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## Implementing Design Thinking for Non-Designers: Learning Profiles from a Q-Methodology Study

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**Abstract:** Design Thinking (DT) has gained attention as a problem-solving method that drives innovation. However, the implementation and application of DT in firms seems challenging. While we know that especially non-designers have problems in adopting DT, we don't know why. Addressing this gap, this study investigates the learning experience of non-designers when Design Thinking (DT) is introduced into a firm. Relying on five projects in which 17 participants took place, Q-Methodology was applied, resulting in three learning profiles of the Empathic Collaborator, the Enthusiastic Missionary and the Focused Expert. Using an experiential learning lens, these profiles are described and explained. Our findings reveal the necessity to consider such learning types to increase the effectiveness of DT. In terms of theory, we found limited capability of existing frameworks to explain our findings, which call for theory that also considers personal traits and contextual factors when implementing DT.

**Keywords:** Design Thinking Implementation; Automotive Manufacturing; Experiential Learning; Q-Methodology.

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## 1 Introduction

Design Thinking (DT) has gained attention as a valuable problem-solving approach that leads to more user-centric products and services in shorter time-cycles (Vetterli et al. 2016; Micheli et al. 2019). Understood as a mindset, process and set of methods that is driven by the ideas of user focus, problem framing, visualization, experimentation, and diversity (Carlgren, Rauth, and Elmquist 2016), the methodology has been diffused to many organisations to develop more user-centered products and to improve collaborations across firms (Schmiedgen, Rhinow, and Köppen 2016). However, while DT comes with great promises, the implementation is much harder as the underlying values of DT challenge existing organizational cultures (Elsbach and Stigliani 2018). In particular, it is known that especially *“cultures based on the values of productivity, perfectionism, and siloed specialization are likely to impede the implementation of design thinking in an organization”* (Elsbach and Stigliani 2018, p.2295). These values are especially prominent in manufacturing firms (Kortmann 2012). Embodied through employees that are working in these environments, especially non-designers in firms cultures that do not rely on the values of user focus, collaboration, experimentation and risk-taking seem to have problems in adopting DT (Elsbach and Stigliani 2018). While literature has analyzed these challenges that come along with applying DT in such organizations on the organizational level (Carlgren, Elmquist, and Rauth 2016; Paula et al. 2019; Elsbach and Stigliani 2018) and on the individual level (Beckman and Barry 2007; Beverland and Farrelly 2011), research still lacks to explain *“the reasons why non-designers may resist design thinking tools”* (Elsbach and Stigliani 2018, p.2296). One reason of resistance could be the different learning characteristics that one can observe when individuals are exposed to DT (Beckman and Barry 2007). However, besides the mentioned exceptions, we do not know much about learning profiles in relationship with DT. To address that gap, this study aims to explore and explain the learning profiles of employees with a non-design background while applying DT in an automotive manufacturing firm by using Q-Methodology. This translates into the following research question:

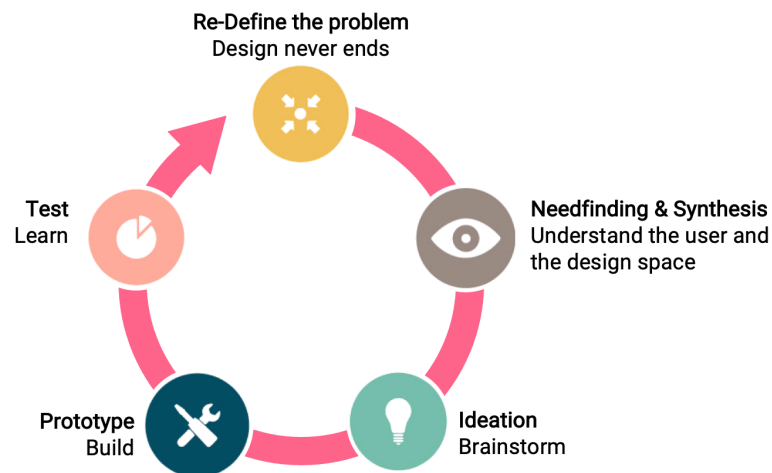
**Research Question 1 (RQ1):** What learning profiles can be observed when applying Design Thinking as a problem-solving method in an organizational context of non-designers and what are implications of these profiles for implementing/using design thinking?

By answering this research question, this study contributes to academia by providing the basis to understand the different learning experiences when applying DT. Doing so can help us to develop *“means to reduce (this) resistance”* (Elsbach and Stigliani 2018, p. 2296). This leverages the effectiveness of DT implementations and can enhance firm’s innovation efforts.

## 2 Related work

### 2.1. Design Thinking

In the past years, the DT methodology has gained momentum as a vehicle for innovation and transformation endeavors in firms across industries (Micheli et al. 2019). While a common definition in the area seems quite challenging, Micheli et al. (2019) have derived the ten characterizing attributes of Creativity and Innovation, User-Centeredness, Problem-solving, Iteration and Experimentation, Interdisciplinary Collaboration, Ability to visualize, Gestalt view, Abductive Reasoning, Tolerance of ambiguity and failure, Blending rationality and intuition and design tools and methods. In line with these principles, DT can also be understood as a process, mindset and toolbox for wicked problem-solving (Brenner, Uebernicketel, and Abrell 2016). In terms of processes, this study conceptualized DT following the Microcycle (Figure 1) which consists out of five iterative steps: 1) Defining the problem, 2) Needfinding and Synthesis, 3) Ideate, 4) Prototype, and 5) Test (Brenner, Uebernicketel, and Abrell 2016).



**Figure 1:** Microcycle according to Brenner, Uebernicketel, and Abrell (2016)

### 2.1. Design Thinking and Experiential Learning

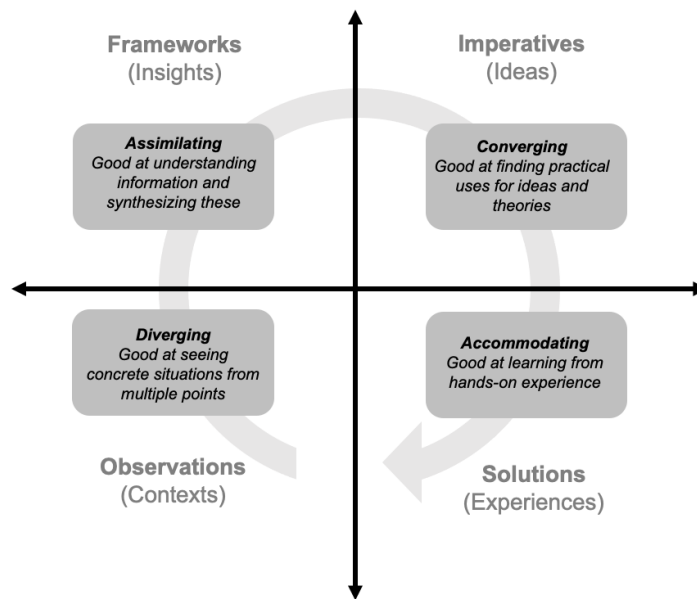
Applying DT in organizational contexts and understanding this process from an experiential learning perspective has gained increasing attention from research in the past years (Elsbach and Stigliani 2018; Beckman and Barry 2007). At its core, these perspectives build on Kolb's (2014) experiential learning theory. The concept consists of a learning cycle and different learning profiles to explain how individuals understand and process information. This theory was applied for DT on the organizational and individual level by Elsbach and Stigliani (2018) and Beckman and Barry (2007).

Elsbach and Stigliani (2018) propose a framework that builds on Kolb's phases from experiential learning theory. They apply findings from a literature review on DT to this learning cycle resulting in an overview of how each stage is experienced in the case of DT.

**Table 1:** *An Experiential Learning Framework for Design Thinking (Elsbach and Stigliani 2018)*

No.	Name	DT Relevance
1	Feedback and Experience	Via use of the DT tools (e.g., interviews, observations)
2	Reflect on Experience	Via signals of DT (e.g. experience emotion of empathy)
3	Develop General Theory Explaining Experience	Via understanding that DT tools lead to solutions when organizational cultures are defined by specific values/norms/assumptions (e.g. collaborative values)
4	Test General Theory	Via further use of DT tools (e.g. interviews)

As shown in Table 1, within the first stage, organizational members gain first experiences and feedback by using specific DT tools. Supported by their experiences and created artifacts, users reflect to understand why DT was valuable. In the third stage, using their reflections, they develop a general theory that can explain their experience through the methodology's underlying values. In the last step, their theory is tested by using DT tools, which results in another experience and feedback loop (Elsbach and Stigliani 2018). In similar direction points the paper of Beckman and Barry (2007) who connects Kolb's four learning types with the innovation process understood along DT's phases. This is depicted in Figure 2.



**Figure 2:** Innovation Process and Learning Style according to Beckman and Barry (2007)

They found a strong connection between different learning styles and phases of the innovation process. During the observational phase, “*diverging*” learning styles that are good at perceiving different viewpoints seem beneficial. An “*assimilating*” learning type seems advantageous when generating insights due to their strength of transforming different perspectives into concise findings. To find ideas, a “*converging*” learning style seems valuable because this style performs well in finding practical uses for ideas. Last but not least, an “*accommodating*” learning style seems desirable when it comes to solutions as they prefer learning from hands-on experience (Beckman and Barry 2007).

While this research from an experiential learning theory has made substantial progress in understanding how individuals and teams experience DT in organizations, we still do not know how non-designers experience DT and why some of them resist using DT as problem-solving method (Elsbach and Stigliani 2018). To address this gap and investigate this topic, this study applied Q-Methodology and investigated the use of DT with teams having a non-design background.

### 3 Research Design

To answer our research questions, this study followed the Q-Methodology, a mixed-method approach relying on qualitative and quantitative data. The approach has gained

increasing attention in disciplines such as Information Systems and Innovation Management (Mettler and Wulf 2019; Stoeckli et al. 2019). We choose Q-Methodology due to its ability to deliver specific profiles (RQ1), and its strength to deliver results based on a small number of participants (McKeown and Thomas 2013). Relying on McKeown and Thomas (2013), Q-Methodology consists of six steps applied to this study which are explained in depth (Table 2).

**Table 2:** Steps of *Q-Methodology* (McKeown and Thomas 2013)

No.	Step	Activities	Outcomes
1	Concourse Definition	Definition of concourse by research team as “ <i>Perception of DT as problem-solving approach for non-designers in manufacturing firms</i> ”.	Questions for Focus Group Sessions can be derived.
2	Q-Set Definition	Gathering different perceptions on DT through focus group sessions after each DT workshop. Transcribe, extract refine and narrow down set of statements.	47 Q-Statements from five clusters.
3	P-Set Selection	Acquire project teams’ members through volunteers and upper management.	17 Participants from different departments with different non design backgrounds.
4	Ranking of Q-Set by P-Set (Q-Sorting)	Participants sorted Q-Set in a Ranking Scheme after conducting DT Projects in person (4) or via video-conference (13).	Q-Sorting Pattern of 17 Participants.
5	Analysis of Data	Data was analyzed using Excel and Ken Q Analysis. Thus, correlation matrix and PCA was conducted.	Three significant factors including their distinguishing statements were identified.
6	Interpretation of Factors	Factors were analyzed considering the context using the data from focus groups, observational notes and interviews.	Three learning profiles of Empathic Collaborator, the Enthusiastic Missionary and the Focused Expert were identified.

### 3.1. Concourse Definition

For this study, the concourse was defined as the perception of DT as a problem-solving method in the specific project background. This is in line with Stephenson (1986, p. 37) who defines the concourse as a “*universe of statements for any situation or context*”.

### 3.2. Q-Set Definition

The Q-Set, meaning the statements that are supposed to be ranked, was built upon focus group data. This is done because statements should be close to the participants natural

language (Brown 1993). The focus group data were gathered from five different project teams that were set up to work on project topics one full day a week for 10 weeks. After each session, questions were asked how each person perceived the tools applied in each workshop. The information was transcribed, and statements that reflect people's opinions were collected. Afterward, statements were filtered, reviewed, and refined by the research team. As a result, 47 statements from five categories (openness for the new methods, ability to reflect, understanding of the method, result of the method, and assessment of the method) emerged. To ensure conciseness of statements, two pre-tests were conducted with employees not participating in the study.

### 3.3. P-Set Selection

The P-Set for this study consisted out of 17 participants from which some were chosen by upper management and others joined voluntarily. Concerning the number of participants, we comply with Q-Methodology, where the P-Set is usually smaller than the Q-Set (Watts and Stenner 2005). All members shared a non-design background (see Table 3). However, in Project Team V, one employee left the company during the project and could not participate in the Q study. Furthermore, one employee joined in two projects (PT I -IP IV/PT II - IP VI).

**Table 3:** Overview of Team Members

#	ID	Age	Gender	Background
1	Project Team I – Interview Partner I	47	M	Mechanical Engineering
2	PT I - IP II	32	F	Mathematics and Physics (Ph.D.)
3	PT I - IP III	46	M	Mechanical Engineering
4	PT I - IP IV/PT II - IP VI	50	M	Mechanical Engineering
5	PT II - IP I	44	M	Electrical Engineering
6	PT II - IP II	45	M	Electrical Engineering
7	PT II - IP III	32	M	Industrial Engineering
8	PT II - IP IV	32	M	Industrial Engineering
9	PT II - IP V	34	M	Mechanical Engineering
10	PT III - IP I	27	M	Industrial Engineering
11	PT III - IP II	31	M	International Business
12	PT III - IP III	38	M	Mechanical Engineering
13	PT IV - IP I	36	M	Industrial Engineering (Ph.D.)
14	PT IV - IP II	52	F	Mathematics
15	PT IV - IP III	46	M	Mechanical Engineering
16	PT V - IP I	26	F	Communication
17	PT V - IP III	25	F	Health Studies



Calculating  $2.58 \times (0.1458) = 0.376$ . Thus, factor loadings  $> 0.376$  can be interpreted as significant. In our case, data revealed a clear picture, which can be seen in Table 4. Building on the statistical analysis and adding insights from transcribed additional interviews (4) with project stakeholders and observational data from a research diary, the factors were interpreted. Interpreting the data in the context of existing literature resulted in labelling the factors as participants' learning profiles.

## 4 Findings

The results show three learning profiles within the data displayed as Factor 1-3 in Table 4. Using the distinguishing<sup>2</sup> statements, each learning profile will be described in two steps. Firstly, building on the Q-Results, the learning profile will be described in detail. Secondly, taking the learning lens, and considering the statement rankings as a starting point, we will try to explain the learning profile relying additionally on interview, focus group, and observational data.

**Table 4:** Results Factor Analysis

#	ID	Factor I	Factor II	Factor III
1	Project Team I – Interview Partner I	<b>0.83</b>	0.17	0.01
2	PT I - IP II	<b>0.79</b>	0.28	0.01
3	PT I - IP III	<b>0.74</b>	0.49	0.12
4	PT I - IP IV/PT II - IP VI	<b>0.72</b>	0.38	-0.01
5	PT II - IP I	<b>0.71</b>	0.36	-0.18
6	PT II - IP II	<b>0.71</b>	0.48	0.13
7	PT II - IP III	<b>0.71</b>	0.48	-0.01
8	PT II - IP IV	<b>0.71</b>	0.42	-0.23
9	PT II - IP V	<b>0.70</b>	0.44	-0.18
10	PT III - IP I	0.49	<b>0.77</b>	0.03
11	PT III - IP II	0.49	<b>0.75</b>	-0.10
12	PT III - IP III	0.41	<b>0.72</b>	-0.19
13	PT IV - IP I	0.39	<b>0.77</b>	-0.17
14	PT IV - IP II	0.36	<b>0.70</b>	-0.28
15	PT IV - IP III	0.34	<b>0.85</b>	-0.06
16	PT V - IP I	0.25	<b>0.89</b>	0.10
17	PT V - IP III	0.01	-0.10	<b>0.96</b>
<b>Eigenvalue</b>		<b>10.57</b>	<b>1.34</b>	<b>1.02</b>
% of variance explained		62%	8%	6%

<sup>2</sup> A statement is distinguishing with  $p < 0.01$  and if the z-score is higher (or lower) than all other statements.

#### 4.1. Profiles from Q-Methodology

**Learning Profile I - The empathic collaborator:** This learning profile refers to the sorting pattern of factor I. The empathic collaborator shares a slightly positive perspective on how they perceive DT in their projects (see Table 5). This profile highly appreciates DT's capability to foster empathy for others (statement 11 & 12). Secondly, they enjoy working driven by the values of openness and transparency (statement 34 & 33). Thirdly, this group is in general open to use new methods (statement 3) and wants to test results in actual projects of their daily business (statement 18), too. Although these members shared high expertise in the problem domain, they were able to generate new knowledge insights (10).

**Table 5:** *Distinguishing statements - The empathic collaborator*

No.	Statement	Ranking
11	Taking time to understand the needs of colleagues in other departments makes sense.	+5
34	The level of openness in dealing with the problem was higher than usual.	+4
12	The method supported me in understanding my role and the role of my colleagues better.	+4
18	Testing the results of the projects within projects makes sense for me.	+3
33	The high level of openness within the project ensures transparency and clarity.	+3
3	Addressing the problem differently than usual was the right choice.	+3
10	Despite my existing knowledge, I was able to generate new knowledge regarding the problem during the Design Thinking process, whereby I have learned a lot.	+2
35	I miss the structure and documentation within the method, as I have no idea where it will lead us.	-2

In terms of explaining this learning type and considering the very positive ranking of statement No. 11, these participants experienced that conducting interviews with stakeholders by using open questions leads to getting a better understanding of needs and, thus, creates empathy for other stakeholders. Reflecting on this experience results in the proposition that asking other stakeholders before developing a solution might be a good idea. This results in the general theory development that people should gain more empathy with other stakeholders to manage projects successfully. Some tested this conclusion in conducting more interviews.

**Learning Profile I - The enthusiastic missionary:** This learning profile refers to the sorting patterns shown in the analysis as factor II. The enthusiastic missionary group shares a very enthusiastic perspective about DT (see Table 6). They seem eager to diffuse the method within the organization and would use the approach again (statement 38 & 39).

They also believe that the iterative process matches the needs of the organization (statement 45 & 36). This group is delighted with the project results (statement 29) and evaluates the problem-solving approach as very efficient (statement 26 & 25). They also share an open mind, enabling them to work interdisciplinary with people with different backgrounds (statement 22). This group can be described as the most positive one. Besides believing in the approach, they would proactively push DT within the organization. For example, one participant set up another project where the method was applied.

**Table 6:** *Distinguishing statements - The enthusiastic missionary*

<i>No.</i>	<i>Statement</i>	<i>Ranking</i>
38	We need to spread the method within the organization.	+5
45	The Design Thinking approach is exactly the right one to help us in our current situation.	+5
22	For me, it was vital to include non-experts that could add a new perspective.	+4
26	I believe that by using the method, we were efficient in the analysis of the problem and in generating a solution.	+4
36	Based on my experience, the method is the right one for us!	+3
39	Looking back, I would use the Design Thinking approach to the same problem again.	+3
25	Comparing with the time investment, I evaluate the results as very good.	+3
29	I am pleased with the results (Prototypes/final Ideas).	+2

Personal profile II experienced that it is highly beneficial to include other perspectives in the project (Statement 22). This profile experienced that the exchange due to the different perspectives leads to a new understanding that delighted him/her. Reflecting this, the profile may think that working in diverse teams provides a more coherent picture of a problem. This results in the theory that working together with people from different backgrounds and using the need-finding methods enhanced a sophisticated problem understanding. This profile tested this theory as participants had ongoing projects within the organization that were conducted in the traditional manner. By working in both modes, individuals could compare their experience and recognize that if he/she works in a more heterogenous team, the team gains a more holistic understanding. Thus, working in a diverse team like in the DT project enhanced the problem understanding.

**Learning Profile I - The focused expert:** This factor shares a critical perspective on the approach statements (see Table 7). For example, he was driven by the perception that DT was a less effective and efficient problem-solving method than his regular problem-solving approaches (statement 23 & 25). The participant can be described as someone relying on his experience in knowing other's needs (statement 8 & 7) and thus, being able to develop solutions quickly (statement 6).

**Table 7:** *Distinguishing statements - The Focused Expert*

<i>No.</i>	<i>Statement</i>	<i>Ranking</i>
23	I think without Design Thinking, we would have been faster in getting the results of the project.	+5
24	I think the status quo before we started the Design Thinking project was ok, and we would have been able to solve our problems within the projects with minimal adjustments.	+5
6	I do not need much time dealing with a problem before coming to a solution.	+4
8	I know the problems of my colleagues in other departments, and for this reason, I do not need interviews to validate them.	+4
35	I miss the structure and documentation within the method as I have no idea where it will lead us.	+4
7	I have so much job experience, I know the needs of this organization.	+3
39	Looking back, I would use the Design Thinking approach to the same problem again.	-4
25	Comparing with the time investment, I evaluate the results as very good.	-5

Learning Profile III was particularly insightful as this profile was the most skeptical one concerning DT. This learning profile experienced the methodology as highly ineffective (23), interviews as a waste of time (8), and already had a solution in mind (6). Thus, he experienced investing time in properly understanding the problem space as not beneficial. In his reflection, he was even irritated, for example, by creating a problem map because he could not see where this is leading him. Furthermore, he could not derive benefit from the interviews as he conducted the interviews without using open questions and only confirming his existing assumptions. This resulted in his theory that the methodology only creates additional work without delivering an explicit value. To test his theory, one decided to criticize the tools in meetings, blocking activities or even not being present during workshops.

## 5 Discussion

Our findings answer the first part of our research question and reveal three profiles that can be observed when applying DT as a problem-solving approach with non-designers in an automotive manufacturing firm. We describe and explain these profiles in detail. The profiles have implications for applying DT with non-designers. For practitioners, our findings have two main implications. Firstly, to consider the different learning profiles in the team composition might enhance team performance. Although DT explicitly asks for interdisciplinary collaboration and diversity (Micheli et al. 2019), it might be beneficial to add certain team members with their learning styles specifically to a certain phase. Thus, our focused expert might be a more suitable learning profile that should be included as an external guest who joins for specific purposes (such as testing, etc.). Secondly, besides considering if the methodology is the right one for the organizational problem, one should

prepare the organizational context for the use of such an exploratory method. This can help to manage upcoming tensions in teams. For example, it might be useful to sense the willingness and openness for DT by hosting short DT introductions so that organizational members might get a better idea where DT might be helpful.

In terms of theoretical implications, we extend existing knowledge as we found that it is necessary to extend the existing frameworks (Elsbach and Stigliani 2018; Beckman and Barry 2007) with contextual factors. For example, our learning profile of the “*Focused Expert*” shows that this person's learning experience stopped or did not even enter the first stage of the experiential learning cycle for DT (Elsbach and Stigliani 2018). While this for sure might be the case due to the personal character traits (such as lack of openness, etc.) interviews with this person revealed that he had to deal with high pressure due to other urgent projects and opinions of other colleagues. Both character traits and contextual circumstances are so far not considered in the framework proposed by Elsbach and Stigliani (2018).

## 6 Conclusion

Our study has answered the research question by showing three learning profiles (*The Empathic Collaborator, The Enthusiastic Missionary, The Focused Expert*) of non-designers derived from applying Q-Methodology. We describe and explain these profiles from an experiential learning lens and show implications for practitioners and academia. Thereby we contribute to improve the understanding of “*the reasons why non-designers may resist design thinking tools*” (Elsbach and Stigliani 2018). Furthermore, we challenge existing frameworks on DT implementation (Elsbach and Stigliani 2018) as they miss important contextual factors that explain our profiles. All this helps us to enhance the efficiency and effectiveness of implementing and applying DT in environments that might be more critical about such a methodology.

In terms of limitations, our sample size and the only representative of the third learning profile can be discussed critically. Although it is not without problems to use one participant for defining a factor, the authors decided to use this participant for an “*In-Depth Single Case Analysis (McKeown and Thomas 2013, p.40)*”. It reveals a perspective that is regularly overlooked as such a critical opinion is difficult to access. Future research could address this by specifically looking at persons who tend to be critical towards DT and apply psychological tests (e.g. Hogan Test) to validate and extend our findings. This could extend our study aimed to investigate the behavior of such persons while DT is applied. This not only helps us to understand their rationales better, it is also the starting point to diffuse DT in more and more environments to foster innovation and user-centeredness in organizations.

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