where the result needs time to show the value.

A design thinker, basing on abductive logic, will not practice pure intuition, but will be able to guide a company through the knowledge funnel and reconsider both exploration and exploitation; therefore a good complement for an analytical organization. The in-between profession of design thinking

1) R. Martin, The design of business, (Boston, Massachusetts: Harvard Business press, 2009), 24.

2) Ibid.

Organization

can bring into a company the understanding of the value of exchanging exploitation and exploration that organization needs to sustain their value. Roger Martin argues that the first step in the acceptance of the designers' role in the organizational work is that the companies need to understand that they favor exploitation over exploration and reliability over validity.

To follow the knowledge funnel observation is one tool of the designer to identify small details. If a designer develops the cognitive tools of a deep understanding of a task or a user, the real development work will find another focus than a shallow investigation, which can only lead to already known knowledge.

"CEOs must learn to think of themselves as the organization's balancing force - the promoter of both exploitation and exploration, of both administration and invention."¹

An organization which practices deductive logic and applies reliability has a fixed budget and permanent departments. Within this structure it is easy to change an employee without renewing the organization, as who is employed is less important than the task itself. In such type of organizations every innovative idea will challenge the logical structure, and only quick-fixes are welcome.

To add abductive reasoning as a practice an organization needs to have an openness within its structure. Samuel West describes that the creative environment is created "in the walls of a company"². An open and excepting environment starts in the everyday business practices and behavior. To open up for ideas over the hierarchies and to build up a tolerant attitude where unfinished ideas are welcomed – this is a basis for an abductive organization. In such organizations some fixed positions can be replaced by projects with teams that are assembled for the specific task. A design thinker will have a natural part in the company and can both work on projects and collaborate with the CEO to construct teams. A design thinker can easily switch between different projects in diverse phases. By participating in various projects everyone in the organisation gets an overview of the activity at the company and create projects according to the core of the organization.

1) R. Martin, The design of business, (Boston, Massachusetts: Harvard Business press, 2009), 27.

2) Interview with Samuel West; psychologist specialist in creativity.

"It makes more sense to continue to develop what already exists"¹. Peter Vragér² describes how new ideas need to be developed in order to enhance the trademark of the company. In his work he slowly implements new ideas by listening and creating a dialogue with employees and colleagues. Tim Brown describes, "If your employees or customers don't understand where you are going, they will not be able to help you get there."³ Vragér who is leading a dentist company with a tradition of deductive logic creates development teams with interested employees which study different target groups and questions to improve the service of the company. He is not aware of the similarities with Tim Brown who describes a creative environment as a social and spatial place where the people know they can be free to explore their skills and knowledge, take risks and experiment. The difference between their approaches is that Vragér is not after new ideas and innovation, he emphasizes the development work and with monthly newsletter and visits to the different dentist clinics he tries to implement a realistic but open working atmosphere where new ideas are welcome. In his company there have been recently introduced a premium for the employee who brings up suggestions for new ideas. Constantly in the daily work they encourage the dialogue about improvement and trigger an open environment for every employee to bring the personal commitment in the otherwise rational business.

1) N. Cross, Design thinking: understanding how designers think and work (London: Bloomsbury, 2011), 126.

2) Interview with Peter Vragér, CEO at Folktandvården Sörmland AB. The public dentist company in Sweden at the region of Sörmland with 22 dentist clinics and 450 employees.

3) T. Brown, Change by design (New York: HarperCollins publisher, 2009), 139.

Similarities between design thinking and business environment are closely intertwined, a design thinker can see the parallel, but the knowledge has not reached all those creative leaders who are implementing the same way of thinking without knowing the similarities to design thinking. The perception of creativity as belonging to the art and design field creates a boundary between the fields. To communicate the similarities between development work in a company and how design thinking works more exchange and collaboration needs to be held between the fields. Samuel West⁴ describes how designers or artists need to adapt their language into the field of business. To relate their ideas to economic values which are the elements that an organization based on logic can understand. West points out that no one outside your own field will pay attention to how you reached a certain goal. On the other hand, if the process of design thinking is communicated better, more CEOs will understand how they can implement a designer into the development teams of their organizations.

4) Interview with Samuel West; psychologist specialist in creativity.

The potential of design thinking could be described as the integrated mindset and ability to work with parallel components at once. The abductive reasoning in the design process has been explained to answer the question: *what is the potential of design thinking and how does a designer communicate this with a field that is based on deductive logic?* This has been shown on examples of the parallel processes of analysis and synthesis and by validity and reliability in business. Deductive reasoning has been explained to understand why organizations prefer reliability over validity. A CEO trained in analytical thinking bases decisions on proved value and therefore eliminates validity. A design thinker applies the knowledge funnel and by taking advantage of constraints masters the balance between validity and reliability. A designer that excludes framing and only focuses on naming possibilities will not reach long term result, the same counts for a business that only applies intuition. The balance between processes, innovation and analysis is the core approach to keep an attractive company and an efficient design process over the time.

Design thinkers need to adapt their language in order to work in business. A design process on itself is not relevant for anyone outside your field. To be able to develop the possibilities with design thinking designers need to find more ways of describing their process. If the value of the design thinking is in the integrated mind between idea and solution, this needs to be communicated. Based on this investigation of the design thinkers role related to business I will use this knowledge in a following project focus on how the designer can communicate the ability of the abductive reasoning to fields based on deductive reasoning. To make the the design process interesting and understandable

for other fields I will use the language of business and present the designers process through economical value and budget.

Brown, T, with Katz, B. Change by design: how design thinking transforms organizations and inspires innovation. 1st edition. New York: HarperCollins publisher, 2009.

Cross, N. Design thinking: understanding how designers think and work. London: Bloomsbury, 2011.

Gedenryd, H. How designers work. Lund: Lund University Cognitive Studies, 1998.

Martin, R. The design of business: why design thinking is the next competitive advantage. Boston, Massachusetts: Harvard Business press, 2009.

Sources:

Film: Designing the new business:
<http://www.designthenewbusiness.com/>

Jurgen Bey:
<https://www.youtube.com/watch?v=Gglv5fGrCsY>

http://www.youtube.com/watch?v=Y3cPhlj2uD4&src_vid=YECOlCkBRtg&feature=iv&annotation_id=annotation_620250

Articles:<http://www.design-museum.de/en/collection/videos-and-interviews/detailseiten/jurgen-bey.html>

Arne Van Oosterom:
<http://www.designthinkingnetwork.com/profiles/blog/list?user=2m9c1y641jb06>

Interviews:

Marc Fonteijn: Service designer: 31Volt.
Interview took place december 5, 2014, Utrecht, Holland.

Samuel West: Psychologist specialist on creativity
Interview took place december 3, 2014, Skype Amsterdam-Lund, Sweden.

Peter Vragar: CEO Folktandvården Sörmland AB (the public densit company region, Sörmland)
Interview took place december 22, 2014, Eskilstuna, Sweden.

