Wicked problems in Information Management and the need for a design attitude

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Preface

Come gather round people wherever you roam
And admit that the waters around you have grown
And accept it that soon you’ll be drenched to the bone
If your time to you is worth saving
Then you’d better start swimming or you’ll sink like a stone
For the times, they are a changing

- Bob Dylan

These are the words of a great artist who gave a voice to the public unrest in America during the sixties. With these words, Bob Dylan speaks to the people, senators, congressmen, fathers and mothers. The song is a warning for the older generations to hand over the power to the younger generations because times-they-are-a-changin.

With this song Dylan signals an important cycle in society; there comes a time that the established order should involve the younger generations to make significant progress in shaping society. The world is constantly evolving and changing, thus retaining one’s power and authority at all costs is useless since sooner or later these bounds will be broken. An emphasis on conservatism will stand in the way of innovation.

One might wonder how this lyric by Bob Dylan is related to my thesis. The answer is anything but easy. Therefore, this thesis should direct the reader towards an answer, for there is no change or transformation that has ever emerged without any effort and some puzzling.

Inspiration

I would like to start my thesis by sharing the ideas and feelings that fired my motivation for this research. Like many others before me, I started this research with a hunch; gut feelings that I could not ignore. During my bachelor Information Sciences I drifted away from the focus on technology that I got confronted with and searched for the human scale.

Technology is inspiring and enriches our world, changing it in many ways. Especially in the last two decades, information technology has had a severe influence on our personal lives, organizations and society. We can keep in touch with friends and acquaintances all over the world via Facebook, money transfers are digitalized, and organizations move their business from the real world to online shops. Technology even played an important role in the Arab spring, where the opposition organized their actions via Twitter and Facebook.

Yet, these examples show us that technology in itself is never the goal, it is a means to reach certain goals. The driving force behind innovation is the needs of an organization, its users, as well as its customers. It is also clear that these innovations are not straightforward but rather complex in technological and social dimensions.

Although we see several inspiring innovations in the technology sector, in my own bachelor and master studies I missed the human-centered perspective. A perspective that in my opinion is indispensable when we consider information systems.

Change

So I began searching for research on the human scale in Information Management and how Information Management deals with complex social problems. During my master track, Business Information Systems, I found that several authors produced articles that pinpoint the tendency towards scientific, rational and economist thinking. The rational scientific perspective sees the world objectively. The world can be divided into good and bad, black and white. Authors like Anna Snel, De Vries, Huizing, Wisse and Introna all conclude that a more humanist perspective is needed in Information Management. This gave me the confidence to pursue my research.

While these authors analyzed the bias towards objectivism, and explained why a new, more subjective, perspective is needed, I will focus on change through education. For it is not only the acknowledgement of the problem and the suggested solutions that require change; I argue that the true solution is to educate people to think and act differently. To really make a change we need people who are living in the new humanist perspective.

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1 Bob Dylan, Times they are a-changin’ on the album The Times They Are A Changin’ released in 1964
The Design Attitude

This thesis addresses an attitude towards the world to deal with the complex challenges of the Information Management field. It is presented as the Design Attitude, a perspective that counterweights the rational scientific perspective. A new way of thinking is often offensive to the old way of thinking. The reader might find himself a proponent of the old way of thinking during this thesis. This might frighten him but I dare the reader to read on.

Although the rational and scientific way of thinking brought the field the successes of the past, it is as Bob Dylan once sang: the times they are a changing. With this song he aimed to prepare the established powers, fathers, mothers, and politicians for the fact that change cannot be retained. Dylan summoned the people to show courage, let go of their certainties and take a leap of faith.

There seems a common tendency to see the world as black and white. Phenomena in the world either are considered left or right, good or bad, safe or dangerous. Actions are premeditated and planned to exclude mistakes or failures. This gives a peaceful feeling of certainty or trust. But in fact the world is not a world of extremes, it encompasses a variety of shades of grey. Uncertainty is a part of life, and we are confronted with inconsistency on a daily basis. Feelings that do not match reality, abstractions that do not represent our subjective perception, love and hate existing simultaneously.

Uncertainty can therefore not be ignored although it is often feared. It is useless to push it aside and try to constitute the world in a black and white framework. It would be an attempt to ignore life itself. The trick is to embrace uncertainty and employ it to you advantage. For this is all it takes to come to great innovative ideas.

*To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.*

- Albert Einstein
Acknowledgements

Although it is my name on the cover of this thesis, completing it was not something I did without the help and support of others. Here I want to pay my respect to everyone who played his or her part in this research.

First of all I would like to acknowledge my gratitude to the Universiteit van Amsterdam for giving me the position and time to conduct a research that lies close to my heart, in particular to Anna Snel and Toon Abcouwer. Anna was my supervisor in the beginning of this research. She motivated me and kept me sharp on the academic requirements in writing one’s master thesis.

Toon is the one who motivates not only me but many students to pursue their dreams and stimulates us to find personal meaning in the field of Information Studies.

Special thanks goes out to Sjeel, who makes the most delicious cappuccinos at Science Park and serves as a secret counselor for many students. She brought a smile on my face every time I was at my wit’s end. “Dankjeschat”!

During my study in Amsterdam I became close to two classmates who became friends. Thank you, Bram and Janine for accepting me when I felt new in the program. Not only did we share ups and downs during the classes, moreover we shared an interest in ‘t IJ-beers and talking about life itself.

From my classmates at the Radboud Universiteit Nijmegen, Rik Janssen deserves to be mentioned. We share a vision on the field of Information Management and are discussion partners from the beginning. From the beginning of the bachelor we shared a fruitful collaboration and I think that our differences complement us.

Furthermore I want to thank my dear friends in Amsterdam and Nijmegen who believed in me and gave me confidence to pull this off. I deeply appreciate that I discover and share life with these close friends. Especially Bo, Jim and Jelle, I am most grateful for sharing the most vibrant experiences of my life with you guys and appreciate your love when I struggled personally or professionally: ‘Be love – beyond the static meaning of words’. I have a special place for Daniel and Wouter who have been my best friends since high school.

When I studied at the Radboud Universiteit Nijmegen I met two inspiring men who triggered my affection with design. It was Hanno Wupper who pointed me to the principles of design and architecture by altering the curriculum into a design education. I remember long evenings talking about design, aesthetics, social dynamics and life. I hope we have a glass of red wine and good conversation in the near future.

Where Hanno taught me the theory of design, Pieter Wisse stimulated me to become a designer myself. He always made me the starting point of our meetings and somehow already seemed to know where I was heading with my thesis before I knew it myself. The only way to truly describe Pieter’s role in this thesis is by the following mosaic: “You cannot teach a man anything, you can only help find it within himself” (Galileo Galilei) and therefore “teaching is the highest form of understanding” (Aristotle).

I also want to thank Michael who guided me towards the true meaning of the phrase ‘home is where the heart is’.

Finally I want to pay my respect to my family especially to my parents who stimulated me from an early age to develop myself socially and culturally hereby feeding my natural interest for art, beauty, design and architecture as well as anthropology, philosophy and education. They sometimes feared I would not finish my master thesis but always motivated me and kept me on track. And last but not least my brother who is my best friend and more since he was born.

I want to show my deep respect for the great thinkers of the past who inspired me from beginning to end: Einstein, Arnheim, Kuhn and Faste. I experienced how during my research their ideas came to life and the true value and impact of their work revealed itself. It felt great to be flooded with revolutionary work from decades ago and find that it is still vibrant and ecstatic.

Amsterdam, 2014
Chapter 1

Theoretical Framework

Every problem has in it the seeds of its own solution
- Norman Vincent Peale

Introduction
In front of you lies my thesis for the master program track Information studies: business information systems at the Universiteit van Amsterdam. For this research two courses from the master program inspired me: Management of Non-Material values and Capita Selecta Information Studies. The main topic of my research is the need for an attitude in Information Management to deal with wicked problems. The growing complexity of society, technology and organizations gives rise to more complex problems, also known as wicked problems. The field needs individuals with an attitude towards the world that encompasses dealing with interdependencies, conflicting demands, and the absence of straightforward solutions. I argue that education is the way to incorporate this mindset in Information Management. In the near future, education should enrich the field with people who are able to find creative ways to deal with the problems they encounter. Or in Albert Einstein’s words: Individuals who are able to leave the old way of thinking behind and transfer to a new way of thinking are able to bring innovation.

A theoretical framework is normally constructed in a linear way with several proceeding steps. Verschuren & Doorewaard (1995) describe the following five building blocks of a theoretical framework:

1. Problem statement
2. Research goals (external and internal)
3. Research questions
4. Relevance
5. Methodology

According to Verschuren & Doorewaard (1995) a theoretical framework or a research proposal should be constructed in this order. The problem statement is the starting point of a research. From a clear problem statement one is able to extract research goals that define the scope and direction of a thesis. These research goals can be operationalized into research questions that are elaborated on in this thesis. Although the problem statement already addresses some of the relevance of this research, I deem it important to show the relevance not only for the field of Information Management, but more in general as well. The final section of the theoretical framework comprises the methodology. This theoretical framework is constructed in a different way than Verschuren & Doorewaard (1995) suggest. The building blocks as suggested by Verschuren & Doorewaard (1995) are used to structure the theoretical framework, but the order of these building blocks is not considered linear. This allows me to experiment with these building blocks in a designer’s way hereby showing the design character of my research and at the same time meeting academic requirements. Therefore the research is constructed from the design attitude. The first step is to consider the problem statement.

1.1 Problem statement
This section provides the reader with a formulation of the problem. In the introduction of this chapter I used the term wicked problems, which is a central topic of this thesis. For a clear understanding of the concept, the problem statement further elaborates on the notion of wicked problems.
For this thesis the focus is on wicked problems in organizations. Wicked problems arise in organizational contexts where social complexity and technological difficulties play a profound role. Uncertainty, disagreement and conflict are common ground in the context of these sticky problems. Especially organizational change causes these sorts of problems to arise (Camillus, 2008). Several authors argue that management is unprepared to deal with these problems that reveal a growing web of interdependencies (Conklin, 2005; Rittel & Webber, 1973; Camillus, 2008). Wicked problems are therefore considered an important issue in management and business education.

Wicked problems are described as ill-defined problems that have no true or false solution, this in contrast to tame problems like mathematical equations or puzzles (Rittel & Webber, 1973). For a tame problem it is clear when it is solved as a tame problem has a fixed solution. Wicked problems have no definite solution and need to be resolved over and over again:

“As distinguished from problems in the natural sciences, which are definable and separable and may have solutions that are findable, [wicked problems] are ill-defined; and they rely upon elusive political judgment for resolution” (Rittel & Webber, 1973, p. 160).

A wicked problem is part of a complex whole of interdependencies, and often many stakeholders are involved with subjective needs and contradicting concerns. Wickedness is not a degree of difficulty, but underlines how wicked problems are different and cannot be resolved using traditional methods (Camillus, 2008). They are hard to describe, have a multitude of causes and have no right solution. Essentially, “the problem with wicked decision problems is thus that of defining the state or nature of the problem” (Mason & Mitroff, 1973).

For now it is important to understand that wicked problems involve complexity with their many interdependencies and the role of various stakeholders. Often many stakeholders are involved with subjective needs and contradicting concerns. In solving a wicked problem, the emphasis is on resolution and finding a way to integrate these perspectives (Rittel & Webber 1973). Two examples of wicked problems are (Conklin 2005):

- Whether to route the highway through our city or around it?
- How to deal with crime and violence in our schools?

These examples suggest that solving wicked problems requires empathy and creativity to capture the social dimensions and human perspectives when working towards a solution. Conklin (2005) argues that working towards a solution in a top-down way will not bring forward the required creativity and understanding to resolve a wicked problem. The waterfall model is a top-down way to design and realize information systems. The waterfall model prescribes a problem solver to (1) first understand the problem by gathering and analyzing requirements, (2) before he can define a solution, and (3) finally implement this solution (Conklin 2005). This approach presumes the upfront understanding of the problem domain and the solution to the problem. Yet, a wicked problem obtains its wickedness due to the complexity of, and unfamiliarity with the problem domain. The solution can therefore not be predefined. Rather than committing to this top-down approach, Conklin (2005) reasons that, “problem understanding can only come from creating possible solutions and considering how they might work” (p.5). Understanding the problem by formulating solutions refines the previous understanding of the wicked problem. Snel (2011) summarizes this divergent approach of problem solving when she argues that, “by taking into account the multiple options and possibilities, the perspective is not restricted prematurely and more use is made of the potential for discovering a better interpretation of the available data” (Snel, 2011, p.182).

Wicked problems should be dealt with by divergent thinking (Snel, 2011) or in other words by a non-linear creative learning process (Conklin 2005) in order to find a solution. The more recent linear way of thinking, like the waterfall model of problem solving, should be balanced by non-linear thinking (Conklin 2005).

By studying the practice of IT-projects, several researchers found that these projects often fail or exceed budget. Cohen and Sayer (2001) describe organizational issues, lack of scope and ill-defined processes as the bottom line of IT-failure. Furthermore Cohen and Sayer (2001) point at a lack of user involvement in design. Reel (1999) conducted research on the failure of IT-projects. He found 10 causes shared amongst several projects that are mostly concerned with organizational and process factors:

1. Project managers do not understand users’ needs.
2. The project’s scope is ill-defined.
3. Project changes are managed poorly.
4. The chosen technology changes.
5. Business needs change.
6. Deadlines are unrealistic.
7. Users are resistant.
8. Sponsorship is lost.
9. The project lacks people with appropriate skills.

These researches show that failure is common in IT projects. Cohen and Sayer (2001) and Reel (1999) found that the causes of failure lay not so much in technological issues, seeing as failure is caused by the design of project management. The problem of implementing an information system is that it lacks several important factors as understanding user’s needs, being adaptive and flexibility, understanding of the organizational context.

Thus IM professionals are often confronted with complex projects that involve many stakeholders like end-users, top-management, inter-organizational networks, policy and politics. Due to the complexity of current business environments and the interdependency of information systems, designing such systems can be seen as a wicked problem This research is mainly focused on addressing wicked problems in Information Management. Moreover I am particularly interested in how to prepare for actually dealing with wicked problems, i.e. in IM practice. Conklin (2005) pointed in the direction of non-linear ways to solve wicked problems. To explain non-linear problem solving, Conklin (2005) points to the way designers deal with complex problems. The articles by Conklin (2005), Reel (1999) and Cohen and Sayer (2001) suggest that the Information Management field is not equipped to handle the wicked problems they are confronted with. By summarizing the statements made above, the problem statement of this thesis can be defined as follows:

**What is a designer way of problem solving that an Information Management practitioner needs to (re)solve wicked problems in Information Management?**

### 1.2 Internal research goals

This section explains what research goals are extracted from the problem statement. According to Verschuren & Doorewaard (1995) one should define external and internal goals to define the scope of the research. In their perspective, the first step is to define an external research goal and derive internal research goals from the external goals. For the sake of clarity, I will first define internal research goals that are related to the problem statement. This is followed by the relevance of this research before defining the external research goal. The internal research goals are described to define the internal scope of the research. The problem statement mentions several concepts that form the basis of this thesis. The internal research goals operationalize these concepts and provide a direction for this research. The role of these internal goals is not to set targets for this research because that would deny the inherent nature of researching: the fact that a researcher does not know everything upfront.

#### 1.2.1 Wicked problems

The notion of wicked problems was briefly addressed in the problem statement. Although this introduction suffices for now, further reasoning on the concept of wicked problems requires an elaboration of the topic. Therefore the first research goal is:

*Understand what wicked problems are in the context of Information Management.*

#### 1.2.2 Non-linear problem solving

The focus on resolving wicked problems leads to the understanding that these cannot be solved in a true or false way. Due to the non-linear way in which wicked problems present themselves, with characteristics like complexity, uncertainty and ambiguity, linear ways of problem solving do not suffice. Thereby it was made clear in the problem statement that solutions to wicked problems are never finished, in the sense that the complexity and variability of these problems continue to exist. As Concklin (2005) states the design of a solution is ‘finished’ when you run out of resources or when you decide that the solution is good enough. Thus dealing with complex problems requires professionals to design organizational solutions and to keep on redesigning these solutions. The emphasis in dealing with wicked problems is on the design of a solution
(Concklin 2005, Rittel & Webber 1973). Conklin (2005) suggests that the problem solver should adopt the attitude that designers have.

It was suggested in the problem statement that Information Management is in need of an attitude that is able to deal with complex problems that have no straightforward solution. Several authors elaborate on such an alternative mind-set and label it as integrative thinking (Sill 1996), ambidextrous thinking (McKim 1972; Faste 1994; Raisch et al. 2009), and design thinking (Boland & Collopy 2004; Brown 2008). In their analysis the authors focus on important aspects of non-linear thinking, as explained by Concklin (2005), like: creativity (Sill 1996; McKim 1972), interdisciplinarity (Sill 1996; Brown 2008), and empathy (Faste 2001; Brown 2008; Snell 2011).

Handling wicked problems requires one to view the problem from different angles, bringing these perspectives together to integrate them in the design of a solution. In other words from these different angles a more holistic attitude towards the field is derived. Here the emphasis is on integrating these different perspectives. Therefore this mind-set or attitude is often referred to as integrative thinking. The reader should not mistake the use of the word thinking in integrative thinking with a restricted focus on the mental activity. Rather than an isolated emphasis on the pure mental activity, integrative thinking should be understood as an attitude towards the world. This attitude encompasses collaboration with, empathy for, and sensitivity towards aspects of wicked problems like the problem itself, stakeholders and possible solutions (Brown 2008). To overcome any misunderstanding I will refer to this attitude as the design attitude. In some situations I will use the term integrative thinking to emphasize the integral character of this attitude. Furthermore no other terms are used to describe the non-linear attitude towards wicked problem solving. Since the IM practitioners seem unable to handle complex problems, the following important research goal can be formulated:

Emphasize what the Design Attitude entails for Information Management.

1.2.3 Education
A quick scan of the literature on Design Attitude and Information Management suggests that this concept is not new to the field. Van Rees & Wisse (1995) suggested the role of the information architect as a designer in the IM field. Furthermore Wisse, Huizing and Lindberg (reference) argue for a more humanist and integral perspective on the field. They and others aim to describe the need of the design attitude for Information Management. But it is not only the acknowledgement of the problem and explaining solutions that indulge change. I argue that the true solution is to educate people who think and act differently. To really make a change we need people who are living the design attitude, and therefore the focus should be on education. The contribution of this thesis is the focus on the role of the design attitude in education.

Propose the Design Attitude for Information Management education.

1.3 Relevance
The problem statement addressed the relevance of this research in the context of Information Management. The broader relevance of this research becomes evident through three arguments: academic relevance, societal relevance and business relevance. Since this is an academic thesis I will provide an argument why this research contributes to science. Moreover, relevance is also shown if a researcher is able to put his or her research in the context of broader social developments. Information Management is a field where practice and theory are entangled. Since Information Management is also occupied with the design and realization of information systems, I also argue from a business perspective why this research is relevant.

1.3.1 Academic relevance
The design attitude is a complex whole that cannot be approached in a purely analytical fashion. There is also room for uncertainty, fuzziness, and conflict, since these go hand in hand with creativity and innovation. Faste (2001) makes a clear statement: “When [designers] include human concern in their designs, they must work comfortably under conditions of generous possibility combined with uncertainty, insufficient information, conflicting demands, judgment calls, and even paradox. They must be able to create and use design tools while simultaneously recognizing their limitations” (p. 330).

Faste (2001) argues that being a designer means incorporating an alternative way of seeing and dealing with the world than an engineer does. This insight will prove to be of great relevance for my research. For now I stay with Faste (2001) and let him explain how deep these latent human needs are rooted in design thinking:

“Successful products require the presence of three things: utility, usability, and meaning. (..) Meaning-making
requires sensitivity to cultural and social differences, including the views of other cultures and minorities. It requires listening to, and valuing, the stories that people tell about their lives” (p.328). Faste describes the holistic and human centered nature of the design attitude. Because of this nature, the Design Attitude can help the Information sciences to face the human challenges in designing and implementing information systems. Through this exploration of the nature of the design attitude, I found that it is based on fundamentally different assumptions such as objectivism and subjectivism. In accordance with Faste (2001), this thesis argues that the design attitude is based on its own paradigm. The design attitude cannot be approached from a rationalist or objectivist perspective. It is a fundamentally different perspective and needs to be approached from its imminent nature. This means that another paradigm is needed in the field of Information studies, the paradigm of design.

But the relevance of education, to give the design attitude significant foothold in Information Management, seems still sorely neglected. However, I’m convinced that the only way to sustain the design attitude as part of the current field, without leaving it up to chance, is through education. Thus, Information Management education can benefit from research that addresses these issues and provides recommendations for education by indicating how the design attitude can offer productive ways of resolving wicked problems.

1.3.2 Societal relevance

The globalization and influence of technological advances have changed the world in a very pervasive way. Organizations can move their business easily to foreign countries by using global transportation networks, email, and the Internet. This automatically leads to more complex information systems that are used in several countries. Outsourcing of IT-development to India and manufacturing in China or Taiwan are two examples of the globalizing market place.

At the same time, people invest more and more meaning in technology. A telephone was once a medium to contact your friends and family across far distances, now the smartphone is a medium to connect, to share your current emotions, to inform you on your work schedule, to plan your trip with public transport or check the weather before you visit a friend. The smartphone has become a hub between people and their relation to the world. So, from an emphasis on utility, technological advances have made a shift to usability and now to meaning (Faste 1993). This means that the way individuals interpret technology is also changing, which makes the design of these developments more complex.

This increase in complexity caused by more functionality, deeper subjective interpretations, and partitioning across the world, leads to complex problems. If not handled right, these complex problems result in failing IT systems (Sessions 2009) that which can have social consequences. Thus the increase in complexity gives rise to more wicked problems. With a relevant design education, IM practitioners are able to contribute to relevant information systems, not as a goal itself but as a means to design and shape the development of our society.

1.3.3 Business relevance

This research is in a broader context also a contribution to developments in other sectors. In other fields of study the emphasis shifts from objectivism and rationality to more subjective and holistic approaches. For example Zuboff & Maxmin (2002) suggest a new enterprise logic that puts an emphasis on the relationship with the customer and centralizes the customers’ needs and wishes in organizations. Snel (2011) offsets the bias in the experience economy and opts for a mindset that incorporates the individual as a relevant actor in an experience. According to Snel (2011), organizations should stop imposing their will on their customers whereby they ignore the subjective truths of their customers. Hereby Snel puts her work in line with Zuboff & Maxmin (2002), who argue that the standard enterprise logic lies far behind on the development that individuals and culture have gone through. These developments in fields like economics and business, both interrelated with Information Management, contribute to the relevance of a more holistic attitude in Information Management.

1.4 External research goal

The external research goal is defined to determine the external scope of the research. It defines to what situation or problem in the world the research aims to contribute. Therefore the external research goal is related to the problem statement:

What is a designer way of problem solving for an IM practitioner to (re)solve wicked problems in Information Management?
The external research goals also relate to the relevance of this research. In the previous paragraph I argued why this research is relevant from an academic, social and business perspective. Therefore the external research goal can be formulated as follows:

*Show why IM practitioners are able to resolve wicked problems in Information Management by adopting a designer way of problem solving.*

### 1.5 Research questions

According to Verschuren & Doorewaard (1995) research questions are formulated when the research has several clear goals. I defined three internal research goals:

- Understand what wicked problems are in the context of Information Management.
- Explore what the Design Attitude entails for Information Management.
- Propose the Design Attitude for Information Management education.

How I aim to accomplish these research goals is explained by the research questions. For every research goal I formulate one or more research questions. Therefore the research questions form the foundation for this thesis. I will also explain which chapter will cover the specific research question.

**Understand what wicked problems are in the context of Information Management**

The first research goal is to understand wicked problems in the context of Information Management. In order to reach this goal I need to find out what is generally understood as wicked problems and what wicked problems arise in the context of Information Management. From this research goal two research questions are derived:

1. What are wicked problems in general?
2. What are wicked problems in Information Management?

The next step in this research is to question whether IM practitioners are able to deal with wicked problems. If IM practitioners have found the cure to deal with the wickedness of problems, why should I conduct this research? Therefore it is important to review the field’s ability to handle wicked problems. The problem statement suggests that IM practitioners are unable to deal with wicked problems because in many IT-projects the problem itself and contextual aspects are not understood. To analyze at a more fundamental level if Information Management is able to deal with wicked problems, the theory of Thomas Kuhn (1962) is used. Kuhn (1962) argues that for a certain field the dominant perspective towards the world determines what is seen as a problem and how problems need to be resolved. This perspective that explains how the world is interpreted, is named the underlying paradigm. In order to sustain the argument whether IM professionals are able to deal with wicked problems, I need to address the dominant perspective in Information Management. In other words I aim to find the paradigm that determines how the world is interpreted in IM. This leads to the following research question with two sub research questions.

3. Is Information Management able to deal with wicked problems?
   a. What is the dominant perspective in Information Management?
   b. Is the dominant perspective in Information Management able to deal with wicked problems?

All three research questions will be covered in chapter 2 ‘Wicked Problems in Information Management, the need for a Design Attitude’.

**Emphasize what the Design Attitude entails for Information Management**

The second research goal aims to explore the design attitude as a way to deal with wicked problems in Information Management. The design attitude is a comprehensive concept and a full elaboration of this subject exceeds the boundaries of a master thesis. A research question like ‘What does the Design Attitude entail?’ is too extensive to answer. Therefore I aim to sketch an integral view on the design attitude by answering several research questions:

4. How can the Design Attitude be positioned in methodology?
Seeing as what is reported here concerns scientific research it is required to position the Design Attitude and design in general in methodology. The problem statement and the external research goal propose non-linear problem solving as a way to resolve wicked problems. This research question searches for a relation between a non-linear problem solving method and the design attitude. By combining several models of problem solving I will methodologically build a foundation of design.

5. What characteristics of the Design Attitude are important for wicked problems in Information Management?

By describing several important characteristics of the Design Attitude it will become clear why this attitude is valued in wicked problems solving. Research question 4 and 5 will be covered in chapter 3 ‘Positioning Design in Methodology’.

The design attitude is presented as a way to resolve wicked problems. The design attitude actively searches for different perspectives and aims to incorporate these in the resolution of the wicked problem. In this way it encompasses creativity and innovation. This means that looking at wicked problems as a designer might lead to interesting conclusions:

6. How are wicked problems interpreted in the Design Attitude?

This research question is covered in chapter 4 ‘Reflection on the Concept of Wicked Problems’. The nature of the Design Attitude is that it is able to research multiple perspectives and integrate these perspectives in realizing a solution. In more general terms, the design attitude values the inherent variety of the problems we encounter and aims to provide a synthesis for these differences.

7. What is the relation between Visual Thinking and the Design Attitude?

By analyzing the work of Faste, Arnheim and McKim popped up as the authors that are at the center of Faste’s ideas on design. Although Arnheim’s and McKay’s work is published under the title of Visual Thinking it serves as the basis for a design attitude. Brown, Kelly, Faste, Martin and several others all refer to Arnheim or McKay when they elaborate on design. Arnheim and McKay are therefore at the basis of today’s interest in Design Thinking or Integrative Thinking.

Visual Thinking is a way of thinking that naturally fosters the process between variety and synthesis. The term Visual Thinking is often named in the context of Design Thinking and Ambidextrous Thinking and serves as the basis for the curriculum of the Design School of Stanford University. In this thesis Visual Thinking is highlighted as a way of designing and it therefore supports the understanding of the design attitude. Research question 7 is reflected upon in chapter 5 ‘Visual Thinking in Design’.

Propose the Design Attitude for Information Management education

The final research goal is directed towards Information Management education. This leads to the research question:

8. What are the consequences of the Design Attitude for Information Management education?

Information Management is an interdisciplinary study that is mostly influenced by the Information Technology sector and the Business sector. Both perspectives are addressed in answering this research question. I examine the role of the design attitude in Information Management education in three parts. The first question to be answered is what is currently lacking in Information Management education. Related to what lacks in education is the question: what is needed in management education to incorporate a design attitude?. The third part is to examine how the design attitude can be brought to practice in education. Research question 8 will be answered in chapter 6 ‘A proposal for Design Education in Information Management’.

1.6 Research as confrontations

Verschuren & Doorwaard (1995) use the concept of confrontation to pertain to a research model. Through confrontation a researcher attains new conclusions. A confrontation is meant to put concept A in the context of concept B. For example empirical data is confronted with a theoretical model or a sociological theory is
confronted with a business administration theory to come to new conclusions. The model below depicts the research model of this research with the use of confrontation.

![Diagram showing the research model](image)

Confronting the basic building blocks of this research like wicked problems in general, wicked problems in IM, wicked problem solving in general and in IM leads to the design attitude as a non-linear way of problem solving. Elaborating on the design attitude and confronting this with visual thinking leads to what is needed in education since this confrontation deepens the understanding of the design attitude and sketches how the design attitude should be practiced. Confronting what is needed in education with the current state of education leads to conclusions on the design attitude in education.

1.7 Methodology
The previous sections explained the goals that are set for this research. In this section the way in which this research was conducted will be explained and the process of answering the research questions is highlighted.

1.7.1 Research model
Before one can select methods of conducting research it is important to know what kind of research one is conducting. First of all the concept of design and therefore the design attitude is very comprehensive. Due to the necessarily more limited scope of a master thesis and the comprehensiveness of this subject my research focuses on knowledge gathering through literature. The design attitude is rather new in the context of Information Management. The nature of this research can thus be described as an explorative research. Although I gather my knowledge through a scientific literature study, the research itself is meant to be applied in practice. For example several case studies and questionnaires are used as well as analysis of and recommendations for the Information Management practice. Using the terminology of Verschuren & Doorewaard (1995), this research is therefore labeled a practical research. Verschuren & Doorewaard (1995) make a distinction between different types of practical research:

1. signaling the problem
2. diagnosis
3. design
4. change
5. evaluation

One of the internal research goals is to show how the Design Attitude reflects on Information Management education. This thesis results in recommendations for Information Management education to develop skills in dealing with wicked problems. According to the terminology above, this research is a design-oriented research. This means that based on the signaling of the problem and a clear diagnosis, a design is made of a possible

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2 Translated from Dutch, by myself
solution to the problem. The solution itself is not implemented or evaluated after implementation. Therefore this research can be labeled as an explorative, design oriented, practical research.

Verschuren & Doorewaard (1995) argue that for a design oriented practical research a clear problem definition should be defined. The problem statement was already defined and research questions 1, 2 and 3 further define the problem statement. Chapter 2 ‘Wicked Problems in Information Management, the need for a Design Attitude’ extends the problem definition.

1.7.2 Research methods
Although the design attitude needs more research in the context of Information Management, in other fields it developed more profound. The practices of product design, architecture or urban planning are fields that have practiced design for centuries. Therefore I use concepts from these practices to explore the Design Attitude in the context of Information Management.

I found that many authors on management theories use terms like Integrative Thinking or Design Thinking. I do not want to contribute to the hyping or inflation of these terms. My aim is not to go along with the hype, but study what is meant with terms like design thinking and integrative thinking. To overcome the misuse of terms like these, I searched for underlying theories that are the basis of the current use of design thinking and integrative thinking in literature.

This search brought me to the work of Thomas Kuhn, who extensively wrote on the progress of scientific knowledge. He describes how a scientific field is more or less controlled by a certain paradigm, what a paradigm and the switch to a new paradigm entails. Although his work was initially seen as controversial, it became a major influence in the academic world. Kuhn’s work is used in chapter 1 and 2.

In the context of the design attitude I found several important authors that are at the basis of today’s scientific literature. Vitruvius, a Roman architect, was one of the first to write down thoughts on architecture and the art of designing. Furthermore I found that underlying Stanford’s Design School the work of Faste plays an important role. With several colleagues he designed, experimented with and published about the engineering education of Stanford.

By analyzing the work of Faste, I found that Faste based his ideas on the work of Arnheim and McKim. Although Arnheim’s and McKim’s work is published under the title of Visual Thinking it serves as the basis for a design attitude. Brown, Kelly, Faste, Martin and several others all refer to Arnheim or McKim when they elaborate on design. Arnheim and McKim are therefore at the basis of today’s interest in Design Thinking or Integrative Thinking.

Although this research is presented in a linear way to enable understanding of the main topic, it was conducted by adopting the design attitude. During the process of writing this thesis, I underwent several iterative cycles in which I re-examined problems and solutions. For instance, I started with the issue of wicked problems and why wicked problems are harder and more pervasive than other problems. A solution for wicked problems led to a focus on design thinking which led to integrative thinking. From the articles and books I read on integrative thinking, the question arose what design entailed. After several cycles of re-examining my understanding of design I found that design lies first and foremost in a person’s attitude towards the world. In this way the Design Attitude became the central theme of this research.

The Design Attitude serves as the central theme of this thesis and, as was stated in the previous paragraph, the nature of this research is an exploration into the Design Attitude. In fact every chapter is a re-examination of the Design Attitude. Furthermore, by adopting the design attitude several terms are re-examined. For example the concept of wicked problems is reconsidered in chapter three. The red arrows in the figure below show some of the main iterative cycles that were made in conducting this research. Although the different chapters form separate entities, together they contribute to the re-examination and understanding of the main topic of this research: the Design Attitude.
My personal discovery of the design attitude was done when I wrote several dialogues on this topic. In this phase I wrote without academic boundaries and did not worry about scientific embedding. Although to some this might not seem scientific or rational, this phase was essential to the shaping of this thesis. Appendices A, B and C provide three dialogues that I wrote on the design attitude.
Chapter 2

Wicked problems in Information Management, the need for a Design Attitude

We are continually faced by great opportunities, brilliantly disguised as insoluble problems
- Lee Lacocca

Introduction
Before exploring the Design Attitude as an enrichment of Information Management, a clear problem statement is needed. As mentioned in the theoretical framework, IM practitioners have to deal with wicked problems and evidence suggests that they are not able to handle these complex issues.

This chapter is divided in three parts. The first part is concerned with exploring the notion of wicked problems in general. It provides the answer to the research question:

1. What are wicked problems in general?

In the first part of this chapter the reader is provided with a general understanding of wicked problems by addressing the nature and essence of complex problems in more detail. The criteria for wicked problems provided by (Dilemmas in a General Theory of Planning) and (Conklin, 2005) clarify the differences between ‘convergent or tame problems’ and ‘more complex or wicked problems’.

From the theory on wicked problems I will extract three characteristics of wicked problems that are used in further reasoning on complex issues and the design attitude: resistance to wicked problems, social complexity and subjective valuing. Following a general exploration wicked problems in Information Management are considered:

2. What are wicked problems in Information Management?

The next step in this research is to question whether the IM practitioners are able to deal with wicked problems. Kuhn (1962) argues that for practitioners of a certain field the dominant perspective towards the world determines what is seen as a problem and how problems need to be resolved. This perspective that explains how the world is interpreted is often named the underlying paradigm. In other words I aim to find the paradigm that determines how the world is interpreted in IM.

3. Is Information Management able to deal with wicked problems?
   a. What is the dominant perspective in Information Management?
   b. Is the dominant perspective in Information Management able to deal with wicked problems?

It will become clear that the current state of Information Management is incapable to deal with these wicked problems. The epistemology underlying IM research and practice is biased towards a positivist and objectivist worldview (Huizing, 2007a; Orlikowski & Baroudi, 1991). By explaining what objectivism entails and how it is incapable of dealing with complex problems, I build an argument why Information Management is in need of an alternative mindset for dealing with wicked problems.

2.1 Wicked Problems in general
For organizations, wicked problems arise where social complexity and technological difficulties play a profound role. Uncertainty, disagreement and conflict are common characteristics of these wicked problems. Especially in organizational change, these sorts of problems will be encountered (Camillus, 2008). Several researchers argue that managers are unprepared to deal with these problems that they encounter in a growing web of interdependencies (Conklin, 2005; Rittel & Webber, Dilemmas in a General Theory of Planning, 1973; Camillus, 2008). Wicked problems are considered an important issue in management and business education.

Wicked problems are ill-defined problems that have no true or false solution, this in contrast to tame problems like mathematical equations or puzzle solving (Rittel & Webber, Dilemmas in a General Theory of Planning, 1973). It is clear when a tame problem is solved since it has a fixed solution. Wicked problems have no definite solution and need to be resolved over and over again:

“As distinguished from problems in the natural sciences, which are definable and separable and may have solutions that are findable, [wicked problems] are ill-defined; and they rely upon elusive political judgment for resolution” (Rittel & Webber, 1973, p. 160).

A wicked problem is part of a complex whole of interdependencies and often many stakeholders are involved with subjective needs and mutually opposing concerns. The wickedness is not a degree of difficulty, but underlines that wicked problems are qualitatively different since traditional methods cannot resolve them (Camillus, 2008). They are hard to describe, have a multitude of causes and have no right solution. In the essence “the problem with wicked decision problems is thus that of defining the state or nature of the problem” (Mason & Mitroff, 1973). Conklin (2005) rephrases that the real issue with wicked problems is to understand what the problem actually is.

2.1.1 Criteria for wicked problems
Rittel & Webber (1973) identify ten distinguishable properties of complex problems. Again, these properties are no checklist for classifying a problem as wicked; moreover they describe the wickedness of the problems. Each property is briefly explained:

1. There is no definitive formulation of a wicked problem:
It is not possible to formulate a well-defined statement of the problem since the information needed to understand the problem depends upon one’s idea for solving it (Rittel & Webber, Dilemmas in a General Theory of Planning, 1973). Every solution or elaboration of a solution exposes new aspects of the problems, leading to adjustments of the solutions (Conklin, 2005).

2. Wicked problems have no stopping rule:
In solving a chess problem clear criteria tell when a solution to the problem has been found. In wicked problems solving the problem is identical with the process of understanding, there are no criteria for sufficient understanding (Rittel & Webber, Dilemmas in a General Theory of Planning, 1973).

3. Solutions to wicked problems are not true-or-false, but good-or-bad:
Choosing a solution to a wicked problem is a matter of judgment, since many stakeholders are involved.

4. There is no immediate and no ultimate test of a solution to a wicked problem:
Solutions to wicked problems create unexpected consequences and undesirable repercussions. Evaluating the effectiveness of a solution is therefore difficult.

5. Every solution to a wicked problem is a one-shot operation:
“Solutions to ordinary problems can easily be tried and abandoned. But solutions to wicked problems, every implemented solution has consequences that cannot be undone” (Camillus, 2008).

6. Wicked problems do not have an enumerable set of potential solutions:
There are no criteria that enable one to prove that all solutions to a wicked problem have been identified (Rittel & Webber, Dilemmas in a General Theory of Planning, 1973).

7. Every wicked problem is essentially unique:
There is no classification of wicked problems. Many similarities can exist between a current problem and a previous one but the distinguishing properties are of great importance.

8. Every wicked problem can be considered a symptom of another problem:
A wicked problem is intertwined in a web of problems that do not have one specific cause.

9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways:
Different stakeholders involved in a wicked problem have different interpretations of the reality of the problem, causes, and solutions.

10. The planner has no right to be wrong:

“Problem solvers dealing with a wicked issue are held liable for the consequences of any actions they take, because those actions will have such a large impact and are hard to justify” (Camillus, 2008).

These criteria distinguish wicked problems from ordinary problems. Through the involvement of many stakeholders, social complexity is considered to be an important driver for the wickedness of problems. Conklin (2005) acknowledges technological complexity as another factor of wickedness.

### 2.1.2 Characteristics of wicked problems

Wicked problems imply uncertainty, ambiguity, and interdependencies. Studies by Conklin, Camillus and Rittel & Webber show that causes of the problem are unclear and ill definable, criteria for finding a solution are lacking and a variety of opinions among stakeholders exist which can be contradictory in nature.

This paragraph will address three characteristics of wicked problems as a solid base for further reasoning especially for Information Management. These characteristics are resistance to wicked problems, social complexity, and variety of signification.

**Resistance** to wicked problems is a psychological dimension. Since individuals are not educated to deal with these types of problems, they tend to ignore the wickedness of the problems and perceive them as tame, puzzle-like, problems (Conklin, 2005). Conklin (2005) argues that business professionals tend to reject wicked problems: “There is a tendency to treat all problems as tame, perhaps because tame problems are easier to solve, reinforced by the lack of understanding about wicked problem dynamics, tools and approach they require” (p.10).

Denying wicked problems seems to make sense from a business perspective; Who wants to burn his fingers on a problem that cannot be solved? However, denying the complex nature of a problem reinforces the complexity of the problem. Lack of understanding the dynamics of complexity strengthens individuals to focus on methods and tools suited only for solving well-defined and structured problems (Mason & Mitroff, 1973; Conklin, 2005). Camillus (2008) argues that understanding of wicked problems is needed when he states that, “moving from denial to acceptance is important; otherwise, companies will continue to use conventional processes and never effectively address their issues” (p. 106). Resistance to wicked problems is a consequence of the lack of understanding complex problems and the inability to deal with uncertainty.

**Social complexity** is a consequence of globalization and the heterogeneity of culture. Organizations expand their scope from local to international markets, and organizations become more and more interdependent. As Rittel & Webber (1973) argue, this leads to increasing variety and complexity: “As the sheer volume of information and knowledge increases, as technological developments further expand the range of options, and as awareness of the liberty to deviate and differentiate spreads, more variations are possible” (p. 167). When more people are involved in a project, the social complexity increases. Different stakeholders hold different values concerning the world they live in. Conklin (2005) therefore concludes that “because of social complexity, solving a wicked problem is fundamentally a social process” (p. 15). The social aspect is therefore an important aspect of wicked problems.

Acknowledging the importance of the social aspect of wicked problems involves a deeper characteristic: **subjective valuing of the world**. This encompasses all different meanings that are invested in a problem. The involvement of many stakeholders gives rise to divergent subjective truths, since “diverse values are held by different groups of individuals [and] what satisfies one may be abhorrent to another” (Rittel & Webber, 1973, p. 169). I will further elaborate on subjective valuing when wicked problems in Information Management are addressed.

### 2.2 Wicked problems in Information Management

As in many other fields, Information Management has to deal with wicked problems. The field is closely related to novel developments in technology, and therefore Information Management is drawn towards a technological perspective. Technological complexity is evident when choices for implementation of information systems have to be made (Conklin, 2005). In this research I will not focus on technological complexity as a
driver for wicked problems. Rather I will emphasize the social nature of wicked problems in Information Management, something that is often ignored in Information Management (Mason & Mitroff, 1973).

2.2.1 Social complexity of wicked problems in Information Management

To emphasize the social nature of Information Management, I introduce the stakeholder framework by Wupper (2010). The development of an information system in a particular organization always considers several stakeholders involved in this project. Wupper (2010) identifies four different stakeholder groups in information management projects:

- The client is the one who has a certain information related problem, and wants an information system to resolve this problem. Often this is the stakeholder who determines where the (monetary) investments are spent. Most of the time this is the CEO, CIO, Board of Directors etc.
- The contractor is the one who makes a living with building information systems. Often the contractor is a large software house or consultancy company.
- The users are the people who work in the particular organization on a daily basis and who have to work with the information system.
- The environment is considered as all the other influences, for example the organizational culture, other related information systems, other organizations. In other words this is considered the context or the specific situation.

Closing in on this stakeholder framework several conclusions can be draw. The different stakeholder groups all have significantly different needs concerning the information system. First of all the different stakeholders have their own subjective needs and interpretation of the project and the information system itself. The client wants insight in the consequences for his organization. He has some monetary funds to invest, but this budget is not infinite. The contractor wants to earn money when building the system, and often has expertise with a specific software tool or package. Users are involved with the system on a daily basis and have concerns how the information system will influence their work. For the environment, like the other information systems or the organizational culture, it is impossible to express their needs in language terms. But the environment forms the context of the problems addressed and plays an important role in solving these problems. Thus, the stakeholder groups in the framework exercise their own subjective influence on the design and development of the information system: “Systems development proceeds through the social interplay of multiple actors who attempt to interpret or ‘make sense’ of their and others’ actions, largely through the medium of language” (Boland R. J., 1985).

In other words, every stakeholder sees the project from his own perspective, the subjective ‘glasses’ of each stakeholder. Wupper (2010) concludes that this requires an extra role to overcome these discrepancies in communication. From the stakeholder framework and their subjective perspective, Wupper (2010) concludes that there is a need for an ‘architect’. The ‘architect’ researches the different perspectives of the involved stakeholders to find the latent needs that they require. These needs are assembled and incorporated in the design of the information system. The architect, in the words of Wupper (2010), is the information professional who is in charge of the design and development of the information system. Long before Wupper constructed his schema of stakeholder groups, Van Rees and Wisse (1995) argued for different roles in constructing an information system. Van Rees and Wisse (1995) distinguish between the information architect as the designer and the systems contractor as the builder of the information system. Van Rees and Wisse (1995) explain that the information architect is a different role than the systems engineer. Like Wupper they argue that both roles are inadmissible for a successful implementation. The conclusion is that Information Management, in its pursuit to design information systems and organizations, is subject to complex social structures in which the stakeholders speak different languages (Conklin, 2005).

2.2.2 Subjective valuing in Information Management

The previous paragraph concluded that social complexity is an inherent aspect of Information Management. Multiple stakeholders with different belief sets use different languages to explicate their concerns and wishes to problems in the organizational context. A deeper analysis of the stakeholder framework leads to the recognition of the variety in subjective values. This perspective acknowledges multiple interpretations for a certain object, since every individual invests value and meaning in the world by his personal interpretive
framework. One object can therefore be the ‘carrier’ of many different meanings for different individuals. A particular object can even have different meanings for one individual in different contexts. This is the fundamental insight in subjectivism situationism (Wisse 2002).

By interacting with the world around them, human beings invest values and meaning in the world. Values and meaning are contextual, culturally determined and influenced by individual’s mental framework with which they interpret the world (Huizing, 2007b; Snel, 2011). Thus, in subjectivism “truth and meaning are therefore neither fixed nor entirely residing in objects, waiting to be ‘conveyed’ and ‘extracted’, but are dynamically and socially negotiated and constructed” (Huizing, 2007b).

A simple but effective example of subjective truths defined by a specific context can be found in the interpretation of numbers. In Europe, USA, and Latin America the number thirteen is perceived as a messenger of bad luck. Friday the thirteenth is a day of adversity; architects design skyscrapers without a thirteenth floor. But in ancient China thirteen was a number of luck, and in Jewish traditions thirteen is the age of maturity and is celebrated by a Bar Mitzvah. The perception and interpretation of numbers is highly subjective and culturally dependant. Interpretations of a single object can thus be contradicting, which lead to an increase in wickedness.

Designing information systems and organizations involves many aspects of an organization and its environment. Acknowledging the social nature of information systems development is impossible without understanding individuals and organizations (Hirschheim & Newman, 1991). Ambiguity, interdependence, and conflict are part of latent needs of stakeholders. Individuals behave according to the subjective interpretations, values and meanings they attach to the world around them. This behaviour is not only subjective but also highly situational, since individuals adjust their behaviour in line with a specific situation (Wisse, 2003). Variety of signification and meaning defines the essence of Information Management. It is the information manager’s task to

“arrange the information infrastructure in such a way that participants of that infrastructure can satisfy their subjective situational information needs as much as possible” (Wisse, 2003, p. 10).

There is no universally right solution to these problems of designing information systems and organizations. And due to the importance of the unique situation and the specific beliefs combined with the latent needs of stakeholders, every problem is essentially unique. This supports the conclusion that Information Management has to deal with the wickedness of these problems.

2.2.3 Resistance to wicked problems
As I have shown for wicked problems in general, Information Management also has a tendency to resist wicked problems. The step from denial to acceptance of wicked problems proves to be a hard psychological step (Conklin, 2005). Information Management, when confronted with complex unstructured problems, is incapable of dealing with these problems since the design of information systems is preoccupied with dealing with tamed problems (Mason & Mitroff, 1973): “Relatively little work has been done on information systems for improving appreciation and for dealing with unstructured wicked problems” (p. 480).

Problems in Information Management are often addressed from the science and engineering approach (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011), focusing on methods and tools directed to solve structured problems (Conklin, 2005). The idea with this rationality is that a certain method or tool will be most effective to reach a certain goal (Snel, 2011). But Rittel & Webber (1973) argued that problems in open societal systems, like an organization and its information systems, demand other ways of problem solving than most problems in natural sciences. Lindberg et. al. (2011) state that the scientific paradigm in Information Management seeks to reduce complexity in order to make problems non-wicked. Again this is an attempt to deny the nature of wicked problems; an attempt that proves to be incapable of dealing with complexity and uncertainty.

2.3 Wicked problems in Information Management

3 Translated from Dutch, by myself
Information Management lacks basic knowledge of complex problems, and managers prove to be unaware that linear processes are not effective with such problems (Conklin, 2005; Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011). The underlying paradigm to deal with wicked problems in a non-linear way is mostly missing in Information Management. The question rises why the field lacks such a foundation. The next paragraph outlines the dominant paradigm in Information Management. This dominant mindset does not suit wicked problem solving, hereby providing insight why Information Management needs a shift in mindset to better deal with wicked problems.

2.3.1 Bias towards objectivism

By analysing if Information Management is able to deal with wicked problems, I found that the field lacks a paradigm to deal with complexity. The current dominant paradigm in Information Management, objectivism, does not provide a non-linear, holistic way of approaching problems. Objectivism is rather focused on rationality, confined classifications, and efficiency. But dealing with wicked problems requires non-linear methods, such as empathy and creativity, since these problems are surrounded by social complexity, ambiguity, and uncertainty. This paragraph examines the bias towards objectivism in the current field in order to build an argument why a new paradigm in Information Management is needed to deal with wicked problems.

Orlikowski & Baroudi (1991) are the first to address this bias empirically when they questioned if a bias exists towards a certain epistemology in the information systems research discourse. They found that “although research is not rooted in a single overarching theoretical perspective, it does exhibit a single set of philosophical assumptions regarding the nature of the phenomena studied by information systems researchers” (Orlikowski & Baroudi, 1991, p. 1). Positivism, the epistemology of objectivism, was prevalent in 96.8% of the 150 research articles they accounted. Orlikowski and Baroudi also conclude that researchers do not purposely examine the dominant set of assumptions, rather they are largely taken for granted (Orlikowski & Baroudi, 1991).

The study by Orlikowski and Baroudi was carried out between 1983 to 1988; hence one could argue that the results are out-dated. Nevertheless de Vries (2007) performed a similar study into the epistemological perspective of 62 case studies in the field of Information Systems. From these 62 case studies seven were embedded in the interpretive orientation. The other fifty-five studies fall under the traditional positivist perspective. Interesting about de Vries’s research is not only that the objective perspective is dominant in case study research, moreover he found that “stating the epistemological orientation is rarely the case in positivist studies but frequently the case in interpretive studies” (de Vries, 2007, p. 5).

De Vries argues that researchers should pay more attention to make the entire chain of evidence evident in case research. Not only should the epistemological standpoint be mentioned explicitly, de Vries also argues that research choices and principals should be made explicit.

Both studies showed that objectivism is deeply rooted in Information Management. But in what ways does this affect the field? Huizing (2007a) argues why and how objectivism plays a role in the Information Management discourse. He argues that, “objectivism has entered the domain, rationale, definition and goal that are commonly ascribed to information and knowledge management as well as the definitions of their core concepts information, knowledge, communication and learning” (Huizing, 2007a, p. 2).

Following Huizing, I use objectivism as an umbrella term for all those theories that view the world as consisting of distinct objects that can and should be separated from their originators and users (Huizing, 2007a).

According to objectivistivc currents, the world external to human beings consists of distinct objects that have inherent properties, where forces from this external world determine our behaviour. By understanding and exploring the objects we gain knowledge about the external environment in order to attain mastery of our external world. The distinct objects are, still according to objectivism, not affected by the way we think or feel of them and have fixed meanings that can be known by investigating their inherent properties (Huizing, 2007a).

For example, a rose has thorns, a certain leaf size, and a distinctive smell: properties that determine our understanding of this flower. These characteristics determine for example the market value of a specific rose in a flower auction. Since objects are, as objectivism holds, not affected by the way we think or feel about them, the abstract knowledge we acquire by studying them is fixed, objective and factual. When science is the study of the inherent properties of the objects in our external environment, “[it] allows us to abstract experiential
knowledge from practice in such a way that ultimately correct, general and definitive accounts of reality can be given that are objectively, universally and unconditionally true” (Huizing, 2007a, p. 5).

The emphasis on objectivism and rationality has severe consequences for the current discourse. Essentially objectivism provides the field with a theoretical foundation “that has ironically proven to be incapable of dealing with the very core of [the field’s] existence: information” (Huizing, 2007a, p. 2). Wisse (2003) sustains this statement by providing an answer to the question, what is information?: “A fruitful answer to that question is that information is all about meaning. And meaning is always interpretation. Thus, a dependency exists on the interpreter. In this way we again arrive at the singular individual.” (Wisse, 2003, p. 8)

Since information is at the heart of Information Management and understanding information demands an understanding of interpretation and meaning, Information Management can only deal with wicked problems when there is room for subjectivist insights. Objectivism as the dominant perspective makes the field ignore the social complexity and interdependency in wicked problems. Information Management is thus unable to deal with wicked problems if it does not shift its focus from objectivism to a paradigm that incorporates subjective values.

2.3.2 An alternative paradigm
In this discussion on dealing with wicked problems, the need for an alternative mindset for problem solving is often sustained by referring to Thomas Kuhn’s work in The structure of scientific revolutions (1970). Hevner et. Al. (2004) argue that design science in Information Management addresses wicked problems and therefore it is in constant scientific revolution (Kuhn T. S., 1970). Kuhn aims to explain how revolutionary innovations in science come to pass. Therefore, in the context of wicked problems, the theory by Kuhn (1970) proves to be very insightful. He distinguishes between two forms of scientific research: normal scientific research and revolutionary scientific research. Both researches address very different types of problems.

Normal science is common practice amongst most scientists. According to Kuhn, normal science is “directed to the articulation of those phenomena and theories that the paradigm already supplies” (Kuhn T. S., 1970, p. 24). Normal science relates to tame problem solving since it is directed towards already knowing. Like Conklin (2005) Kuhn compares tame problem solving to puzzle solving when he argues that:

“Though the outcome [of normal research] can be anticipated, often in detail so great that what remains to be known is itself uninteresting, the way to achieve that outcome remains very much in doubt. Bringing a normal research problem to a conclusion is achieving the anticipated in a new way, and it requires the solution of all sorts of complex instrumental, conceptual, and mathematical puzzles” (Kuhn 1970: 36).

This shared paradigm serves as the basis for generally accepted methods, rules and standards for scientific research. But for wicked problem solving, this does not suffice since “the really pressing problems, e.g. a cure for cancer or the design of a lasting peace, are often not puzzles at all, largely because they may not have any solution” (Kuhn T., 1970, p. 36).

I have argued that Information Management is in need of an alternative mind-set or an alternative paradigm to deal with wicked problems. Kuhn argues that a crisis of the current paradigm is the driver for the eruption of revolutionary research. Although the word crisis might seem a bit dramatic, I will still use it as in Kuhn’s reasoning. The paradigm is for example unable to explain certain occurrences or it is incompetent to solve a specific problem. As in wicked problems the problem is unclear and cannot be solved with linear thinking and current methods and tools.

Wicked problems result in crisis because the field is not able to deal with them in a proper way. The current objectivist paradigm is at crisis and a new paradigm is needed. This chaos or crisis serves as the bridge to a new paradigm as it “loosens the stereotypes and provides the incremental data necessary for a fundamental paradigm shift” (Kuhn T. S., 1970, p. 89). This is what Kuhn defines as a scientific revolution: a fundamental change in the perspective on the field in which science is conducted. Huizing (2007a) and Wisse (2003) argued that objectivism, the dominant perspective according to (Orlikowski & Baroudi, 1991) and (de Vries, 2007), is deeply rooted in the foundations of the Information Management. This transition is a change of foundations of

4 Translated from Dutch, by myself
the field, by Kuhn described as “a reconstruction of the field from new fundamentals, a reconstruction that changes some of the field’s most elementary theoretical generalizations as well as many of its paradigm methods and applications” (Kuhn T. S., 1970, p. 85).

This does not mean that the old paradigm is fundamentally wrong or untrue. Moreover the new paradigm reshapes the way in which certain phenomena in the field need to be interpreted. Yet this leads to an incommensurability of both paradigms. Therefore it is impossible to evaluate the new paradigm according to the conditions of the old paradigm since these criteria depend in part upon the old paradigm. Thus, “when paradigms change, there are usually significant shifts in the criteria determining the legitimacy both of problems and of proposed solutions” (Kuhn T. S., 1970, p. 109). In the new paradigm, wicked problems will be seen from a new perspective and some, if not all, wickedness may simply disappear. In the conclusion section I argue what this alternative paradigm should entail.

2.4 Conclusion
This chapter aimed to describe the current state of affairs concerning wicked problem solving, and more specifically wicked problem solving in Information Management. The first part of this chapter elaborated on wicked problems in general and hereby answered the first research question: What are wicked problems in general?. Wicked problems are characterized by complexity through interdependencies, involvement of many stakeholders and opposing needs concerning the problem. Individuals tend to deny the complex nature of these problems since they provide them with deep uncertainty. There is no definitive formulation for a wicked problem, and neither does a true or false solution exist. By experimenting and working towards a solution, a problem is better defined and understood. Thus dealing with wicked problems requires no-linear thinking methods like those in design studies. Moreover the acceptance of uncertainty as an important aspect of life and the problems it imposes on us might be the toughest challenge.

Designing information systems and organizations is not a straightforward, rational process. Information Management has to deal with social aspects, integrating them with technological variety. Inherent to the design of information systems for organizations is the study of organizational culture, latent needs of stakeholders, and social structure. The acknowledgement of social complexity in Information Management has lead to the insight that variety of signification and meaning is an important aspect of information and knowledge. The field requires an understanding of subjective belief systems and resulting behaviour in specific situations. This section answered the second research question: What are wicked problems in Information Management?

Problems in Information Management cannot be addressed from the paradigm of natural sciences. Several studies show that Information Management is biased towards objectivism. Objectivism proves to be incapable of dealing with the eminent subjective nature of information and knowledge. The current emphasis on analytical and rational skills does not provide a solid base to deal with the true nature of complex problems. Hereby providing an answer to the third research question: Is information management able to deal with wicked problems?

The need for an alternative paradigm that incorporates the study of subjectivity and situation specificity and translates this knowledge into workable solutions is therefore evident. Mason & Mitroff (1973) summarize this in two principles for Management Information Systems practice and research. (1) “Managers need ‘information’ that is geared to THEIR psychology NOT to that of their designers” (Mason & Mitroff, 1973, p. 485). Designers must therefore find out what information the manager needs and how it should be displayed. Moreover the designer should be aware of his own psychology. (2) “Managers need a method of generating evidence that is geared to THEIR problems NOT those of their designers” (Mason & Mitroff, 1973, p. 485). It requires designers to be aware and prepared to deal with wicked problems (Mason & Mitroff, 1973) by adopting a design attitude. This alternative mind-set to deal with wicked problems is the topic of the further chapters.
Chapter 3

Positioning Design in Methodology

We cannot solve our problems with the same thinking we used when we created them.
- Albert Einstein

Introduction
Problem solving or designing solutions is at the essence of many sciences and practices. In today’s complex and globalized world, challenges arise that demand unconventional approaches for working towards a solution. In the open information era, Internet and organizational networks have unlocked a growing information and knowledge traffic across national boundaries. In this interplay of information traffic, professionals are asked to define the organizational information infrastructure as a participant in the growing information society.

Dealing with the problems that arise in such complex contexts requires a designer’s way of problem solving. The previous chapter showed that IM professionals are unable to deal with complex problems. I argued that a different mind-set or paradigm is needed to deal with wicked problems. This mindset is labeled as the Design Attitude. To argue how the design attitude should be incorporated in management education, a deeper understanding of this concept is needed. Since this is an academic thesis the first step is to build a methodology sustaining the design attitude.

4. How can the Design Attitude be positioned in methodology?

This research question searches for a relation between what Conklin (2005) calls non-linear problem solving and the design attitude. By combining several models of problem solving, I will methodologically build a fundament for the design attitude. The next step is to further deepen the understanding of the design attitude.

5. What characteristics of the Design Attitude are important for wicked problems in Information Management?

To answer this research question I use theories from management practice and design studies like architecture, product design and so on. The design attitude is presented as an attitude that is inquiring, divergent, aimed at finding stakeholder needs and seeing the salient. The purpose of the design attitude is to come up with an innovative design that transcends conflict and ambiguity by integrating all the perspectives. Variety is thus an inherent aspect of the design attitude.

3.1 The Design Attitude

Conklin (2005) argues that every problem asks for design. Essentially every project is designing something. A problem is a gap between the current situation, a desired state and the possibilities of the situation. Design aims to resolve the tension between what is needed and what can be done (Conklin, 2005). Therefore learning strategies in design are intended to “grasp multiple knowledge and multiple perspectives of others for the purpose of synthesizing and creatively transforming the knowledge to new service or product concepts” (Boland & Collory, 2004, p. 4).

3.1.1 Linear and non-linear problem solving

Conklin (2005) distinguishes linear from non-linear problem solving. The linear way of problem solving is described as a linear process in which several steps lead to a solution of the problem: gather information on
the problem, analyze the information, design a solution and implement this solution. This is often named the waterfall model of problem solving. We tend to think that problem solving happens in this incremental way. Figure 2.1 depicts the linear way of problem solving.


Figure 2.1 Waterfall model of problem solving (Conklin, 2005)

Conklin (2005) observes that the designer achieves a better understanding of the problem by working towards a solution: “These experienced designers illustrated that problem understanding can only come from creating possible solutions and considering how they might work” (2005, p. 5).

The jagged green line in figure 2.2 also leads to the conclusion that problem understanding evolves throughout the project. The problem is not understood in its totality upfront, but understanding develops simultaneously with solving the wicked problem. Lindberg, Meinel & Wagner (2011) phrase this as two spaces: the problem space and the solution space. The problem and solution space are concurrently explored.

The interaction of the problems solver with both spaces determines his or her creativeness and innovativeness. The exploration of both spaces is closely related to convergent and divergent thinking (Snel, 2011; Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011). Joy Paul Guilford first used these terms in 1967. In convergent thinking the goal is to find a single right solution to the problem. Convergent thinking is aimed to find the best answer, leaving no room for uncertainty or ambiguity. Divergent thinking aims to take multiple perspectives in consideration, finding several solution possibilities to a given problem.

Brown (2008) used both concepts to depict a model for creative problem solving. He explains how divergence is about taking multiple perspectives into account and convergence constitutes to making choices for the design. Both perspectives are often combined in creative problem solving, for example in ambidextrous thinking and design thinking. This relation between divergence and convergence is depicted in the figure below:
3.1.2 Problem solving model

Lindberg, Meinel & Wagner (2011) formulate a deeper analysis of Brown’s model by explaining how problems are addressed in a designer’s way. Lindberg, Meinel & Wagner (2011) also make the distinction between problem and solution space as in the work by Conklin (2005). In their article, Lindberg, Meinel & Wagner (2011) use the term design thinking for what I named the design attitude. I prefer the model by Lindberg et. al. over the more simple model above, because it provides a basis for further reasoning. The model is aimed at exploring both the problem space and the solution space by using divergence and convergence:

This model clearly depicts that multi-perspective comprehension is obtained in order to deal with the ambiguity of wicked problems (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011). Lindberg et. al. (2011) argue with this figure that creative problem solving can be divided into three characteristics:

- Exploring the problem space
- Exploring the solution space
- Iterative alignment of both spaces

The distinction between problem and solution space is characteristic for the design attitude, since it elucidates the dualistic approach: “Whereas in science the focus lies in general on exploring the solution while the initial problem is given, design treats both the problem and solution as something to be explored” (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011, p. 5). Exploring both spaces is thus a process that iterates until a ‘good enough’ solution is reached for the wicked problem. Problem understanding and problem solving are both simultaneously conducted and repeated throughout the process of working.
towards a solution. These three phases provide a solid base to explain how creative problem solving functions and to show how a design attitude is valuable when dealing with wicked problems.

Lindberg et. Al. (2011) argue that the divergent phases enable the problem solver to approach the problem holistically and integral. This results in a more viable solution because "when more perspectives on a [wicked problem] are available, a more comprehensive view is obtained, providing more possibilities for action" (Snel, 2011, p. 188). The convergence phases should not be understood in the same way as convergent thinking is explained. Convergent thinking aims to find a single well-established answer to a problem, while the convergence phases in this model focus on synthesis of knowledge pertained in the divergent phases. The convergent phases should be understood as phases of synthesizing and selecting, not as phases that result in a single arched solution to the problem.

The third important aspect of this model for problem solving is the iterative nature of exploring both spaces. This way of problem solving balances both the innovativeness and the suitability of the solution since it “helps to keep in touch with the problem relevant environment and [the designer] can use this information for refining and revising the chosen solution path” (Lindberg, Meinel, & Wagner, 2011, p. 6).

Hereby I want to underline that a designer has to cope with uncertainty because this is eminent to this way of problem solving. In the divergent phases, uncertainty increases, therefore the wickedness of the problem grows. The problem is understood as complex and the problem solver investigates this complexity in its true nature. Wisse (Wisse, 2003) calls this ‘problematizing’ when he argues that questioning every aspect of a given situation is needed to encounter a problem in its full holistic being. Through observation and other methods, a better understanding of the problem is achieved and this knowledge is brought in synthesis by the problem solver. The problem solver then finds himself in the middle of the model by Lindberg et. al. (2011) at the exclamation mark. After exploring the solution space and working towards a solution, the process is repeated. The problem space is re-investigated where the problem solver again is confronted with ambiguity, uncertainty and complexity. This iterative way of problem solving makes it clear that both accepting wickedness and re-seeking wickedness is an important aspect of this attitude to solve complex problems. Designers actively search for complexity and the tension that i accompanies. This iterative search for more complexity and finding new aspects of the problem is essential to the design attitude. In the further part of this thesis I name this characteristic problematizing.

This yields an important insight and a closing argument for this way of problem solving. The iterative nature of non-linear problem solving that switches between deliberately searching for the wickedness of the problem, working towards a solution and back again, can be related to the model of (Conklin, 2005). The jagged line clearly represents the continuous shift between problem understanding, problem solving and re-understanding the problem.

![Figure 2.5 Combination of Concklin’s model (2005) and Lindberg’s model (2011)](image-url)

The figure on the left is based on the model of Conklin (2005) and the orange line depicts the designer’s way of problem solving by exploring problem and solution space. The orange line in the figure on the left corresponds to the dotted orange line in the right figure. Every cycle in the problem-solving model (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011) is part of the jagged line in the model on the left. The combination of both models is an important foundation for the rest of this chapter, since it
explains how problems are treated in design. As Lindberg et. Al. (2011) formulate it: design thinking teaches to treat problems as wicked problems, thus more openly, with the purpose of embracing the blurred space of social ambiguity” (p. 8). This argues again for resolving the distinction between tame and wicked problems, since all real-life problems can be handled as wicked problems if one adopts the design attitude towards the problem (Conklin, 2005).

3.1.3 The design attitude as non linear problem-solving
Since I have shown what creative problem solving entails and that it requires an alternative, non-linear attitude, I will now go deeper into this alternative mind-set. As mentioned before, several authors elaborate on such a mind-set labelled as integrative thinking (Sill D. J., 1996), ambidextrous thinking (McKim, 1972; Raisch, Birkinshaw, Probst, & Tushman, 2009; Faste R. A., Ambidextrous Thinking, 1994), and design thinking (Boland & Collop, 2004; Brown, 2008; Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011). All these different labels have in common that they tackle problems from a non-linear perspective. I will refer to this problem-solving attitude as design attitude since the emphasis is on exploration of different perspectives on the problem and synthesizing these into a suitable solution.

3.2 Characteristics of the design attitude
In this section I portray what the design attitude as an alternative mind-set actually means in the practice of wicked problem solving. The first argument that is made is that a design attitude does not dismiss options but aims to accommodate opposing ideas, needs, and perspectives. Furthermore I explain how a designer deals with social complexity and finds latent stakeholders needs. In other words I underline the importance of empathy in the design attitude.

3.2.1 Resolving tension between opposing ideas
Martin (2007) argues that a designer actively seeks less obvious features but potentially relevant factors that at first make for a messier problem. “Integrative thinkers embrace [a messier problem] because it assures them that they haven’t dismissed anything that may illuminate the problem as a whole” (Martin, 2007, p. 64). Designers treat a problem in a holistic manner and use problematizing to discover salient aspects that might prove important. Or as (Brown, 2008) puts it, “[Designers] not only rely on analytical processes (those that produce either/ or choices) but also exhibit the ability to see all of the salient—and sometimes contradictory—aspects of a confounding problem”.

Designers thus welcome complexity as they are confident to muddle through and emerge on the other side with a clear resolution. Sill summarizes certain characteristics of a design attitude that match exactly with the non-linear way of complex problem solving: “an appreciation of, even seeking out, perspectives other than one’s own; (..) tolerance of, even a preference for, ambiguity; more sensitive to ethical issues; the ability to synthesize or integrate” (Sill D. J., 1996, p. 132). This summary advocates the simultaneity of divergence and convergence in wicked problem solving. Integrative thinkers thus have the “predisposition and the capacity to hold in their heads two opposing ideas at once” and “then, without panicking or simply settling for one, they are able to creatively resolve the tension between those two ideas” by uniting elements of both ideas in a synthesis of both (Martin, 2007, p. 62).

A great example of an integrative thinker is given in the study by Martin (2007) in which he introduces Bob Young, the CEO of Red Hat, a provider of Linux software packages. In search of a new business model to stimulate annual growth, Red Hat saw two business models in practice. The first is the classical proprietary software model in which big software houses sell operating software but not the source code. The alternative is the free software model, in which suppliers sell cd-roms with their software and source code. The first business model leaves customers locked in and forced to buy expensive upgrades, while the second has a low profit rate and due to the great amount of upgrades this business model does not attract corporate customers. Young would not settle for either of these models and introduced a new business model. Red Hat made their software freely available via the Internet and provided extensive support with upgrades keeping the Linux operating systems up to date. In this way Red Hat became a competitor in the corporate market for operating systems with a new way of doing business that involved aspects of the previously mentioned business models. Young recognized that he wasn’t bound to choose either of the prevailing business models. He rethought the problem from the bottom up, coming up with a model that grew out of the tension between both software models (Martin, 2007).
But how are designers able to see different aspects of a problem and treat them as salient? In search of this creative tension, designers problematize (Wisse, 2003). According to Sill “making a subject or an idea ‘problematic’ is making it absurd, taking an idea or ideas to the point where they no longer make sense” (Sill D. J., 1996, p. 143). The designer inquires into the true nature of the idea by questioning how it derived its meaning. This attitude “presumes a state of mind that impels the person to seek uncertainty in what appears to be ‘obvious’ certainty and to raise questions that are in some way startling” (Sill D. J., 1996, p. 143). It requires the ability to see the familiar as strange and the strange as familiar. Designers first and foremost question existing conceptualization and are able to decontextualize existing concepts.

In the words of McKim (McKim, 1972), designers have the ability to re-center their perception of objects and situations. Re-centering is another term for the concept of problematizing. “Creative seeing is the ability to change from one imaginative filter to another” (McKim, 1972, p. 50). According to Sill (Sill D. J., 1996), it is to put something that makes perfect sense in one mental matrix, in another mental matrix. The key to creative seeing according to McKim is flexibility, since “people who can flexibly use their imaginations to re-center viewpoints are able to see creatively” (McKim, 1972, p. 50). Re-centering vision is fundamentally an experience in unlearning, since it questions our preference for stereotypes and cultural or educational determined perceptions. This ability to flexibly switch between perceptions is a matter of courage and vitality of the individual (McKim, 1972). Our natural tendency to avoid uncertainty and prefer simplicity can be an obstacle for creative problem solving. McKim provides us with several ways of practicing this recentering of one’s perception like relabeling, and unlabeling.

An important aspect of a design attitude is being ambidextrous (McKim, 1972; Faste R. A., 1994). Literally, ambidextrous means being able to use both hands equally well. In design, ambidexterity is linked to both cerebral hemispheres. Both hemispheres are associated with certain functioning modes. The left mode is associated with symbolic, segmented, objective, linear, and analytical thinking, while the right mode refers to visual and kinaesthetic, intuitive, holistic, emotional, and relational characteristics (Faste R. A., Ambidextrous Thinking, 1994). Creative problem solving requires the integration of both types of thinking (Faste R. A., Ambidextrous Thinking, 1994). McKim quotes Bruner when he calls for a need to integrate the artist and scientist within each one of us. We need to create bridges between the intuitive receiving right mode and the outward oriented left mode (McKim, 1972). McKim argues that everyone experiences a hemispheric preference for one of the two modes. But, his conclusion is that one can train one’s thinking to move between the left and right mode in order to think ambidextrous. Switching between different perspectives on the problem situation and being internally flexible thus requires accepting the tension between opposing ideas and demands courage and practice of the information management professional.

### 3.2.2 The design attitude and social complexity

Chapter one stressed that wicked problems are entangled with social complexity. In designing information systems, the needs of stakeholders play an important role in finding a suitable working solution. In this section I argue how stakeholders’ needs can be perceived. Brown argues why a design attitude is needed to solve problems concerning humans: “By taking a ‘people first’ approach, design thinkers can imagine solutions that are inherently desirable and meet explicit or latent needs” (Brown, 2008, p. 3). Finding needs is also a creative act since the needs of many stakeholders are often latent. Therefore Faste concludes that “[need finding and creative problem solving] both require reordering the facts in order to see something that did not previously exist and was therefore unseen” (Faste R., 1987, p. 2). Needs finding is in itself paradoxical; “what is sought is a circumstance where something is missing and in order to find and articulate a need, this missing thing must be seen and recognized by someone” (Faste R., 1987, p. 1).

At the same time the complexity of requirements grows. Faste (2001) argues that successful products require the presence of three things: utility, usability, and meaning. The design of a solution to a socially complex problem includes not only the design of functional utility but also that of behaviors and experiences (Faste R., 2001). In the context of information systems: the first information systems only provided functionality to their users, often in the fields of mathematics and physics. As more people began to use information systems the need grew for more usable systems since the old systems often required programming skills. Currently, with the rise of user interfaces, laptops, smartphones and tablets, technology is influencing the way people perceive the world, and invest meaning in the world. Information systems are thus influential on the investment of meaning and behavior aspects. Designing these systems therefore requires knowledge of human beings.
Needs finding thus becomes more complex and focuses on the essentials of being human. “Meaning making requires sensitivity to cultural and social differences, including the views of other cultures and minorities” (Faste R., 2003, p. 22). In order to explicate these needs, need finding “requires empathy or a feeling of involvement with the needer” (Faste R., 1987, p. 2). Brown (2008) even states that empathy is essential to find latent needs and perceiving a wicked problem from multiple perspectives. I derive two conclusions from the arguments made. First since wicked problems involve many stakeholders with different needs these problems have a complex social dimension. Second our needs tend to become more complex because “as more of our basic needs are met, we increasingly expect sophisticated experiences that are emotionally satisfying and meaningful” (Brown, 2008, p. 7). Need finding thus requires creativity and integrative thought to ensure the perception of latent needs.

An example will illustrate the abstract arguments made above. I took a design example of IDEO, a design firm closely related to Stanford University. IDEO redesigned the ATM machine for BBVA, a Spanish bank. Their purpose was to redesign the ATM machine, not by enhancing the automation process but by humanizing it. IDEO observed customer interactions with the ATM, their feelings, and expectations.

The first thing that is strikingly is the 90 degrees angle of the ATM to the cue. This set up makes the customer feel safe and secures the privacy of self-service banking. Furthermore, the machine has one slot for the deposit of cash and receipts in order to make this interaction with the machine simpler. The buttons on the ATM are replaced by a touchscreen on which the machine shows personalized information. All the actions are visualized making the real and the virtual more connected. Visualization results in less doubtful interaction with the ATM. This example shows that the focus on human needs leads to new opportunities for the design of solutions.

In another project to redesign patients’ experience in hospitals, IDEO found an interesting way to capture the experience of the patients in the hospital. One of the IDEO employees had a helmet with a camera and stayed in the hospital for several days. With this patient’s point of view, IDEO found that one of the key parts of experiencing a stay at the hospital was that the patient stayed most of the time to a white ceiling. Patients were also found staring at the ceiling when nurses, doctors and other medical personal were talking about the patient. This constant staring at the white ceiling and not being involved in conversations about their health alienate the patient from the actual medical process. One can imagine that this is not a pleasant or comfortable experience. By focusing on human needs and visualizing these needs, IDEO helped the hospital to redesign the experience. Together they created a blueprint for the hospital experience in which human needs were centralized.

A final example from the book Design and Truth by Robert Grudin (2010) points out the profound difficulty and depth of needs finding. Grudin (2010) describes an anecdote by Mark Taylor, a student of the famous designer Frank Lloyd Wright. Wright designed and built ‘Usonian’, which were affordable houses. Taylor said the following: “During my time at Taliesin, I was able to talk to many owners of Usonians. They talked about their environments with unreserved passion. It was from one, Mrs. Pew, that I learned the true secret of Mr. Wright’s genius and success. She described how at first she hated the house. She felt that Mr. Wright had not listened to her requirements but merely built what he wanted. She was, at the end of her second year living in it, ready to sell it and move on – at great financial sacrifice. She told me that she decided that she would “give the house another year without struggling with it” before she made up her mind. In that year a transformation took place. She discovered that “Mr. Wright had not built a house for who I was” – but for “the person that I could become. It turned out that Mr. Wright had listened well and understood me very deeply.” (Grudin, 2010, p. 24).

This example of needs finding explains the profound role and essence of latent needs in design. Wright understood Mrs. Pew in a very deep way such that he was able to translate in a particular design that suited her personal development. Especially in wicked problems in Information Management the social complexity has an important influence and cannot be overlooked. The focus on latent needs prove to be a driver for creativity and innovation.

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3.2.3 Latent needs in design
This thesis will emphasize the divergence aspects of the design attitude, since divergence forms the basis for integrative thought. Divergence counters premature decision making, stereotyping and biases, phenomena that inhibit creativity and innovation. Of course the convergence aspects are also touched upon since divergence and convergence are inseparably linked, but they are not the main topic of this thesis. Figure 2.8 depicts the scope of this thesis in the model by Lindberg et. al (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011).

Figure 2.8 Scope of this thesis

As stated before, emphasis in this thesis is on the social aspect of wicked problem in Information Management. Technical complexity is evident, and considered in many other inquiries. Human needs are the basis for innovation and creativity, and focussing on these needs will provide designs that contribute to humanity. To resolve a complex problem it is important to find the latent needs of these stakeholders and honor them in the design of a solution. Therefore need finding will play a profound role in the remaining part of this thesis, as it is an important aspect of the exploration of the problem space.

The previous paragraphs gave a deeper insight in the design attitude. These subsections emphasized the divergence in exploring the problem and solution space. The divergence phase is essential to designing: it is a contributor to the unique character of the design attitude. Designers first seek to problematize or diverge their viewpoint on the problem space or solution space. This leads to multiple perspectives from different viewpoints on the given situation. Often the diversity in perspectives leads to opposing ideas, conflict and ambiguity. But this is exactly what the integrative thinker aims for, since opposing ideas result in a creative tension. By resolving this tension without rejecting any of the perspectives, the design results in an innovative solution.

3.3 Conclusion
Creative problem solving in a designer’s way requires a non-linear approach as was stated by Conklin (2005). The combination of Conklin’s model (Conklin, 2005) of iterative problem solving with Lindberg’s model (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development, 2011) puts the design attitude in methodology of non-linear problem solving. I concluded that this problem solving approach moves iteratively back and forth between exploration of the problem- and solution space. Hereby deliberately seeking for wickedness and uncertainty. Problem situations are problematized to discover the problem space. A designer actively problematizes to find a creative tension that results in innovative solutions. This describes the methodological approach of the design attitude. This provided the answer to the research question: How can the Design Attitude be positioned in methodology?

The further part of this chapter focused on: What characteristics of the Design Attitude are important for wicked problem solving in Information Management? For the scope of this thesis I focused on the left part of
Lindberg’s model, especially because the divergent phases and the social aspects are underexposed in the Information Management field. Resolving opposing ideas, dealing with social complexity and finding latent needs are the three top characteristics that were mentioned.

To summarize, the design attitude is focused on perceiving multiple perspectives on a given situation without prematurely rejecting certain perspectives. Contradictory ideas or needs are accepted without panicking and the tension between both is resolved by an innovative idea that forms a synthesis. Especially the divergent phase requires courage of the problem solver, in our case the information professional, since he needs to accept uncertainty as eminent to the process. The problem solver also needs be conscious of his own perceptions in finding stakeholders’ needs.
Chapter 4

Reflection on the concept of Wicked Problems

The problems of the world cannot possibly be solved by skeptics or cynics whose horizons are limited by the obvious realities. We need men who can dream of things that never were. - John F. Kennedy

In this chapter the model of Lindberg is applied to this thesis and the concepts that are addressed. The design attitude is applied to material I presented thus far and the concepts are problematized.

In previous chapters I elaborated on wicked problems and contrasted these problems to tame problems. This separation proved to be important in reasoning about problem solving in Information Management. The analysis of problems solving in Information Management resulted in the recommendation for a design attitude in IM education.

Although I first described wicked problems as completely different from tame problems, Tyrrell argues differently: “Tyrrell (1947) claims that convergent problems do not exist in reality, but are created by a process of abstraction. The true problems of living (...) are always problems of overcoming or reconciling opposites. They are divergent problems and have no solution in the ordinary sense of the word” (Tyrrell 1947: 89 quoted by Snel, 2011, p. 182). What Tyrell (1947) and Snel (2011) describe as convergent and divergent problems, are synonyms for the definitions made by (Rittel & Webber, Dilemmas in a General Theory of Planning, 1973) for tame and wicked problems. Conklin (2005) makes a further nuance on wicked problems when he argues that problems cannot be classified binary. All problems have wicked and tame aspects.

According to McKim the eye of the beholder is particular important. He points out the difference between a novice and an expert. An experienced sailor can anticipate waves and currents. The novice sailor is unable to forecast the water conditions. For the novice sailing can be a wicked problem while for the expert this is a piece of cake.
The definition of wicked problems is therefore not a static definition. But how does the concept of wicked problems relate to design? (Rittel & Webber, 1973) provided several characteristics of which some have a direct link with the design attitude:

1. There is no definitive formulation of the problem.
2. Wicked problems have no stopping rule.
3. Solutions are not true or false.
4. Every wicked problem is essentially unique.
5. Every wicked problem can be considered a symptom of another problem.

These characteristics show uniqueness of a problem, uncertainty, and problem understanding through problem solving. The previous chapter argued that design is able to deal with this variety since design actively searches to match this variety. These characteristics of wicked problems are interesting but since they are not drafted from the design perspective, they do not provide insight in how wicked problems are seen from the design attitude.

Kuhn explained that the new paradigm reshapes the way in which certain phenomena in the field need to be interpreted. This leads to an incommensurability of both paradigms. Therefore it is impossible to evaluate the new paradigm according to the conditions of the old paradigm since these criteria depend in part upon the old paradigm. Thus, “when paradigms change, there are usually significant shifts in the criteria determining the legitimacy both of problems and of proposed solutions” (Kuhn T. S., 1970, p. 109).

Therefore if seen from the perspective of the designer, wicked problems do not exist. Attaining the design attitude, the Information Manager welcomes uncertainty, trusting that this will lead to resolving the problem. The wickedness of a problem is therefore not an obstacle for the designer but a mere driver for creativity and innovation in finding a solution. Wickedness is inextricably linked to designing and thus not considered problematic to the designer. From the perspective of the designer a wicked problem is not complicated, but interpreted as a design situation. A design situation is seen by the designer as an opportunity to create something new. For the designer a design situation reveals a window for innovation. Therefore the characteristics provided by Rittel & Webber (1973) that discourage people, are the driver for a designer to start challenging the situation. My conclusion is therefore that if one comprehends the design attitude wicked problems seize to exist and one will find a new sort of classification that I call design challenges.

To go on with this reasoning, a design situation emerges when an individual sees it as a design situation. It is in the eye of the beholder if a situation is a design situation. In our case if an individual sees a given situation as a design situation, he then automatically becomes the designer. Again it becomes clear that design finds it’s beginning in the specific situation and the subjective perceptions of that situation. This is what Wisse names subjective situationism.

One could argue that every choice we make is also a design situation. We are in a sense the architects of our own life, since every choice a person has to make can also be seen as a possibility for design on a small level. Or is this a sophism? To quote Herbert Simon: “Everyone designs who devises courses of action aimed at changing existing situations into preferred ones.”
Well-designed objects are easy to interpret and understand. They contain visual clues to their operation. Poorly-designed objects can be difficult and frustrating to use. They provide no clues or sometimes false clues. They trap the user and thwart the normal process of interpretation and understanding.

- Donald Norman

Introduction
Visual thinking is a term that raises doubt in the minds of many. Visual thinking is often considered as a synonym of visual perception. Vision, as a part of perception, is mostly considered separate from thinking in fields like psychology. The distinction between a ‘lower’ and ‘higher’ form of cognition is prevalent. The senses are said to gather information from the environment. The information, gathered by this ‘lower’ form of cognition, is then connected, separated, and inferred by thinking processes. Thinking emerges as the higher, more respectable function of the mind. This dichotomy between perception and thinking originated with Plato and Aristotle who thought of reason as compensating the flaws of perception (Arnheim, 1970). Thus considering Visual Thinking there is a tendency to focus on the visual aspect and forgetting the thinking. As was stated in the theoretical framework of this research, visual thinking is at the basis of design. The work by Arnheim and McKim serves as the fundaments of many articles on design and the design attitude. Furthermore the currently famous Design School of Stanford University has its curriculum based on visual thinking. The central theme for this chapter is therefore the link between design and visual thinking:

1. **What is the relation between Visual Thinking and the Design Attitude?**

In this chapter the aim is to present visual thinking as an extension of the design attitude. Therefore this chapter is divided in several paragraphs. The first paragraph explains why I choose visual thinking as a way of designing that enriches the understanding of the design attitude. As was mentioned above, visual thinking is an ambiguous term that has several definitions. To provide an understanding of visual thinking, the second paragraph argues what interpretation of visual thinking is used in this research. This part sets the scope of visual thinking in the context of this thesis. Furthermore visual thinking is inextricably linked to vision. In order to understand visual thinking some basic understanding of vision is provided in the third paragraph. At the end of this paragraph the link between the design attitude and visual thinking is set forth. The fourth paragraph describes how visual thinking trains individuals in observing, a skill that is valued in design. It refers to and builds upon the stakeholder framework and the glasses metaphor introduced in chapter 3. Arnheim (1970) describes three attitudes towards seeing that enhance the understanding of the design attitude. Central to these attitudes towards seeing is the relation between object and context. The final paragraph describes how the notion of problematizing can be interpreted from a visual thinking perspective, thus deepening the understanding of the process of problematizing.

5.1 Why Visual Thinking?
Before going deeper into visual thinking I want to explain why I chose to present visual thinking as an extension of the design attitude. Vision is one of the distant senses, as are hearing and smell. Smell and taste are rich in nuances but it is hard to think in smell or taste. Hearing is more appealing since music is one of the most potent outlets of human intelligence (Arnheim, Visual Thinking, 1970). But music is confined to the realms of thinking in the musical universe since it can refer to the outer world only indirectly and hardly without the help of the other senses (Arnheim, 1970, p. 18). Vision is therefore the most interesting of the senses since: “the great
The virtue of vision is that it is not only a highly articulate medium, but that its universe offers inexhaustibly rich information about the objects and events of the outer world. Therefore, vision is the primary medium of thought” (Arnheim, 1970, p. 18).

McKim (1972) provides us with a model that comprises visual thinking. He distinguishes three kinds of visual imagery that constitute visual thinking: (1) what we see, (2) what we imagine, (3) what we draw. These three imageries are depicted in the figure below.

![Figure 5.1 Three imageries of visual thinking (McKim, 1972, p. 8)](image)

Visual thinking is experienced at the fullest when seeing, drawing, and imagining merge: “Visual thinkers utilize seeing, imagining, and drawing in a fluid and dynamic way, moving from one kind of imagery to another” (McKim, 1972, p. 8). This interplay in visual thinking enables visual thinkers to solve complex problems in new and innovative ways (Arnheim, 1970). Jacobsen (2007) claims that “visual-spatial reasoning is an integral and fundamental part of complex problem solving in multiple domains” (p.2). Goldschmidt (2 p 193) relies on several other authors when she argues that visual thinking has an important role in “different kinds of thinking tasks, scientific thinking and discovery and is indispensable to artistic and architectural reasoning.”

In the context of Information Management, “Tractinsky (2004) noted that research in information systems has almost completely ignored [the notion of aesthetics] to focus on robustness and functionality” (Snyder, Heckman, & Scialdone, 2009). With the advent of user-friendly interfaces and touchscreens, next to the more pervasive role of information technology in daily life, user needs are already taken more serious. “As information systems become more interactive and place more emphasis on visual displays, (...) visual aesthetics should receive more research and pedagogical attention” (Snyder, Heckman, & Scialdone, 2009). Especially since these aesthetic responses differ in origin; “while some aesthetic responses are innate and relatively invariant most are learned and depend on culture, education, and other experiences” (Snyder, Heckman, & Scialdone, 2009). As designers of information systems, Information Managers need to be fine-tuned to their stakeholders’ needs which includes aesthetic responses. Most important to designing solutions is to understand everything one can about the stakeholders. Therefore the skills of observation and inquiry are essential to an integrative thinker (Dunne & Martin, 2006). Currently this forms an educational gap as business educations fail to teach students visualizing and imagining something that does not now exist that would take care of users’ needs.

Also in resolving opposites or dealing with the creative tension, visual thinking plays an important role. Sill (1996) who extensively elaborates on integrative thinking acknowledges the connection between the visual and the integrative: “particular promising areas for further study include the relationship between integrative thought and visualization”. Visual thinking is not only important in the design of a beautiful product; it is also the driver for visualization and imagination. The link between visual thinking, design and complex problem solving is therefore evident since scientists in both Information Management and the field of visual thinking explain the intrinsic value of visual thinking for design.
5.2 Visual Thinking: a dichotomy?
In this section I want to explain what I do not interpret as visual thinking to avoid misunderstandings and set the line for further reasoning. Goldschmidt (1994) recognizes that in the context of visual thinking much discussion exists and several schools of thought contribute. These schools cover a spectrum that reaches from a clear separation between perception and cognition to an intertwined and mutually supportive existence of perception and cognition at the other end of the spectrum. To build further reasoning on visual thinking and the relation to complex problem solving it is important to elaborate on this spectrum. In this section I provide a brief overview of the spectrum and position this research.

At one end of the spectrum one can find the cognitive scientist who believes that perception has little to do with cognition. Therefore perception should not be studied in the framework of cognitive psychology (Goldschmidt, 1994). Thinking is strongly identified with language; the intellectual process of acquiring, producing and developing language. Thinking in pictures is seen as developmentally rudimentary, a pre-linguistic phase of cognitive functioning (Goldschmidt, 1994). The artistic or design role of visual thinking as equally relevant is not accepted by this prevalent linguistic paradigm.

Some acknowledge the role of vision in perception but the tendency is to research these processes in detail and the significance to thought is not under scrutiny (Goldschmidt, 1994, p.159). These researchers explain “how the external world is codified in our brain via retinal impressions, how we recognize shapes and how the processes involved can be simulated computationally” (Goldschmidt, 1994, p.159). Visual thinking can also be interpreted as visual representation. The last decade visual representation has become a ‘hot topic’ pursued by the developments in the IT industry. Technology has provided a means for the average person to produce visual media rather than passively consume it. Two important advocates of this perspective on visual thinking are Colin Ware and Edward Tufte. Both did extensive research on visual perception and the design of information representations.

Colin Ware wrote a book with the title ‘Visual Thinking for Design’. The title itself seems to indicate that his work might be important to this thesis. Ware provides summarize his perspective on visual thinking: “This book is about graphic design that provides a channel for clear communication that supports visual thinking and acts as an interface to the vast information resources of the modern world” (Ware). Ware is director of the Data Visualization Research Lab at the University of New Hampshire where his main research topic is advanced data visualization. Although his work advocates that visualizers make user-friendly visualizations that are adjusted to the working of the eye and brain, his focus is on the perception part of visual thinking. By unraveling how light, through the eye, is translated into images in the brain this section of the visual thinking field sets forth how information can be visualized as an extension of perception.

Visual thinking in this part of the spectrum pretty much corresponds with vision and perception. Related to complex problem solving this part aims to visual represent complex information or complex issues. Jacobsen (2007) describes the example in which “students used sketches and schematics to explore ways of representing the complexities of data in a manner that ultimately revealed new information about the size of sperm at stages of the Anopheles mosquito’s maturation” (p. 7).

Goldschmidt argues that this dichotomy in vision and thinking results in two modes of thinking that are codified as “analytical-rational and synthetic-non rational”. The analytical-rational way of thinking is the adult information processing scheme focused on language and epimotized in scientific thinking (Goldschmidt, 1994). This linguistic paradigm in cognitive psychology is unwilling to accept the notion of visual thinking as a integral part of thinking.

Synthetic thinking is seen as a characteristic of the arts. It is non analytic and seen as intuitive, unsystematic and non logical. Goldschmidt (1994) states that “this dichotomy certainly reflects popular belief, but as we have seen, it pervades scientific theories of thinking as well” (p.161).

Although the dichotomy mentioned above is sustained by good arguments, it does not reflect upon the design attitude and complex problem solving. Visual thinking interpreted as visualization or visual representation is directed toward the design of visual representations adjusted to the needs of distinct stakeholders. Thereby the focus is not on resolving complex problems but the focus is on the visual representation of complex information in a meaningful manner to the user. The latter interpretation of visual thinking should, according to Ware not be mistaken for “the kind of visual thinking that goes into fine art where the goals are frequently the opposite of clarity, but rather beauty, visual impact, or an investigation of a new vocabulary of expression” (Ware). I want to state that I greatly value the contributions in science of this perspective on visual thinking.
But in the context of complex problem solving and mastering the design attitude this perspective on visual thinking does not add value.

Then what do I interpret as visual thinking in this thesis. Goldschmidt (1994) argues that “[Visual Thinking] is the production of ideas, the reasoning that gives rise to ideas and helps bring about the creation of form in design” (p.160). In the context of design and architectural studies visual thinking plays a profound role. In the previous mentioned standpoint on visual thinking the arts are often considered as non-rational of unsystematic. In line with Goldschmidt and Arnheim I argue that “visual thinking operations are in no way, developmentally or cognitively, of a lower level compared to linguistic thinking” (p.161). Visual thinking is often found in creative thinking or in general in creating something new. In architecture designers have years of practice and research to build on. The analogy with the architectural world is important to draw important lessons for a design attitude in Information Management. Goldschmidt (1994) summarized the importance of architecture in grasping the design attitude: “For most architects the use of visual thinking in the making of form represents the artistic aspect of designing, seen as characterized by intuition, responding to aesthetic and emotional needs and not necessarily rational ones. The design process is, of course, regarded as also including rational aspects, subject to logical, functional and scientific analysis and compatible with implementation requirements” (P161).

5.3 Aspects of vision

The previous section argued that perception is part of cognition. Like Arnheim I argue that perceiving and thinking are intertwined since every percept involves thinking and vice versa; “all abstract thinking relies on some perceptual referent, even the most abstract theme is tied from the beginning to concrete images” (Arnheim p2). Visual perception is not just the mere passive reception of stimuli from the outer world. Moreover it is active perceiving. An individual is not passively sensing the world surrounding him without any handling by the individual himself. Perceiving is an active operation given direction by attention, focusing on different aspects in the field of sight. This eminently active performance is understood as visual perception. One would expect that if perception were the passive reception of information, our brains would not react to an omitting of these stimuli. But experiments show that people deprived from stimuli find themselves unable to think and replace the lacking outer stimulation by reminiscing and conjuring up imagery (Arnheim, 1970, p. 18). “These desperate attempts of the mind to replace the missing stimulation indicate that instead of a mere facility for reception, the activity of the senses is an indispensable condition for the functioning of the mind in general” (Arnheim, 1970, p. 19). Arnheim (1970) therefore understands cognition, the acquiring of knowledge, as all the mental operations involved in receiving, storing, and processing information: sensory perception, memory, thinking, learning. Images are inherent to thinking and therefore vision is at the basis of every human activity including design.

5.3.1 Filtering

Vision is first and foremost directed towards change: change in movement, light intensity, shape, color and so on. Imagine an enemy approaching, an opportunity to escape, a demand to be met, or signal to be obeyed. Vision also serves the survival of an individual therefore it is drawn to change. In contrast an always present repeating stimulus will be extracted from consciousness: “Psychologists discussing satiation and adaptation point out that animals, even quite primitive ones, will stop reacting when a given stimulus reaches them again and again” (Arnheim, 1970, p. 21). These reactions to monotony go all the way from conscious defense to the purely psychological wearing off of impulses generated in the brain by a static situation. Though this has some practical use, it also withholds one from becoming aware of the constant factors in life.

5.3.2 Selectivity

Arnheim (1970) argues that vision is limited to a narrow area and therefore exemplifies selectivity. Vision is selective and this can for example be found in smaller organism; a frog responding to an overflying insect, a chick peck at the red spot at the lower mandible of the yellow bill of the herring gull (Arnheim, Visual Thinking, 1970). This example also underlines the statement that perceiving and thinking are deeply intertwined. “Perception consists in fitting the stimulus material with templates of relatively simple shape, which I call visual concept or visual categories” (Arnheim, 1970, p. 27). But it is not the mind, which contains a pre-established collection of simple shapes waiting to be addressed. Rather than explaining these mechanisms it presupposes
these simple forms. The red spot at the mandible of the sea gull must be apprehended as such before it can be reacted to.

When one focuses on an object, for example a chair, the background becomes blurry and the object is in the spotlight. Retinal sensitivity is thus restricted as it focuses on a specific object or a particular spot in the visual field. The selection of an object is driven by attention. The retinal selectivity is focused on an object since it stands out or it matches the interest of the observer. The field of vision cannot be overseen all at once to avoid an overload of information the mind can or needs to handle. Imagine for example when you look at a painting or drawing, your eyes shift to various parts of the image and form relations between these various parts in order to constitute a comprehensive whole.

The focus of the individual who is watching determines what is actually seen. For example, when watching the basketball video clip, many people fail to see the gorilla walking through the screen beating his chest. The visual focus is on the basketball thrown around by the white team. The environment is blurred and the black team lacks focus of the observer. Therefore the black gorilla is able to walk across your screen without being seen. Visual perception searches for simplicity. This example shows that vision selectivity can be induced by the interest of the person who is watching. The response can also be steered by the stimulus rather than by the individual. Arnheim (1970) provides us with the example of a young child turning towards a bright light entering his field of vision, like a plant turns towards the sunlight. The focus of vision on a certain object is called ocular fixation. Ocular fixation is a move from tension to tension reduction. An alien object entering the visual field creates the tension; an object that is not in the focus point. The ocular focus point shifts from its original center to a new and alien one when the stimulus enters the visual field: “this conflict between the intruding outer world and the order of the inner world creates a tension, which is eliminated when a movement of the eyeball makes the two centers coincide, thus adapting the inner order to the outer (Arnheim, Visual Thinking, 1970, p. 24).

5.3.3 Vision and the Design Attitude

Visual perception and thinking are intertwined. Vision by nature searches for simplicity, is selective, cuts out the constant factors and is driven by attention. In this way it might seem that vision cannot contribute to the design attitude. But these simple features of vision can be put to practice in a meaningful way. If one can steer his or her attention to different objects in the field of sight it is possible to see more. By steering attention away from the explicit features in the observed world, one can find new patterns and new meaning in what at first seems familiar territory. This makes visual thinking perfectly suited in discovering new perspectives on a given situation.

Designers in complex problem solving are able to see all the salient aspect of a wicked problem. This includes the often-overlooked constant aspects of the given situation since these might be important in finding a solution while humans are hardwired to focus on change. A remarkable example of someone who wondered about the constant factors in life is Newton. He questioned why an apple always falls downwards which led to his innovative conclusion of gravitational forces. All the other thinkers in his time, and even in later eras, took the downward falling motion as a constant factor in life that they never questioned. The design attitude through visual knowledge thus requires specific training or education to make the designer sensitive to constant factors or stimuli.

I have argued that complex problem solving requires including multiple perspectives on the problem. Conklin and Lindberg showed that re-wickedning is an important aspect of creative problem solving. Arnheim names this process restructuring while McKim uses the term re-centering. Both restructuring and re-centering are different terms for the concept of iteratively exploring the problem and solution space. Visual thinking is thus inextricably linked to the design attitude.

5.4 Glasses metaphor: the art of observing

Design starts with the needs of a stakeholder. These needs can be experienced conscious and unconsciously. A problem situation is in the essence also a desire. The current situation A does not complement the wishes and desires and is therefore problematic. Solution situation B is what is desired and is the aim for design. Wishes, desires and needs are factors that appoint the concept ‘problem’ to the current situation. In previous chapters it was shown that latent needs are a window for innovation and require design to reveal the desired solution. Since these latent needs can be conscious or unconscious it is the designer’s task to reveal these needs.
But these latent needs are often hard for stakeholders to communicate. Moreover, some stakeholders do not have the ability to communicate their needs (remember the environment from the stakeholder framework). Since the designer aims for these latent needs, he is not concerned with WHAT the stakeholders want. It is the underlying WHY, the deeper need that people experience, that truly describes the desire of people. And this underlying why is what a designer needs to be tuned to or able to reveal. And that is the difficult part of design. Often the stakeholder does not know how to communicate the why to a designer. This is because of the abstract and intangible nature of the why. Therefore stakeholders often speak in what they want, because this makes the why more tangible and concrete. Since it is difficult to translate these why’s into what’s, the designer should be careful with focusing only on the what. It is the task of the designer to reveal these underlying reasons since these lead to a design of a system that fits the stakeholders. The true nature of desires and needs emerges through observation of the situation by the designer. The latent need is not an isolated object that stands alone in the world. It is not only embedded in its context, latent needs emerge from the context. So without the context a stakeholder’s needs do not exist.

Needs finding and design thinking require the specific skill of observation. The designer aims to observe unprejudiced and open minded without making premature generalizations. That is observing in its purest form; without any generalization. It entails that the designer does not start from expectations. He is calm, centered and observes the world as it is. Both expectations and aversions are valued but the designer determines the focus. Here we enter the domain of consciousness, and being balanced. Openness is of the essence. An eye for detail and seeing what others do not is essential. From this it follows that the designer starts from an extreme position, namely the subjectivity and uniqueness of the situation at hand. The designer is able to see the situation from different perspectives. In this process he is consciously aware of his inextricable subjectivity and takes this into account.

Observation can be done in many different ways. The designer can be an observer while at the same time being a participant in the observed event or he can be an observer from the outside. Although a variety of observation methods exist, it is important that the designer knows at least several of these methods. It is of great importance that designers learn to observe, while observing is fundamental to finding needs.

5.4 Three attitudes towards seeing
The previous paragraph emphasized the role of observation in design. In following paragraph I present the design attitude from the visual thinking perspective. As was already mentioned in this chapter, everything in the world presents itself in its context and is modulated by that context. Strictly no object exists purely by itself. The relation between the object and the context is prevalent in understanding the object itself. Arnheim (1970) describes three attitudes towards seeing an object in relation to its context. In presenting these attitudes towards seeing the link with the design attitude will become clear.

The first attitude observes the contribution of the context as an attribute of the object itself. It aims to see every aspect of the object as though it exists without the context. This attitude aims to ignore the context and to focus on the local effect. Arnheim (1970) suggests the example of realistic painting in which the painter is trained to see the size and shape of an object as though it were flattened out on a two-dimensional plane. The colors of surfaces are seen as through a tube; the aim is to see the specific local color. Realistic painting aims to produce an exact representation by viewing every aspect in a very local way. Another example is that of an observer watching an individual in various social situations. The observer might be unable to grasp the character of the person due to his constantly changing behavior. He is unable to extract the ‘local’ behavior from the influences exercised upon the individual by the social setting. This reductive attitude shows a given object as changing its character when the context changes (Arnheim, Visual Thinking, 1970).

The second attitude is even more restrictive while it aims to peel of the influence of the context on the object. This attitude uses the information to subtract the influence of the context. The goal is to obtain an object in its pure and impaired state. This is according to Arnheim (1970) the practical attitude of everyday life because when someone desires to sit, our perception scans the environment for a chair. But he does not really see the specific chair he sits on, moreover he scans the environment for the concept of a chair. Sometimes humans are only interested in a particular aspect or trait of a certain object and more information is not required. Important to notice is that these abstractions of the object cannot be represented by any practical realization. No object in the world exists without a context; no object can show its color without being enlightened by a light source; the weight of an object does not exist without gravitational forces (Arnheim, Visual Thinking, 1970). These abstractions can only exist in a man-made universe like a textbook, a formula, fiction, or an
illustration. Only in this way a scientist is able to present the forces of the environment as separated from those inherent in the object. Arnheim (1970) states that this, sometimes absolutistic approach to science, is not to be mistaken with the real world.

The previous two attitudes both entail the objectivistic perspective towards the world, which I explained in previous chapters. The first attitude explained above is unable to cope with the contradicting attributes of an object because the influence of the context on the object is forgotten. The second attitude has an even more rigid objective focus, since it aims to get the pure impaired object by eliminating any influence of the environment. Remember the arguments made in chapter one for example that “science allows us to abstract experiential knowledge from practice in such a way that ultimately correct, general and definitive accounts of reality can be given that are objectively, universally and unconditionally true” (Huizing, 2007a, p. 5).

This objectivistic approach to science reveals the belief that the true nature of objects is concealed by the context. Therefore the objects should be extracted from the setting to study it in its unimpaired and pure form. I have argued that the objectivistic perspective does not suffice in dealing with wicked problems in Information Management.

The third attitude Arnheim (1970) mentions does not seek to eliminate the effect of a setting on an object. In contrast, this attitude holds that in exposing the object to a variety of situations the object exposes its nature. Everything, every so-called object, is connected with its surroundings and in these relations mutual influence exists. Objects cannot be seen as cut off or separate from the world because they are always in the world, influenced by and influencing their surroundings. Thus the context is just as important as the object itself.

In the essence the world exists in synthesis, everything is one. This understanding that everything is part of a bigger picture, or the conscious contemplation of this connectedness, is in my opinion an essential understanding of this specific third attitude and of integrative thinking more general. If one is able to grasp this profound synthesis of the world, its wholeness, then one is open to all the perspectives that play a part in designing a solution to a complex problem.

Arnheim summarizes this in one sentence: “This third approach fully appreciates and enjoys the infinite and often profound and puzzling changes the object undergoes as it moves from situation to situation” (Arnheim, Visual Thinking, 1970, p. 45). This statement suggests that the third attitude appreciates the wickedness that accompanies real world situations. The third approach ‘enjoys the infinite and often profound and puzzling changes’, changes that are deliberately sought by integrative thinkers when re-wickedning problem situations. This third attitude towards seeing is clearly linked to the design attitude.

To strengthen the understanding of the third approach towards seeing I will present several differences with the first two approaches. The first attitude differs from the third because in the first approach the effects of the environment hide the identity of the object. The observer is for example unable to see the true identity of a person when this person behaves differently in different social settings. The influence of different social settings on the individual and the individual’s ability to alter his behavior are both ignored by the observer. Put simply, whereas the first sees the influence of the environment as concealing the identity, the third appreciates different settings since these reveal the identity of the object. Notice that the first approach is based on a duality between the individual’s true nature and the context. The third attitude attends the synthesis or unity in the world by acknowledging that object and context are intertwined and therefore inseparable. In the third attitude the observer sees the unfolding of the object’s identity in a multitude of appearances.

The difference between approach two and three is most evident in the rigidness of the second attitude. The observer aims to see the pure impaired object and therefore the object seems to look the same every time. By searching for some sort of permanence in the appearance of an object the observer aims for a rigid kind of constancy. An object of which everything is subtracted is most useful in supporting identification, classification and learning, and therefore the second attitude is very useful for example in science. But “the rigidity of such constancy make the observer blind to revelations offered by a particular context and prevent him from reacting in a manner appropriate to the particular occasion” (Arnheim, 1970, p. 45). In other words the second approach ‘finds’ the pure impaired object every time the observer is confronted with the object. In this way the observer is unable to see the object in relation to its environment, hereby restricting him from reacting to the specific situation at hand.

The third attitude however “does not suppress the differences between the various species over which it presides as a genus but keeps them present in an all-embracing comprehension” (Arnheim, Visual Thinking, 1970, p. 46). This is exactly what dealing with wicked problems entails; search for a holistic and comprehensive understanding of the problem instead of prematurely restrict yourself to biased solution directions. As is
argued by Arnheim (1970) the third attitude provides the artist, scientist or manager with richness and moreover it gives a “continuing contact with the concrete manifestation of the phenomena of interest” (p. 46). Through the acknowledgement of synthesis of object and context the attitude towards the world, and thus the attitude towards the complex problems that arise, changes into a continuous dialogue. From the arguments above I conclude that this attitude towards seeing provides a clear link with the iteration between divergence and convergence in handling wicked problems, as was mentioned in chapter two.

To emphasize the importance of the third approach, not only in seeing object but also in interpersonal relationships, I will quote an example by Arnheim (1970):

“Similarly, a depraved person may appear to be inhuman. To understand such a person requires, first of all, the ability to see him not as an alien monster but as a distortion of human nature. The abstraction involved in detecting human nature in this disguise is facilitated, and understanding is enhanced when the distortion is seen positively as the effect of definable interferences, such as social forces of deprivation and humiliation. In such cases also, to abstract does not mean simply to detect and isolate, in the depraved specimen, the invariably entity, ‘human nature’. All aspects of that nature – love, pity, hope, devotion – may have been perverted. They cannot simply be extricated. Instead, the person’s behavior must become perceivable as a distortion of the standard called ‘normal human behavior’. And here again the perception of the distortion is not static. The call for rectification, that is, the demand to do something about the situation, is an intrinsic component of the distortion’s very appearance” (p. 52).

Thus in the perception of human beings and their behavior the third approach enables the observer to obtain a much richer and integral view of the specific individual. Recall the example from chapter two on needs finding, in which Frank Lloyd Wright designed a house for a lady. He designed the residence in such a way that it contributed to the development of the inhabitant. Finding the true needs of the stakeholders thus requires the third attitude towards seeing in order to fully understand the need the different distortions in an individual’s behavior. The third attitude conveys empathy as an important aspect of problem solving.

5.5 Problematizing in Visual Thinking

The preceding paragraphs made clear that seeing is more than just sensing stimuli from the outer world. It is the activity of finding meaningful patterns in the field of vision. Therefore the experienced observer will see other things than the novice. McKim (1972) refers to Aldous Huxley to exemplify: “the experienced microscopist will see certain details on a slide, a novice will fail to see them” (p. 49). The knowledgeable observer can match the incoming stimuli with a larger stock of memories. However, the knowledgeable observer might not see in a creative way, since his knowledge can also restrict and confine him. Therefore McKim argues that creative seeing requires the ability to re-center one’s perception, to observe the familiar from a new viewpoint. Seeing the world from one specific knowledgebase becomes stereotyped seeing. By re-centering one’s vision new knowledge is created. Re-centering means to change one’s perspective, to see from new angles. Re-centering is the visual equivalent of the term problematizing that was used in previous chapters.

To explain re-centering, McKim (1972) first focuses on the work by William James, one of the most influential psychologists in the United States. James found that “part of what we perceive comes through our senses from the object before us, another part always comes out our mind” (McKim, 1972, p. 49). Like Arnheim (Arnheim, 1970), James also viewed perceiving and thinking as intertwined. In the context of visual thinking, McKim (1972) expanded what James called the mind with the notion of imagination. This results in the following model of perception in which sensation and imagination play a prominent role:
On the right McKim (1972) depicts several forms of perception that result from the mixing of stimuli with different degrees of imagination. The inner image represents pure imagination, without sensing. Hallucination is almost totally a product of imagination but is triggered by a stimulus from the outer world. The next arrow is projection or stereotyping in which the observer is unaware that his perception is influenced by imagination. The observer might like or dislike the lady since it evokes memories of someone they know or it reminds them of themselves. Although projection can be creative, stereotyping is inflexible seeing (McKim, 1972).

As the picture shows re-centering your viewpoint involves a degree of imagination. Re-centering thus becomes the ability to see something with different imaginative filters. The final arrow represents the here-and-now perception in which the influence of the imaginative filter is minimum. Here-and-now perception enables the observer to see ‘what is’ without interferences like in stereotyping and projection.

Re-centering moves perception away from its usual viewpoint to a new center (McKim, 1972). The new center of perception enriches vision, leads to new insights and makes that familiar things are seen differently. A simple example of the experience of re-centering is when one travels to a foreign country. When we experience a different culture we are able to see our own cultural bounds in a new light.

Recentering is important for needs finding since the act of needs finding is essentially making a shift in viewpoint. The designer abandons his or her own perspective and adopts the perspective of the stakeholder. By adopting the viewpoint of the stakeholder and seeing through his glasses the designer finds latent needs of the stakeholders. These new insights can then be used in design. The creative act is in integrating these perspectives in a single solution. Synthesis is not only important to the design attitude but as well to Visual Thinking.

Although recentering might seem simple, Arnheim and McKim acknowledge several inhibitors of creative seeing. Arnheim (1970) showed that our visual perception has an appetite for simplicity to avoid perceptual overflow. In other words stereotyping in vision is natural since vision is aimed at recognizing and simplification. Stereotyped vision is therefore something that grows when one matures since it brings advantages in one’s daily activities. If we want to sit we do not need to fully see and perceive a chair, recognizing something that has potential to sit on is the clue. Breaking through this cycle of stereotyped vision does require effort by the observer.

McKim (1972) also addresses the importance of cultural and social bounds in visual stereotypes. The social environment strongly influences our visual stereotypes. In this way prejudices are shared and it becomes hard to question these visual images. Stereotypes indulge fear since individuals are afraid to be exiled from their social group, if they question these stereotypes. McKim (1972) shows that he was ahead of his time when he points to fear as the basis for the prejudice toward skin color and the rejection of nudity (p. 51). Fear is an important inhibitor of creative thinking.
McKim (1972) concludes that “the ability to re-center perception freely, in the long run, is a matter of the courage and vitality of the individual” (p. 52). To see things differently in a more permanent way can be a lonely experience. And like designers, re-centering observers “must welcome the insecurity, the adventure, and eventually the wisdom of courting the unknown” (McKim, 1972, p. 52). Healthy perception is flexible and switches between several perspectives without being bound to one. McKim (1972) refers to Frank Barron when he quotes: “The truly creative individual stands ready to abandon old classifications and to acknowledge that life, particularly his own unique life, is rich with new possibilities” (p. 51).

Thus, re-centering is at the basis of observing, switching perspectives and aiming to integrate these perspectives; activities that leads to creative seeing. It shows how several aspects of the design attitude are also important in Visual Thinking. Re-centering is the visual equivalent of problematizing and enhances the understanding of the design attitude by showing an operationalization of it. Appendix E provides some visual thinking exercise that I gathered during the writing of this thesis. These exercise reflected on some aspects of the design attitude and the reader should see these exercises as a starting point for exercising visual thinking.

5.6 Conclusion

The main topic of this chapter is the link between Visual Thinking and the Design Attitude. Visual thinking was chosen since the term showed up in several articles on design and design thinking. Several authors interpret visual thinking as visual representation or visualization whereby they confine visual thinking to visual perception. In this thesis Visual Thinking is interpreted broader by arguing that visual perception and cognition are intertwined. Thinking does not occur without seeing. Moreover, the mind creates visual images when deprived from visual stimuli. Vision is therefore essential to thinking. This makes vision essential to all human activities including design.

Arnheim explained that vision has a tendency for selectivity and simplicity by using several filtering strategies. These are built in strategies to avoid overflow of visual stimuli. Considering these filtering strategies it would be a mistake to interpret vision as a simple process. Vision itself is rather complex and the filtering strategies are needed as limitations of the variety and complexity vision entails.

Several aspects of visual thinking are also evident in the design attitude. Observation is an important aspect of visual thinking and an essential aspect of the design attitude. The true nature of desires and needs emerge through the designer’s observation of the stakeholders and their context. Recentering is the visual equivalent of problematizing and builds upon observation. Observation is important for needs finding since the act of needs finding is essentially making a shift in viewpoint from your own to the viewpoint of the stakeholder. This is an act of empathy that through integration leads to creative insights.

This attitude towards seeing led to an alternative relation between object and context described by Arnheim. From this perspective object and context are inextricably linked. The object does not exist without its context and therefore the relation between object and context is seen as a synthesis. The effect of the context on the object is not eliminated but appreciated in every manifestation. The third attitude “does not suppress the differences (...) but keeps them present in an all-embracing comprehension” (Arnheim, Visual Thinking, 1970, p. 46). This third attitude towards seeing provides a clear link between visual thinking and the design attitude.

This chapter showed how aspects of visual thinking are also present in the design attitude. This made clear that visual thinking is basic to the design attitude. Moreover visual thinking provides some operationalization of the design attitude. Since visual thinking is essential to being human, it provides a natural entrance to basic design. It is my contention that Visual Thinking can prove to be an important driver of the Design Attitude in Information Management.
Chapter 6

A proposal for design education in Information Management

*Education is the most powerful weapon which you can use to change the world*
- Nelson Mandela

Introduction
In my opinion education is the way to bring real change to Information Management. Students need to get familiar with the design attitude, practice it, supported by people who already master this attitude towards the world and towards the problems they encounter. This chapter puts Information Management education under scrutiny. The central question in this chapter is:

1. **What are the consequences of the Design Attitude for Information Management education?**

The Information Management field is an interdisciplinary study that is so far mostly influenced by the Information Technology sector and the Business sector. To elaborate further on educational implications it is important to emphasize that I will use both perspectives in my argumentation. Lindberg et. al. (2011) and Snyder et. al. (2009) studied the importance of design thinking in IT development and how to shape IT-educations to incorporate design thinking. Starkey & Tempest (2009) provide the foundations for my reasoning on the role of the design attitude in management education. The findings by Starkey & Tempest (Starkey & Tempest, 2009) are sustained by arguments what the challenges are for business education (Schoemaker, 2008), how design will change management education (Dunne & Martin, 2006), and how design thinking can be taught in business (Starkey & Tempest, 2009). Almost all these researchers go back on John Dewey to sustain their theory. Therefore Dewey plays a central role in this chapter.

Since I do not conduct an empirical research to answer these questions I will focus on what scientific literature states about solving wicked problems in Information Management education through design. As I mentioned in chapter two, the design attitude in this thesis is understood as an umbrella term comprising ambidextrous thinking, design thinking, integrative thinking and so on. I summarized these terms in an attitude towards the world that I labeled the design attitude. From this point forward I replaced all the other terms for the [design attitude] to avoid confusion.

This chapter will examine the role of the design attitude in Information Management education in three parts. The first question to be answered is what is currently lacking in Information Management education. Chapter one concluded that Information Management is biased towards a rational, objectivist perspective. I will further elaborate on this argument in the current chapter and put the bias toward objectivism in the context of Information Management education.

When the conclusion is sustained that education is lacking a design attitude to solve wicked problems, the following question rises: what is needed in management education to incorporate such an attitude. The third part of this chapter addresses how design can be brought in the practice.

6.1 Lack in education
Organizations strive for a controlled and predictive state of operation, but at the same time require innovation and creativity to stay viable and gain long-term advantage (Snyder, Heckman, & Scialdone, 2009). Such organizational innovation is a design task, especially considering the wicked problems that arise. Innovation thus demands a creative act of the manager involved, which is considered a design task. Schoemaker (2008) points to a change in organizational awareness for information managers: "when confronted with profound ambiguity, commercial success depends on developing a different set of capabilities, tools, and perspectives
than offered in the traditional business model for more stable industries” (p. 123). The need for organizational innovation by dealing with ambiguous and complex problems make that “the ability to live with these ambiguities, and periodically to re-conceptualize them, may be the most important skill set managers must develop” (Schoemaker, 2008, p. 125). But management education is not designed to teach students this skill set that sustains them in handling wicked problems (Starkey & Tempest, 2009). The importance of incorporating such an attitude in Information Management education is evident if organizations want to remain viable in their highly complex environment.

Information Management, being rooted in the Information Technology, is driven by a technological perspective. Technology is a complex phenomenon with a high rate of innovation that requires detailed knowledge. Therefore the emphasis on the technological perspective is an important aspect of the studies that are associated with the Information Technology sector and therefore “IT development has the tendency to take place within an exclusive expert’s world” (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development?, 2011, p. 7). But Snyder et. Al. (2009) argue that it is insufficient to teach the technical methods in isolation of the context because “successful professionals in technical disciplines require abilities beyond technical competence—to interpret complex and ambiguous situations, interact with experts from other specialties and disciplines, and constructively evaluate their own work and the work of others” (p. 1923).

Information systems research has mostly ignored this notion to focus on robustness and functionality, a tendency that influenced IM education. Snyder speculates that the origins of the computing disciplines with an emphasis on the rational model of hard science, efficiency and utility might have caused this. Lindberg et. al. (2011) argue that a dominant technological perspective lead to several problems concerning users, stakeholders, and customers. For example; although functionalities and user interfaces are technically perfect, from the perspective of the user they might be incomprehensible and unworkable. This can lead to an innovation trap; more and more is invested in technological innovation while at the same time, the users do not see the solution’s distinctiveness and attributed value (Lindberg, Meinel, & Wagner, Design Thinking: A Fruitful Concept for IT Development?, 2011).

The current offerings in education for information professionals are focused too much on the rational scientific model (Starkey & Tempest, 2009). A complementary way of knowing is needed because, in the words of Maria Nussbaum cited by (Starkey & Tempest, 2009), “it would be catastrophic to become a nation of technically competent people who have lost their ability to think critically, to examine themselves, and to respect the humanity and diversity of others.”

The conclusion is that the authors writing about Information Management education, from the technological perspective and the business perspective, agree that today’s complex and interdependent organizational world demands another attitude, a new paradigm to deal with the ambivalent and wicked problems that managers come across. Based on Dewey, Lindberg et. al. (2011) extract the following summary on how knowledge is pertained: “Solving wicked problems does not acquire the analytical inductive/deductive scheme pursued in science that follows an epistemological logic to achieve knowledge about scientific truth, since [designers] strive for enhanced viability and novelty of product and services” (p. 4). Dunne & Martin (2006) argue that programs in management educations confine students to inductive and deductive knowledge without using abductive knowledge, the reasoning on what might or could be. Deductive and inductive knowledge are focused on what should be or what is. Imagination is excluded while in fact its development should be characteristic of a design attitude in management education. Schoemaker (2008) summarizes: “the traditional paradigm of business schools, with its strong focus on analytical models and reductionism, is not well suited to handle the ambiguity and high rate of complexity” (p. 119).

Management education is rooted in a paradigm that favors profit maximization and firm-centric solutions (Schoemaker, 2008) and lacks a holistic view of management that encompasses social, cultural and environmental aspects (Starkey & Tempest, 2009). An evolutionary step in education is needed and “articulating and mastering a new model will require a significant shift in management education, which remains in the grip of a highly analytic and reductionist science paradigm” (Schoemaker, 2008, p. 135).

Human rationality, according to research from cognitive psychology and organizational cognition, is bounded or limited (Snyder, Heckman, & Scialdone, 2009). These studies describe “humans limitations in the ability to understand and represent complex concepts and situations” (1924). The limitations of human rationality stress how important other tools than the rational and analytical are in a holistic interpretation and evaluation of complex situations (Snyder, Heckman, & Scialdone, 2009).

It is my contention that education is most critically important in contributing the Information Management field a design attitude that complements the current emphasis on scientific ways of knowing, resulting in an
integrative approach to identifying problems and developing solutions. As Snyder (2009) states “by recognizing that information professionals require the ability to use both creative thinking and science rigor when confronting challenges, a technical education informed by arts-based practice can benefit both individuals and organizations” (p. 1926). The next section elaborates on what is needed in management education to incorporate the design attitude.

5.2 Needed in education
A small group of authors from the business as well as the technological perspective draw upon arts and aesthetics to introduce other ways of knowing than the prevalent scientific paradigm. Education in aesthetics makes students more susceptible to the needs of others (Starkey & Tempest, 2009), and to social and cultural dependencies (Snyder, Heckman, & Scialdone, 2009), skills that are highly valued in solving complex problems. Snyder et. al. (2009) state that “an aesthetic way of approaching complex situations may provide a number of benefits, including the ability to usefully integrate information that at first appears to be fragmented, and unrelated, and thus ambiguous” (p. 1924).

Both (Starkey & Tempest, 2009) and (Snyder, Heckman, & Scialdone, 2009) propose that problem solving and aesthetics are combined in the study of design. Their arguments coincide with Schoemaker (2008), Dunne & Martin (2006) and Lindberg et Al. (2011) who outline an important role for a designer’s attitude in Information Management education. In previous chapters I have stressed the importance of a design attitude in solving wicked problems, therefore the work by Snyder et. al. (2009) and Starkey et. al. (2009) will be incorporated from this perspective, placing their emphasis on arts more to the background.

The benefit of the design attitude is that it “teaches to treat problems as wicked problems, thus more openly, with the purpose of embracing the blurred space of social ambiguity through which a successful design process should pass as well” (Lindberg, Meinel, & Wagner, 2011, p. 8). By designing students learn to explore problem and solution space in an iterative manner that allows them to refine or revise their solution paths. Divergence and finding multiple perspectives on a given situation is essential to the design attitude. Sill (Sill D. J., 1996) stresses that students, in general, are not taught to synthesize information into a new order.

Finding the latent needs of stakeholders and holistically involve these in the design of a solution is an important aspect of design. Dunne & Martin (2006) state that a design school should emphasize understanding the stakeholders to a much larger extent than current management educations do. Like Norman (2002) and Faste (1994) they call for a user-centered design in management. Dunne & Martin (2006) stress the importance of skills of observation and inquiry, which according to them can only be fully mastered by practice. The fallacy in needs finding is in the projection of “our own rationalizations and beliefs onto others, [designers] can become isolated from users’ needs and interests, and functionality can suffer” (p. 519). Students therefore need to learn how to develop a clear understanding of stakeholders through continuous interaction. The designer is as much as possible conscious of his own subjective values as an interpreter of the situation. The realization of his subjective role in the design process incites the designer to iteratively research the problem and solution space.

Starkey uses the concept of narrative imagination, a term coined by Martha Nussbaum (1996). It is the ability to be the intelligent reader of another person’s story, it describes a person who is able to understand the lives of others. According to Starkey et. al. (2009) “narrative imagination and the empathy it promotes are core competences needed to empower managers to approach their role with a broader sensibility, more open to a wider range of influences and sense of responsibility, thus facilitating the creation of more inspiring designs for products, services, and processes that are both profitable and more humanly satisfying” (p. 579).

The current focus on rationality in economics and business is Kantian in its repudiation of empathy, since Kant stated that feelings degrade the power of reason (Starkey, 2009). Starkey et. Al. (2009) counter this notion by underlining the effects of empathy in taking decisions that will have long term positive outcomes for the maximum of stakeholders is involved. Alternative courses of action are discovered in a design process that involves empathy as a way of learning creative possibilities. Empathy provides the designer with a richer problem and solution space that induces the creative tension. A tension that designers appreciate while it challenges them to find innovative solutions that synthetize the variety in stakeholder needs. “The role of education, therefore, is to encourage perceptiveness and creativity rather than conformity to rules” (Starkey & Tempest, 2009, p. 580).

Several authors stress the importance of collaboration in education as a means to stimulate empathy and openness to multiple perspectives. Students have to learn collaborative skills because they have to observe and listen to other people to understand other people’s reasoning (Dunne & Martin, 2006). Students need to work
in interdisciplinary teams to broaden perspectives and attain practical insights in exploring the complex problem. Moreover, this stimulates another didactic goal, that is to build a shared understanding of the problem that is not bound to disciplinary thinking (Lindberg, Meinel, & Wagner, 2011). “[Design] education, thus, teaches to generate a mutual knowledge and experience pool that helps to facilitate team communication on a meta-disciplinary level” (p. 14). By working together, being open to and valuing other’s perspectives, designers learn to trust themselves and others, and this provides them the courage to be more expressive of their own visions (Starkey & Tempest, 2009). Combined with education in needs finding, students are taught to be more sensitive and perceptive.

Sill (1996) puts forward that creativity is both natural and teachable, and thus the proposition holds that a design attitude is also teachable. He points out “that environmental factors can either encourage or discourage creativity, and that an environment that encourages and values creativity can enable creativity in both the individual and the group” (p. 146). The instructor is able to stimulate integrative thought with his design of assignments and activities. Sill (1996) therefore opts for distinctive exemplars in design education. Hearing the stories of individuals who overcame opposing ideas and integrated multiple perspectives, motivates students to engage in integrative thought themselves. It is important that the creative process is visible to the students, “because the creative process is logical in reverse, (...) when in fact the process through which pioneers came to their discoveries involved guesses, mistrial, and backtracking” (p. 147). The instructor should inhibit behavior to set an example (Sill, 1996) and his credibility is served by having significant experience as a practitioner in successfully solving management related issues (Schoemaker, 2008). A class in design for a management education should be put in the context of business problems (Schoemaker, 2008) since this “gives students ways to approach integrated thought and gives them permission to accept information that is problematic, to create their own synthesis” (p. 146). The presentation of the examples of real world issues enables instructors “to trigger thought in multiple, simultaneous matrices, to provide a supportive environment which encourages and rewards divergent thinking” (p.145). Exposure to and practice with wicked problems is essential in Information Management education in pursuit of passing a design attitude.

In line with the previous chapters, the authors mentioned here focus on Information Management education and opt for the incorporation of a design attitude that complements the rational scientific model. Teaching of design in management education requires a pluralistic approach that is currently missing (Dunne & Martin, 2006). What all authors emphasize is that the scientific paradigm and the design attitude paradigm do not present a pure dichotomy. One is not preferred over the other, but the objective “is to promote a way of thinking and knowing that operates in terms of a ‘both-and’ opportunity rather than an ‘either-or’ choice” (Snyder, Heckman, & Scialdone, 2009, p. 1925). Starkey et.Al. (2009) point out to Tung (2006) who researched East-Asian management practices based on artistic principles that rely on experience and practice as distinct from North American practices grounded in science and business school classroom-based instructions (p. 577). Tung (2006) argues for a more balanced approach that not only supports deductive ways of knowing but also advocates intuitive, inductive, and qualitative approaches that foster imagination in management education (Starkey & Tempest, 2009).

I am inclined to agree with this perspective on Information Management education in which both ways of knowing are balanced. But something interesting arises in the context of this reasoning. The design attitude is understood as constructively resolving the tension between opposing ideas (Dunne & Martin, 2006). Both Starkey et.Al. (Starkey & Tempest, 2009) and Dunne & Martin (Dunne & Martin, 2006) found that current business education is not susceptible to a holistic perspective, while the schools are more concerned defending their own grounds. Although the scientific paradigm seems to reject other ways of knowing, the authors in this chapter aim to coincide the seemingly opposing paradigms. The prospect of integrating the scientific as well as the design attitude perspective in management education is a form of design in itself. Without prematurely choosing one of the options but overcoming the tension between both paradigms, the above-mentioned authors find themselves to be designers that strive for holistic resolving of a creative tension. These authors are themselves practitioners of the design attitude. Therefore I argue that the emphasis is on the design attitude paradigm, since this paradigm aspires to resolve tension between opposing ideas by a practical synthesis. Therefore I conclude that objectivist thinking and design can both have their place in design.

5.3 Design Attitude in the practice of education
In the context of education Schoemaker (2008) argues for change in management education, where research and teaching should be intertwined with the practice of business. Some might counter that business school and
management educations have changed to respond to market changes. Schoemaker (2008) acknowledges the fact that many educational institutions started new programs on topics as strategy, ethics, international business etc. But Schoemaker (2008) questions if these changes actually incorporate a new paradigm that enables students to deal with wicked organizational problems. Do these programs really emphasize complex problem solving or do they only provide a new jacket for outdated knowledge? Schoemaker (2008) sees a tendency that new institutions steal market share. Sophisticated companies start their own educational programs, the rise of action intervention learning by consultancies, and the explosion of corporate universities (Schoemaker, 2008) might point at the insufficient ground of current management education.

Lindberg et. al. (2011) held several workshops in design thinking and interviewed the IT professionals who participated. They were asked to let go of their technical background. The majority of the participants were found to be skeptic before the workshop, but afterwards shared positive opinions on design (Lindberg, Meinel, & Wagner, 2011). Especially the divergent phase was found interesting and inspiring as this was only rudimentarily addressed in their earlier education. As an explanation, Lindberg et. al. (2011) points to the engineering problem solving methods that encompasses a strong tendency towards converging activities. Some think the design attitude is beneficial but doubt if it would function under severe time constraints. The final conclusion of their interviews reads that although many participants were highly interested in the design attitude, they were unable to pursue it in daily practice arguing that organizational constraints, time schedules, corporate pressure hinder the application of design in the professional context (Lindberg, Meinel, & Wagner, 2011). The study leaves it unclear whether these conclusion on the practicality of design thinking are the result of the objectivist perspective. The participants might still be adherents of the scientific perspective, may it be unconscious.

Although the study by Lindberg et. al. (2011) provides several interesting insights, it does not explain how design was taught and how education was shaped from an designer’s perspective. Snyder et. al. (2009) explain their implementation of studio-learning environments to provide more practical relevance. Studio learning evokes creativity through an open master-apprentice relation between instructor and student. Snyder et.Al. (2009) also stress that the instructor needs to be a practitioner. Students work on problems that are ambiguous and equivocal, in other words, on wicked problems (Snyder, Heckman, & Scialdone, 2009). As students create, present, and defend their work in front of others, they are exposed to important learning experiences. Student are able to observe other approaches and solutions to the problems. This open situation benefits students as they learn to defend their work and form constructive and thoughtful criticism. Snyder et.Al. (2009) conclude that “gaining such multiple insights and perspectives is necessary for our graduates, as this may carry over to their professional lives, allowing them to be innovative beyond the confines of the rational, scientific way of approaching people” (p. 1926). Their research further addresses the implementation of studio-learning environments in the iSchool, and the Center for Multidisciplinary Design (COLAB) both at the Syracuse University.

5.4 Recommendations for education
The previous chapters have showed that several aspects of the Design Attitude are rooted in practice. The reflection on visual thinking concluded that several aspects of vision are essential to the design attitude. Visual Thinking functions as an operationalization of the design attitude. The most important consequence for education is the need for a course on ‘learning-to-observe’. In this class the students are taught problematize (in design attitude terms) or to re-center (in visual thinking terms). At first students learn to observe stakeholders and practice this skill. From observation they need to learn to see things from different perspectives even if what they find is contradictory and brings them tension. Finally they need to inquire how the observed and the context are connected, how object and context are inseparable and therefore intertwined. This knowledge should then be used for design.

Although the skill of observation is important for the divergent phases of design, the secret of design lies in synthesis. Only observing and describing the world is not enough since this knowledge should be directed towards improving or adding to the world. Bringing seemingly opposing ideas together in synergy is what is understood as the convergent phase of design. Therefore a design education should have problems as its starting point to bring the design attitude in practice. Students learn to inquire different perspectives on the problem, followed by bringing these ideas together in a solution. The real design step is to iterate this process to find more perspectives and aim to synthesize these perspectives with the chosen solution. This continuous revision is essential to the design attitude and is driven by the designer’s wish to limit his subjective influence on the project.
Chapter 7

Conclusion

The final section of this thesis is the conclusion. To conclude this thesis we have to go back to the start. The starting point of this thesis were three internal research goals:

- Understand what wicked problems are in the context of Information Management.
- Explore what the Design Attitude entails for Information Management.
- Propose the Design Attitude for Information Management education.

In order to operationalize these research goals I formulated several research questions:

1. What are wicked problems in general?
2. What are wicked problems in Information Management?
3. Is Information Management able to deal with wicked problems?
   a. What is the dominant perspective in Information Management?
   b. Is the dominant perspective in Information Management able to deal with wicked problems?
4. How can the Design Attitude be positioned in methodology?
5. What characteristics of the Design Attitude are important for wicked problems in Information Management?
6. How are wicked problems interpreted in the Design Attitude?
7. What is the relation between Visual Thinking and the Design Attitude?
8. What are the consequences of the Design Attitude for Information Management education?

This conclusion section provides an overview of the answers to these research questions to conclude if this the internal and external research goals are reached.

Understand what wicked problems are in the context of Information Management

This research goal is sustained by three research questions. In this section an answer is provides for every research question.

1. What are wicked problems in general?

Wicked problems are present in the field of Information Management as well as in many, if not all, other fields of study. Wicked problems are complex issues that have several characteristics summarized by Rittel & Webber (1973):

- Complex problems lack a simple and definitive problem definition.
- Complex problems do not have a straightforward solution.
- Many interdependencies exist in and between complex problems.
- Problem understanding is achieved through problem solving.

These characteristics of wicked problems come down to ambiguity, uncertainty and paradox because there is no clear problem definition and no straightforward solution path. Wicked problems thus imply great tension caused by uncertainty and by the many social interdependencies. These characteristics cause fear to come in contact with wicked problems. Information Management Professionals are not equipped to handle these sorts of problems and therefore avoid complex issues. Some even interpret these complex problems as tame problems and apply problem-solving methods for tame problems. Since these problems cannot be approached with a recipe for finding a solution, the need of a new way for problem solving becomes evident. In fact, wicked problems are also all about recognizing the relevant problem. According to Conklin resolving wicked problems...
is possible by using non-linear problem solving methods. This provides an answer to the first research question: *What are wicked problems in general?*

2. **What are wicked problems in Information Management?**
Designing information systems and organizations is not a straightforward, rational process. Information Management has to deal with social aspects. Inherent to the design of information systems for organizations is the study of organizational culture, latent needs of stakeholders, and social structure. The acknowledgement of social complexity in Information Management led to the insight that variety of signification and meaning is an important aspect of information and knowledge.

3. **Is Information Management able to deal with wicked problems?**
The next step in this research is to understand if the field Information Management is capable of dealing with wicked problems. Kuhn stated that the underlying paradigm of a field determines how a field interprets the world.

   a. **What is the dominant perspective in Information Management?**
   A paradigm defines what is considered a problem and how problems should be dealt with. Several authors indicated that the Information Management field follows the objectivist perspective. Huizing (2007a) argues that, "objectivism has entered the domain, rationale, definition and goal that are commonly ascribed to information and knowledge management as well as the definitions of their core concepts information, knowledge, communication and learning" (Huizing, 2007a, p. 2).

   The interpretation of objectivism in this thesis views the world as consisting of distinct objects that can and should be separated from their originators and users (Huizing, 2007a). According to objectivistic currents the world external to human beings consists of distinct objects that have inherent properties. Forces from this external world determine our behaviour. By understanding and exploring the objects we first gain knowledge about the external environment in order to attain mastery of our external world. The distinct objects are not affected by the way we think or feel of them and have fixed meanings that can be known by investigating their inherent properties (Huizing, 2007a).

   Since objects are, as objectivism holds, not affected by the way we think or feel about them, the abstract knowledge we acquire by studying them is fixed, objective and factual. Science is the study of the inherent properties of the objects in our external environment and therefore “[science] allows us to abstract experiential knowledge from practice in such a way that ultimately correct, general and definitive accounts of reality can be given that are objectively, universally and unconditionally true” (Huizing, 2007a, p. 5).

   b. **Is the dominant perspective in Information Management able to deal with wicked problems?**
   Several authors indicate that this epistemology is unable to deal with the essence of information and knowledge. The positivist epistemology proves to be incapable of dealing with complex problems since it ignores the subjective valuation of the world and the investment of meaning by individuals. The objectivist perspective focuses on self-contained objects that are torn apart from their context. The designer’s way of problem solving aims for synthesis, a holistic approach with respect for the individual objects-in-context that form that synthesis. In other words the inextricable link between object and context is greatly valued in the design attitude.

   The conclusion was drawn that the field is unable to deal with the essence of wicked problems in Information Management. Information professionals have not yet equipped themselves to resolve wicked problems. In line with many other researchers this thesis proposes a different paradigm for the field that enable Information Professionals to deal with wicked problems. This paradigm is labeled the Design Attitude.

**Explore what the Design Attitude entails for Information Management**
The Design Attitude is the central theme of this thesis because it provides a way to resolve wicked problems. A significant part of this thesis is dedicated to the exploration of the design attitude in the context of Information Management. Three research questions were formulated to research the design attitude.

4. **How can the Design Attitude be positioned in methodology?**
By using the model of Linderberg et al I was able to explain some important characteristics of the design attitude. Since most objectivistic ways of problem solving solely focus on finding the solution, a convergent strategy, this thesis aimed to highlight the prior phases in the process of resolving wicked problems and the iterative nature of design.

Through the model it becomes evident that problem solving requires both the exploration of the problem space as well as the solution space. Both explorations start with divergent activities followed by convergent activities. Exploration of both the problem and solution space is done iteratively. These iterations are performed until satisfaction is reached or attempts are, at least for the time being, exhausted. The problem solver purposely subjects himself to redefining and rediscovering the problem. This process is what I named problematizing. The model by Conklin (2005) and Lindberg et al. (2011) were combined as a fundament for further reasoning on the design attitude.

The designer undertakes an iterative process of understanding the problem, formulating a solution followed by redefining the problem and reformulating the solution. He moves iteratively through the problem and solution space by using divergence and convergence. These two models put the design attitude in methodology and sustain the argument that the way to handle wicked problems is by acting with a designers attitude.

5. What characteristics of the Design Attitude are important for wicked problems in IM?
In order to resolve wicked problems, creativity is needed from the Information professionals. A comprehensive description of the design attitude is of course beyond the scope of this thesis. Therefore I choose to describe an overview of the design attitude, to give the reader a comprehensible understanding of the notion of the design attitude.
In general a designer moves iteratively back and forth between exploration of the problem- and solution space deliberately seeking the creative tension formed by wickedness and uncertainty. Problem situations are problematized to ensure that important aspects for an innovative solution are considered. The conjunction between the divergent phase in which multiple perspective are explored and the convergent phase that brings these perspectives together in synthesis is essential to Integrative Thinking.

The social dimension of wicked problems is often overlooked in Information Management. The design attitude is focused on attaining stakeholder needs. The problem solver shifts his viewpoint to the viewpoints of the different stakeholders at hand. He observes how stakeholders behave and invest meaning in the world with the aim to find their latent needs.
The design attitude is focused on perceiving multiple perspectives on a given situation without prematurely rejecting certain perspectives. Contradictory ideas or needs are accepted without panicking and the tension between both is resolved by an innovative idea that forms a synthesis of these needs. This requires courage of the problem solver, in our case the Information professional, since he needs to accept uncertainty, ambiguity and paradox as inherent to the process. For the individual who exhibits the design attitude these factors are not demotivating. On the contrary, they drive the creative act.

6. How are wicked problems interpreted from the Design Attitude?
Chapter four reflected on the Design Attitude as a different paradigm than scientific problem solving. Seen from the perspective of the designer, wicked problems do not exist. Attaining the design attitude, the Information Professional welcomes uncertainty, trusting that this will lead to resolving the problem. The wickedness of a problem is therefore not an obstacle for the designer but a mere driver for creativity and innovation in finding a solution. Wickedness is inextricably linked to designing and thus not considered problematic to the designer. A wicked problem is interpreted as a design situation. A design situation is seen by the designer as an opportunity to create something new, a window for innovation.

7. What is the relation between Visual Thinking and the Design Attitude?
The chapter on visual thinking provided insights that can enrich the education of Information professionals. First of all vision is one of the most important senses and is inextricably linked to thinking. Recap the phrase that people use when they do not understand something: “I cannot form a mental image of this theory”. People think in visual images how abstract they may be. Hereby vision and visual thinking form the basis for every human activity.

I argued that visual thinking is part and parcel of Integrative Thinking since visual thinking is the basis of design. Arnheim’s and McKim’s work on visual thinking serve as the basis for the ideas of Faste and Brown, and as such are programmed into Standford’s pioneering Design School. Faste wrote extensively on design education of Stanford and based his curricula on Visual Thinking.

Visual thinking is at the heart of complex problem solving. In my analysis of literature on visual thinking I found that visual thinking stimulates re-centering one’s viewpoint, teaches to observe stakeholders, and finding synthesis between object and context. These characteristics of visual thinking are essential to the design attitude. Since vision is natural to every human being, visual thinking is suitable to teach individuals to explore and adapt the design attitude in order to resolve wicked problems.

Propose the Design Attitude for Information Management education
Thus far it was concluded that Information Professionals are unable to deal with wicked problems and that a design attitude is needed to resolve complex issues. In this discussion only few studies explain the implications for Information Management education, the main focus in research is on addressing the need for this paradigm. The following step of this research is to examine the role of the design attitude in education.

8. What are the consequences of the Design Attitude for Information Management education?
In order to determine the role of the design attitude in education this research focused on (1) what lacks in education, (2) what is needed in education and (3) the design attitude in the praxis of education. The conclusion from the first focus is that the educational practice of Information Management is also biased towards rationality and scientific reasoning. Education has little or no attention for solving complex problems, therefore knowledge on how to deal with wicked problems lacks. According to several studies it is argued that design education makes students more susceptible to the needs of others (Starkey & Tempest, 2009), and to social and cultural dependencies (Snyder, Heckman, & Scialdone, 2009). These skills are highly valued in solving wicked problems. Dunne & Martin (2006) state that a school teaching the design attitude should especially promote stakeholder understanding, that is, something that current programmes in management education fail to do. The design attitude is valued since empathy provides the information professional with a richer problem and richer solution space that both induce the creative tension. This tension is appreciated while it challenges designers to find innovative solutions that bring together the variety in stakeholder needs. “The role of education, therefore, is to encourage perceptiveness and creativity rather than conformity to rules” (Starkey & Tempest, 2009, p. 580).

The chapter on Information Management education concluded with several recommendations. Starkey & Tempest (2009) stated that design education needs a master-apprentice relationship between students and teachers, problem-driven exercising and collaboration in groups. The most evident recommendation is to
bridge the gap between course and practice. Although the design attitude needs a theoretical basis, moreover it should always be rooted in practice. Design implies the alteration of or the adding to reality. Real world problems should form the starting point for design courses, only by practicing the design attitude students will pertain it.

On the other hand students should find their own design challenges. The search for design challenges teaches them to practice several important aspects of the design attitude: observing stakeholders, empathizing with stakeholders, find their latent needs. The needs of stakeholders provide the input for design that leads to innovative solutions that sustain the stakeholders.

**External research goal**

The conclusion is that all the research goals were achieved by answering the research questions. The internal research goals made clear what the external research goal of this research is:

*Show why information managers are able to resolve wicked problems in Information Management by adopting a designer’s way of problem solving.*

This research centralized the design attitude as a non-linear way of problem solving. As was mentioned in the theoretical framework the design attitude was explored from various perspectives to provide a greater understanding of this mindset. The contribution of this research to the external research goal is to deepen the understanding of a specific non-linear way of problem solving.

**Further research**

The design attitude is a comprehensive topic and this thesis gave an overview understanding in the context of IM education. Further research can fist of all direct its attention towards the distinction between objectivism and subjectivism to build a theoretical framework for the design attitude. “Fenomenologie en empirische menskunde” by S. Strasser (1962) is a good starting point in which the ideas of Sartre are related to phenomenologists as Heidegger and Husserl. It provides a philosophical and fundamental insight in subjective situationism (Wisse 2003).

Further research is also needed to understand and cope with the growing scale of Information Management. Wisse (2008) names this *civil information management*. With pervasive digital interconnectivity, the limited perspective of the separate organization is increasingly causing social problems. Information Management has expand its scale from an organizational perspective to a social one. This thesis focused mostly on the designer and the design attitude. Further research should put the design attitude in the relation to the growth of information traffic on a social scale.

The theoretical framework already mentioned the literary character of this thesis. Therefore further research can focus on the design of a curriculum based on the principles gathered in this thesis. How can the design attitude be practiced in the context of Information Management? What course can be designed to attain and practice the design attitude.

I hope that such a design would be brought to practice in higher education since it is my contention that education on design is essential to the evolvement of Information Management. The design attitude reveals that practice and theory are intertwined, therefore it is my hope that researchers will not only publish on design in Information Management. Moreover they should also ‘practice what they preach’ and become role models for future designers. It is the responsibility of these teachers to enable students to learn nothing but learning: by now it should be clear to the reader that designers are life long learners.

*Come mothers and fathers throughout the land*  
*And don’t criticize what you can’t understand*  
*Your sons and your daughters are beyond your command*  
*Your old road is rapidly agin’*  
*Please get out of the new one*  
*If you can’t lend your hand*  
*For the times they are a-changin’.*  

-Bob Dylan
Bibliography


Appendices

Appendix A

The first dialogue: Anthropology and Design Thinking

The other day I had a very interesting conversation. I sat with a friend in a small cafe near the Amstel canal in Amsterdam, dwelling on about life and what we wanted from it.

At a certain moment, when silence had entered our conversation, my anthropologist friend asked me: "What is it that you study, Royce? I have known you for many years now, but it is still somewhat vague to me, what are you up to?"

I answered him: "Well my dear friend, to be honest my study has a lot in common with your study, anthropology..." A frown emerged on my friend’s face and he had a somewhat astonished look in his eyes: "Explain yourself, Royce." And that was the start of a very interesting conversation.

I am always motivated to explain something in a way that the other half of the conversation can understand. To answer his question, I started from his perspective:
"Well what you anthropologists do, is try to look behind the curtains, right? The aim is to discover what motivates people for certain behavior, why they act how they act and what cultural motives are underlying these actions."
"That is pretty much the case, yes. And this group of people we research can be an ethnical group like the the Dajak in Indonesia, a tribe in Africa or starting entrepreneurs in America. But of course also in the field of Anthropology there is much discussion on the essence of the field. For now, let's state that anthropology aims to reveal cultural motives and behavioral patterns from an empirical standpoint. Anthropologists do this for example by participating research, in depth interviews and many other techniques to reveal subjective truths."

I took a sip of my beer, and said: "Well, let me restate that, by arguing that an anthropologist tries to look though the eyes of people he researches. To use a metaphor an anthropologist aims to look through the 'glasses' of these people to reveal how they see the world."

GLASSES METAPHOR

My friend nodded affirmatively and encouraged me to proceed. "The 'glasses metaphor' is important for my argument. It presupposes that individual members of different groups have a different way of 'seeing' the world. One could say that they all have different concerns, needs and wishes. Therefore the glasses metaphor acknowledges the existence of a subjective truth. It is the task of the anthropologist to map this subjective truth, or in other words to describe these glasses."
"That is an interesting metaphor, clear and enlightening. I see what you mean while these glasses are determined by culture, education and so on. But where comes your study into play? What is it called again... informatics?"

ANTHROPOLOGY

Although my friend has a bright mind he is also bad with names, especially with things that are of not interest to him. I ignored his obliviousness when I answered:
"I study Information studies. Which is about how different actors like individuals, organizations and networks deal and work with information. We as Information Managers are educated to design information systems and processes to sustain the way these actors deal with information."
"Ahaaa!", my friend said with some excitemtent in his voice. "I just had a small epiphany, because you should also research the subjective truths of the people who work with an information system. Am I right?"
"You are absolutely right. For us as designers of information systems and related organizational processes it is always important to incorporate the concerns of all the people involved. For designers in general it is important to include the human centered part of design. Let me elaborate on that..."

"Imagine the designer of a house, an architect. Building a house involves a lot of different stakeholders, actors who have a certain concern in the house. For example, the family who is going to live there, the client who pays money for the project, the builder, the neighbors, local government, and the environment. All of these stakeholders have different concerns, expectations and wishes for the house that will be built. The architect needs to mediate between this variety of concerns to incorporate them in the resulting design of the house."

**DIFFERENT STAKEHOLDERS WITH CONCERNS**

"In general terms a stakeholder framework emerges from this." Meanwhile I drew the following picture on the back of a coaster to visualize my story:

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[Diagram showing stakeholders: Client, Contractor, Designer, Users, Environment]
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In a way it is the architects task to empathize with the different stakeholders to find how they see the world. To use the metaphor, he has to look through the glasses of the stakeholders. The stakeholder and his view on the world is than the starting point for design; not money, the building itself or technological feasibilities. Therefore an architect is different from an anthropologist in the following sense. Where the anthropologist only needs to describe these 'glasses', the architect needs this knowledge in order to design. For him looking through the glasses is not an end but a means to get to a good design. A design which incorporates the concerns of the stakeholders. It is this step towards design were designers distinguish themselves from anthropologist and many other sciences."

**GLASSES METAPHOR/SUBJECTIVE TRUTHS + UNIQUENESS OF SITUATION**

"If I understand this correctly, and correct me if I am wrong, you as information managers are in certain way designers. And designing should not be understood as making a product more esthetic or technically feasible but moreover looking at stakeholders involving their needs to design in a human centered way."

"Yes correct."

"But then you have to know a lot about all these different fields which are involved, right? Like an architect needs to know about materials, building processes, urban planning, interview techniques, ways of living, discovering peoples interests. How is this even possible?"

A smile appeared on my face, my friend got intrigued by the whole designer story. I decided to see how much more he could handle:

"Well if we look at my science, Information management, we see that this is related to many fields. For example: anthropology, as we saw before, business administration, process management, computer science, psychology, politics and so on. Your question is how can an information managers know about all these different fields?

Well, the first part of my answer is that collaboration is an important factor. It is evident that one is unable to know everything, hence the quote: the more you learn the more you realize how little you know. Therefore working together and sharing knowledge is an essential part of being a designer. The designer is not the man in his ivory tower looking down upon the world."

**COLLABORATION**
But to answer your question on a deeper level, I would have to pay some respect to Vitruvius. Nowadays seen as one of the first designers in the Roman Empire, while back than the romans only saw him as a plumber. Vitruvius argued that we need to divide the way we look at performing a certain skill or work. He said we need to make a differentiation between the work itself and the reasoning behind the work.

Each individual art consists of two elements: the work itself and the reasoning behind it. One of these is the particular property of those who are trained in an individual skill, namely the execution of the work itself. The other (reasoning) is shared in common with every learned person, just as doctors and musicians share knowledge of the rhythm of our veins’ pulse and the motion of our feet. However, if there is need to heal a wound or snatch a sick person from danger, the musician will not come forward, for this is the proper work of the doctor. Likewise, the musician, not the doctor, will play an instrument so that his ears will delight in song.

similarly astronomers and musicians discuss certain things in common: the harmony of the start, the intervals of squares and triangles, that is, the musical intervals of fourths and fifths, and with geometers they speak about vision, which in Greek is called logos optikos, the science of optics, and in the other disciplines many - or all - things are common property, so far as discussion is concerned.

But as for embarking on creation of works that are brought to elegant conclusion, whether trough manual dexterity or skillful application, this is properly left to those who have been trained to practice a single skill. Whoever has a moderate grasp of the theory and the practical details of those individual disciplines necessary to architecture seems to have done enough, and more than enough; he will not fail, if need should arise, to judge and test decisions and evaluate these various areas and techniques.

Therefore the aim for the designer is to grasp the abstract reasoning behind the work. All this follows from the 'glasses' metaphor."

WORK & REASONING UNDERLYING THE WORK

"Although I follow your reasoning, Royce, I have a hard time seeing the practical essence of your thought and the work of Vitruvius. Can you give me any examples to sustain your argument?"

His question surprised me a little bit, but it was an interesting question. Being a designer your work always has a place in reality. I immediately thought about an architect I met when I studied in Nijmegen. "That questions intrigues me, because it is in the essence of a designer that from all these abstractions he needs to make some sense in reality, in the real world. I think I might have an interesting example concerning a juvenile penitentiary in Amsterdam Sloterdijk. The architect introduced some innovative solutions because he was able to think outside the box and see what reasoning was underlying certain concepts in a penitentiary."

"When I was finishing my bachelor degree at the Radboud University Nijmegen I followed a course named Physical and Digital Engineering. The instructor of this course intended us to see the parallelism between engineering and architecture in the physical world and the digital world. With the digital world he meant the world of the information manager; an organization with the focus on information aspects. The instructor of this course was very eccentric, in his clothing as well as in his thinking. His idea to compare the design and building of physical artifacts with information systems would prove to be an inspiring one. For the final assignment we had to choose a certain type of building, for example office buildings, churches, schools etc. The next step was to analyze these buildings in order to discover what the architect intended and if he succeeded. My group chose to analyze three prisons. We set ourselves the goal to speak to at least one architect of the three prisons. Study the prisons to see and reason about it would be very interesting, but it would be even more interesting to test our ideas by talking to the architect.

Luck was on our side when we managed to make an appointment with Martin van Dort. He was working on a project to redesign a juvenile penitentiary in the west part of Amsterdam. This was a very interesting project because the juvenile penitentiary had to be redesigned and rebuild while it was still being used. Martin made an appealing impression and was eager to explain some of his design choices. To give us an impression he showed us around in the part that was already build."
From the first moment it was clear to me that his clients intrigued this man. And with his clients I do not mean the people who pay him to redesign the building, but all the stakeholders involved in this project. Martin made it clear that he paid special attention to the young boys that were sentenced to stay inside the prison and to the people working in the prison. These were most important in the project, he said, while these people are always there, and hence always confronted with the building he was designing.

One particular remark he made stuck with me until this day: "The young boys locked up in the juvenile penitentiary realize that they are being sentenced for what they did. They are confronted with their situation everyday, so why should this building emphasize that they are locked up?" Martin clearly aimed to empathize with the stakeholders to see through their 'glasses'. Without empathy Martin would not have been able to imagine the world from the perspective of the adolescents.

**Empathy**

For our group this was a very inspiring insight. The adolescent men had to re-integrate in society, therefore the building itself should sustain this purpose without breaching any security regulations. Martin was concerned to incorporate clarity, daylight and clear orientation in this prison. This provided us with the insight that the concerns of different stakeholders can be contradictory. At first sight, openness and clarity are contradictory to security and imprisonment. These contradictory concerns were not a stumbling block for Martin, instead he saw them as a challenge that would lead him to innovation.

**Contradictive Concerns**

Martin wanted to bring more daylight into the juvenile prison to sustain a feeling of freedom or connection to the outside world. For this purpose he designed a hallway made of glass without bars. But next to this hallway there was a football club, and he did not want the football players to point and laugh at the young men inside the prison. This resulted in the following design which makes it difficult to see inside the prison from the football club but there was still a sense of openness inside the hallway.

Include: Picture

The way Martin discovered these innovative solutions is what he calls integrative design or integrative thinking. Integrative thinking is a multidisciplinary and holistic approach to a given situation. It aims to combine all the factors involved in a project to come to a (innovative) solution that fits the specific situation and subjective concerns of the stakeholders. Contradictive concerns are therefore not seen as a problem but as an opportunity for innovation. Integrative thinking is a way of looking at the world more than that it is a process or method.

**Integrative Thinking**

Does this give you some practical insight into the things I mentioned about design?"

"It's a lot to handle, but I think I see some light at the end of the tunnel. Let me think here for a moment", he said frowning as deep as the cracks in the pavement. I came to know him as a brilliant mind so I waited in silence for him to reveal his insights in the matter. The waitress unnoticed smiled at us but my friend was ignorant so I winked at her. I put two fingers in the air and she understood the message.

"Thinking like a designer or what you call integrative thinking..."

"Let's just name it Design Thinking....", I interrupted. "Sorry, proceed...".

"Alright then, design thinking is something like a process or even more specific an attitude towards the world. It sounds to me that a designer needs to be able to see constraints from different perspectives to explore them. By posing questions, and exploring these constraints the designer aims to find totally new directions, which lead to innovation. Innovation for that specific situation and the subjectivity of the stakeholders involved."

"Woow, that actually touches the essence of being a designer. Acknowledging the uniqueness of a given situation and exploring the subjective concerns of the people involved. For me personally design thinking is a way of life."

"But what I find even more interesting is the playfulness in this. A designer needs his childlike wonder to be astonished by every new situation he encounters. Without this curiosity he would be unable to ask questions which lead to great insights. Because it is when we play that we let our intuition speak."

**Playfulness**
While my friend kept on raddling, the lovely waitress silently put the two beers on our table, afraid to interrupt our exciting and energetic conversation. I sent her a little smile when she walked away.

Appendix B

The second dialogue: Design attitude in Information Management

"Listen to me, Royce... In certain ways a designer has a very difficult task. While a designer should be blank towards a given situation or at least aim to be unprejudiced. In a sense this might be impossible; to lay aside his own subjective truth. Maybe a better way to describe it, is to be open-minded. Every design situation should be encountered without being captivated by the designer's prejudices, methods, or solutions. The situation itself and the subjective perspectives of the stakeholders are the grounds from which design can flourish. Therefore design starts with an extreme point of view, extremely subjective and situational and not with generalizations. It is the extreme starting point which leads to general solutions and innovation."

"You are getting somewhere my friend, in your statements I see another pitfall to design. In this view on design, tools and methods are mere means than and end. A designer selects the tools and methods which fit the specific situation and the concerns of the stakeholders. Again the situation itself is the starting point, not the methods themselves. But the danger lies in the trust and confidence one invests in these methods. The pitfall is that the method becomes more than a method. If one has only learned to use a hammer, one is easily inclined to see every problem as a nail. But I think it is clear to everyone that a encountering every problem with a hammer in your hand might not be the smartest thing to do. A hammer is a very useful tool for a carpenter but it cannot be used on a screw. Therefore a skilled carpenter is not (yet) a designer.

Thus the danger for an individual is to incorporate the rationale of the method as a part of his world perspective. The individual than sees the world trough the perspective of the method, hence classifying every problem as a nail. This contradicts the open-mind of a designer. The art of design thinking is to be able to see the different rationales underlying several methods and use this knowledge to apply an appropriate method in a specific situation."

"And to follow your line, this also withholds any innovation. Of course, a method should be tested in different situations to see what the boundaries are. But simply applying a specific method to a variety of situations and expecting the same results is somewhat short-sighted. It cannot be expected that practicing the same method in a new situation will lead to the same results as before. A method is always a limited abstraction of the real world. But although it is limited, at the same time we need tools and methods to make sense of reality.

So, the focus on the desired results often leads to the selection of a particular method, which is believed to achieve these results. In this way the situation itself is totally ignored/given no credit. From a design perspective this is a counter intuitive point of stance. Integrative thinking aims to handle the design situation in a holistic way. The situation itself is the essence, it presupposes the challenges that arose. The discrepancy between the actual and desired results lies within the specific situation. Only focusing on the desired results and the way to get to these results, misses the basis of the challenges. Therefore it is not the method that functions as the starting point towards a solution but it is the situation itself and all its characteristics."

I sipped my beer and tried to summarize my friend's ideas.

"To put it more philosophical, if you want to get to a certain destination (desired situation), it is not only important to know that you are going by bike or by car (method or tool). Moreover you first need to know where you are (current situation), because without a starting point there is no road, and thus you will not reach any desired destination. Be aware of where you are and be aware of the limitations of the methods and tools you use.
In a sense designing has several similarities with Bob Ross making a painting. Bob seems to be a crazy genius, who is always chatting to himself and to his audience while creating a beautiful painting. Most of the time Bob starts with a picture of some scenery that serves as the basis for his painting. For example a tree with several birds, a basket filled with fruits and vegetables.

Hereby giving the audience a sense of where he is going, what his aim is. Meanwhile during his painting he names every action he takes leaving us with a feeling of purpose. But in reality he is a master at deceiving his audience in a designer like way. Ross gives his audience a false sense of expedience (doelmatigheid, doelgerichtheid) during his work.

He for example claims to add a little red to give the sparrow some warmth, a little blue to give the union a glowing effect. He uses the small brush for several details and the biggest brush to emphasize effects or to start his sketch. All these little details, and small actions seem to be part of the plan, the plan that was about to be fulfilled when the first brushstroke landed on the canvas.

While in fact Ross does not have a well-defined plan for the painting. His playfulness with colors, small adjustments, additional figures all emerged in the moment of painting. The uniqueness of the situation itself lets these additional actions arise. The different methods and tools are used in a varying amount of situations contributing to the overall picture in their own particular way. Ross is a master at intuitively sensing what the painting needs in order to reach more beauty or to emphasize certain details. Therefore in a sense Bob Ross is designing while painting and painting while designing.

So our conclusion can be that we do not argue against the use of methods. Rather we state that the uniqueness of the situation serves as the basis for design. And that when using a method a designer needs to remember that this method houses certain limitations when applied.”

“You learned me a lot today, Royce. Maybe there is a future for anthropologists... In the end we discussed some very interesting facts about design and the design profession. What is still unclear to me, is how this is related to Information science. Are these people designers? And if so why?”

His question evoked a strange feeling in my gut. This was a serious question, to which I did not have an answer yet. I did not want to disappoint my friend, so I started my reasoning to see where it would lead us.

“A designer of information systems, let’s name it that. He or she is, like an architect, involved in the tension field of different stakeholders. Let’s take an interesting and much discussed example of a pervasive information system, the EPD (Elektronisch Patienten Dossier). This system will be used to secure a patient’s medical history and make it available in every medical institute in the Netherlands. This to ensure that a doctor or a medical examiner can decide for a certain treatment based on all the details of a patient’s medical history.

If we analyse the EPD project we already see a variety of stakeholders: Dutch government (client), doctors, medical specialists, nurses (users), technology and consultancy companies (builder), current medical information systems, insurance companies, infrastructure (environment).

All these stakeholders need to be involved in the design and construction of the EPD. Because it is such a pervasive system it is important that the system is accepted by the stakeholders, and most important, accepted by the users. Thus it is of the essence that the designer of the EPD designs the right system!”

“What do you mean by that, designing the right system?”

“Well, the easiest way to explain this, is by putting information studies next to computer science: Computer science is about building the system right

Information studies is about building the right system

Building the right system presupposes that the designer has some knowledge on what the stakeholders perceive as right. By empathizing or looking through their glasses the designer extracts the world perspective of the stakeholders. This reveals what stakeholders want, like, wish, need from the
information system. Hence my conclusion that the designer needs to design the right system; bringing together and fitting the stakeholders‘ needs.

To bring this back to the example of the EPD, the designer needs to understand how the medical world is organized. For this design, he needs to know what doctors, specialist, general practitioner, and nurses expect from the EPD and how they work together. The medical world in general is based on hierarchy. In a sense the designer needs to involve the culture of the medical world in his design. How do doctors, nurses etc work with patient information, how do they share it, when do they come in touch with it? These and more are all important questions related to the culture in the medical domain.

Besides the medical domain, there is also the patient as an important stakeholder of the system. The EPD secures private medical data of the patient, which lead to several privacy issues. The patient might not want to share his medical history with the nurse or with an insurance company. Who should get access to what information concerning the patient?

A general conclusion is that the designer needs to be a culture specialist. The culture in all its aspects is part of the situation at hand, which serves as the basis for design.

But aside from being a culture specialist and empathizing with the stakeholders there are also other aspects of design found in the information science field. First and foremost the designer needs to use this knowledge found from his study of the stakeholders and the culture. The designer is able to switch between different levels of abstraction and different domains. Revealing the needs of the stakeholders, working on the design, thinking about what materials to use.

In the EPD example, the designer of this information system often has to deal with the same challenges when is conducting research on the needs of the doctors and nurses, finding the privacy issues of the patients, designing the system, tune the design and the current infrastructure, finding innovative solutions for certain challenges.

This means that the designer of the EPD needs to be able to apply integrative and abstract thinking: combining and integrating different levels of the design. Starting from the specificness of the situation the design comes to its form. But this is not a linear process, the designer has to go back and forth between on the one hand the specific situation and needs, and on the other the overall design. Designing is then about switching in focus; keeping the overall design in mind while researching specific stakeholder needs, culture and so on.

We also see that working in a design environment of an information system requires a variety of expertise. Altough an designer (or an architect) needs knowledge on many fields as was argued by Vitruvius, collaboration is also an important part of design. Many architect agencies work in teams with different expertise. Likewise in designing an information system, many specialists are involved, so collaboration is of the essence.

Thus the working environment of a designer of information systems has several similarities with the world of an architect. Stakeholders with different concerns which need to be incorporated in the design. Empathy with the users and environment to make the design human centered and adjusted to the users. Being open minded to what the situation at hand brings forward and an integrative approach to breach opposing concerns, transforming these into innovative ideas. Information studies has grounds in practices and in abstract reasoning. This is one part of my argument why information studies is also about design and moreover about learning to think like a designer”

Appendix C

The third dialogue: A designer and his problems.

From the conversation with my friend two interesting questions emerge. The first is why is Information studies a design study? The second is when is a certain situation a design situation or when is a situation
suitable for design? The second question is the basis for this section in which a search for answer to the question what is design or when can we call something designing? This section is free associating of my part about designing. Several interesting statements are made that serve as a basis for further reasoning in the next chapter. The following chapter will address the education of the designer.

I could name several characteristics that found their way into literature, that seem to have to do with designing and design situations:

- a complex situation which is not easy to grasp, so called wicked problems
- conflicting and intertwining concerns of stakeholders
- many levels of abstraction
- problems occur on different levels

These characteristics are interesting but fail to describe the essence of designing. From the perspective of the designer these wicked problems are not complicated problems, in a way the designer doesn't see them as problems at all. A design situation is seen by the designer as an opportunity to create something new. For the designer a design situation reveals a window for innovation.

To go on with my reasoning, maybe a situation is a design situation if someone sees it as a design situation. Then it is in the eye of the beholder if a situation is a design situation. In our case if an individual sees a given situation as a design situation than he automatically becomes the designer. Again it becomes clear that design finds it's beginning in the specific situation and the subjective perceptions of that situation. These make it a possibility for design. Let's examine this a bit more.

One could argue that every choice we make is also a design situation. We are in a sense the architects of our own life, since every choice one has to make can also be seen as a possibility for design on a small level. Or is this a sophism?

But the basis for all my previous reasoning are needs, if it is designing for the wicked problems or designing a small life's choice. The stakeholder framework showed that these stakeholders have different concerns, wishes, desires concerning the design. But underlying these concerns, wishes, and desires are their true needs. Desires and wishes are the construct of these deeper needs. It is the designers task to get attuned to these needs and find out what they conceal. While creativity and innovation result from a deeper understanding of these needs. This abstract reasoning demands some practical examples to sustain my statement.

I argue that a design situation is a situation where the world of possibilities meets the world of desires. Design is the art of making the desired feasible. As something is feasible it can also become possible. It is on this cross-section between the desire and what is feasible where design finds its interplay. And making something desired possible is about thinking outside the box. This is what in literature is called divergent thinking. Seeing opportunities for new solutions that do not fit the normal standards.

A way to see or reveal these out of the box solutions is to focus on the underlying rationale in the desires of stakeholders. It is the essence of their desire, which motivates the designer to transform these underlying needs into reality. Therefore the designer is not concerned with WHAT the stakeholders want. It is the underlying why, the deeper need that people experience, that truly describes the desire of people. And this underlying why is what a designer needs to be tuned to or able to reveal. And that is the difficult part of design.

Let's take an example from architecture concerning the Henderson’s family. Henry, a middle aged man, married and father of two beloved children, desires a new house. He has bought a lot so he can build his own house. Because he is not skilled to build the house with his own hands, he hired a construction company to build the house.

If we focus only on his wish, we see that WHAT he wants is a house. With this focus the construction company could build a simple house with two bedrooms and a bathroom with toilet upstairs, and downstairs the living room, and kitchen. But is this the house that Henry desires?
If we get to know Henry a bit better we see that underlying the what of his desires are many reasons why. Let’s find out what his true needs are... Henry is a business man, gets up early, works hard but still finds himself at the diner table around seven pm with his beloved family. Henry is a professional who has pleasure in his daily work. But more important, he is also a family man who loves to spent time with his daughters.

Every morning it is like a tornado flew through the Henderson’s residence. Dad has to shower, shave and eat before getting to work, mother Marie needs to make breakfast for Felicia and Rebecca, who both need to brush their teeth and comb their hair. So the bathroom is always occupied, the kitchen is overcrowded; in other words morning’s never quietly go by in the Henderson’s house.

Henry’s main concern is that there is place for every member of the family in their house. The opportunity to go at your own pace every morning, of course in view of the others (MET HET OOG OP), but with a bit more personal space. This could for example result in a design in which the bathroom is separated from the toilet and there is an extra toilet on the ground level. Felicia and Rebecca are getting older, so Marie and Henry want them to have separate rooms. But to give them a sense of connectedness their rooms are adjacent with a door that functions as a passageway between both rooms. They are also planning to have a newborn in the near future. Henry wants to be prepared and for this future youngster they want a room that is easy accessible from the parents bedroom. With this newborn in the planning and the promotion Henry made to senior consultant, he wants a quiet place to work in his house. The promotion enables Henry to work from a working place that he chooses.

Design starts with the needs of a stakeholder. These needs can be experienced conscious and unconsciously. A problem situation is in the essence also a desire. The current situation A does not complement the wishes and desires and is therefore problematic. Solution situation B is what is desired and is the aim for design. Wishes, desires and needs are the fundamentals on which we appoint the concept ‘problem’ to the current situation. We see that desires or needs are a window for innovation and require design thinking to reveal the desired solution. Since these desires can be conscious or unconscious it is the designer’s task to reveal these desires.

In the example of the Hendersons we have seen that if we only focus on the what of the stakeholder’s desire, in our example a house to live in, the design and resulting artefact can be completely misplaced. Or in other words it fails to fit the situation and the desires, hence it is not the ‘right’ system. Therefore a designer should investigate the why’s that underlie the what. Often the stakeholder does not know how to communicate the why to a designer. This is because of the abstract and intangible nature of the why. Therefore stakeholders often speak in what they want, because this makes the why somewhat tangible and concrete. Since it is difficult to translate these why’s into what’s, the designer should be careful with focusing only on the what. It is the task of the designer to reveal these underlying reasons since these lead to a design of a system that fits the stakeholders.

The true nature of desires and needs emerge through observation of the situation by the designer. The desire is not an isolated object which stands alone in the world. It is not only embedded in its context, the desire emerges from the context. So without the context the desire does not exist at all. Observation can be done in many different ways. The designer can be an observer while at the same time being a participant in the observed event or he can be an observer from the outside. Although a variety of observations methods exist, it is important that the designer knows at least several of these methods. It is of great importance that designers learn to observe, while observing is fundamental to finding needs and desires. And finding needs serve as the basis for design thinking.

Needs finding and design thinking require the specific skill of observation. The designer aims to observe unprejudiced and open minded without making premature generalizations. That is observing in its purest form; without any generalization. It entails that the designer does not grasp for expectations nor does he reject aversions. He is calm, centered and observes the world as it is. Here we enter the domain of consciousness, and being balanced. Of course it is sometimes important to think about what you want to observe and what to expect, but the observing itself needs to be as open minded as possible.

An eye for details and seeing what others don’t, is essential. From this it follows that the designer starts from an extreme position, namely the subjectivity and uniqueness of the situation at hand. The designer is
able to see the situation from different perspectives without (or with minimum) interference of his own viewpoint.

Thought experiment

These are several quotes that came to mind when I was writing the essay. Of course they are not the truth but they are an approximation.

Design is the art of unraveling the unraveled
Design is the art of revealing the unrevealed
Design is the art of revealing what is desired
Design is the art of translating the desired into the possible
Design is the art of revealing the desired as a possibility
Design is the art of making the desired possible
Design is the art of making the desired feasible
Design is the creative art of transforming desires or needs
Design is the art of consciousness

Appendix D

The fourth dialogue: Design attitude and education

I went by train to the political capital of the Netherlands, The Hague. This city is where the prime minister is suited, our queen lives, and our government guides our country.

I was here, in this town full of culture, to meet a respected member of the information sciences field. We meet on a regular basis to have a chat about my study, his business, society, people and discuss the richness of these subjects. In other words we talk about life. In a way I see him as a sparring partner, an expert by experience maybe I even see him as a friend.

Anyway, the conversations we have are always enlightening and have a glimpse of brightness about them. That is why our meetings provide me with great pleasure.

We met the other day in the same café as always around noon. I had mailed him that I had several interesting conversations about information studies, amongst others with my friend and Anna’s research assistant. These conversations led up to the important insight that design thinking is an important attitude for an information manager in order to design and build human-centered information systems. But this insight also led to a new questions, namely how can we educate individuals to master a design attitude? This question was the topic of the conversation I had with the designer.

“As I understand from your email you had some interesting conversations. And I think your question about educating individuals in our field is addressing a core problem... When we see design thinking as an attitude towards certain challenges or problems it immediately becomes clear that the individual needs to get accustomed with this stance. Some people developed certain skills more than others but an education should aim to get everybody on a desired higher level. Therefore I agree with your proposition that education is of great importance. Designers of information systems need an education to learn design thinking just like an architect needs to learn how to design buildings with respect for the concerns of the stakeholders.”

“That is exactly my point... Of course it is important to analyze the bias towards objectivism and rationalism and evaluating several other perspectives. In the end it is the balance between these different perspectives that is important to find innovative solutions for problems that arise. Therefore we need an attitude towards the world or way of life that is able to bring balance to these different perspectives with more emphasis on the needs of stakeholders.
So in the essence it is about bringing everything together, creating a synthesis that functions in the world. In other words one could say it is about designing.

From the reasoning in the other conversations I conclude that Design Thinking is perfectly suited to oversee and integrate all the aspects of a design situation. Or to quote Tim Brown:

[Design thinkers] not only rely on analytical processes (those that produce either/or choices) but also exhibit the ability to see all of the salient—and sometimes contradictory—aspects of a confounding problem and create novel solutions that go beyond and dramatically improve on existing alternatives. (Brown, 2010)

Now we found Design Thinking as a way of bringing more balance to the information studies field, we need to design educational programs that teach students to design. In accomplishing these programs a deep understanding of design thinking is required. And we have seen that Design Thinking is based on totally different set of assumptions (paradigm) than the current analytical basis of the IS field. Understanding Design Thinking enables us to create an curriculum that educates design thinkers.”

"Well Royce, than my next question of course is, to what extent do you understand Design Thinking? What is in your opinion the essence of it?"

"Hmmm, at this particular moment I think Design Thinking is an attitude for design. So considering Design Thinking as a way of thinking does not cover the content. Design Thinking is more an attitude towards the world, a point of stance. For me design thinking entails a stance towards the world that asks for a change in paradigm, especially in the Information sciences. Humanity has known and educated designers in architecture, industrial design, urban planning and so on but not in Information sciences. Therefore the information science field, which is currently stooled upon a different paradigm, needs a shift in the understandings of its basic fundaments to encompass Design Thinking.

Let me explain more on my thoughts about Design Thinking. In my previous conversations with others and even in this conversation I have seen many aspects of design thinking. But in the essence I think design is about synthesis, bringing everything together.

A designer is able to see the world and therefore the design situation from different perspectives since he aims to remain open minded, full of empathy. He switches from a detailed focus to the bigger picture, sees the embedding the in the context. Finding the why behind the desires and needs of stakeholders. But all these different perspectives need to be bound in the design, and the resulting artifact needs fit into the world. The essence of design lies in this synthesis.

Design Thinking is an attitude for design in which the designer is conscious of the wholeness of the world and therefore of synthesis of the design situation. This probably needs some explanation.

The world is a synthesis, there are no objects which exist on their own, cut off from the world. Everything, every so called object is connected with its surroundings and in these relations mutual influence exists. Objects cannot be seen as cutoff or separate from the world because they are always in the world, influenced by and influencing their surroundings. Thus the context is just as important as the object itself (maybe the true understanding is that there is not distinction. The object is the context and the context is the object).

This understanding that everything is part of the bigger picture, or the conscious contemplation of this connectedness, is in my opinion an essential understanding of design thinking. If we realize this profound synthesis of the world, its wholeness, we are open to all the perspectives that are playing a part in designing.

This leads me to the conclusion that design thinking rests on a distinct new paradigm that is essentially different from the current paradigm in the field of Information sciences."

Pieter smiled while he looked me in the eyes. I saw a glimpse of recognition in his glance, right before he said: "So what does this mean for education?"

"This means that first and foremost that these students need to be guided in realizing the connected, and whole nature of the world.
Of course practicing empathy, learning to observe, finding needs are all things that can be practices and need to be educated. These skills are important to grasp the connected nature of phenomena in the world. But these and other tools are all methods to (re)discover the synthesis of the design situation.

But what I realize now is that the understanding that everything is contextually connected, is in fact a feeling, a realization. It is something that cannot be grasped by methods, tools and so on because these methods and tools are already part of the totality of the world. Trying to capture the wholeness of the world with a certain method would assume that the method itself is not part of the world. Therefore the designer should in the deepest sense realize that he can never capture this synthesis. Because when he could, this ‘thing’ he created would be separated from the world, something that is impossible. The designer can only understand this synthesis and extend it with his design of a certain artifact.

Therefore in educating designers, it needs to become clear that activities like needs finding, observing, empathizing, bringing them together, prototyping are a doorway to grasp and contribute to the synthesis of the situation. In a sense the designer needs to rediscover this every time he designs. This makes a designer a life long learner, since with every design challenge he will aim to understand the synthesis of the situation and make an innovative contribution to it."

Pieter: "Let me contribute to that. The designer is able to see a certain challenge in many different ways, in your words he sees the wholeness from many different standpoints.

Every person carries mental images, classifications, prejudices with him let them be cultural or educationally determined. This is how our brain works, it seeks for patterns and recognition and chooses the easiest way.

The designer needs to abandon these old classifications, and acknowledge the richness and possibilities of life. This richness and possibilities are a consequence of the synthesis of the world. Thus the designer needs to experience to unlearn. Only when he is able to let go of his accustomed perceptions he will see the world from a different perspective. This also means that the designer needs to embrace uncertainty, insecurity and welcome the unknown.

To really see, one needs to let go of future prospects and past experiences and truly be in the here and now. It is moving your perception away from its usual standpoint to see familiar things in a different way. Design is the art of making the strange familiar and the familiar strange."

"Woow this is like I am having a deja vu. For one of the courses of my master I came to the following conclusion in a paper on hyper reality which relates to your insights Pieter!--- We have a tendency to see the world as a black and white place. Phenomena in the world either are left or right, good or bad, save or dangerous. We tend to calculate our every actions, excluding mistakes or failures while this gives us a peaceful feeling of certainty or trust. But in fact the world is not a world of extremes, it encompasses a variety in shades of grey. Therefore uncertainty is a part of life, and we are confronted with inconsistency on a daily basis. Feelings that do not match reality, abstractions that do not represent our subjective perception, love and hate existing simultaneously. Uncertainty can therefore not be ignored. It is useless to push it aside and try to constitute the world in a black and white framework. It would be an attempt to ignore life itself. The trick is to embrace uncertainty and employ it to you advantage. ---

But to put aside the labels and images asks for a great deal of courage since it means letting go of your certainties. But then again this is the part where the designer welcomes uncertainty.

So a design education is to a certain extend an investigation of the self, aimed to free an individual of images, labels, interpretations and prejudices one holds on to in order to see the richness and find new associations from which creativity and innovation emerge."

"That sounds like a new paradigm, Royce" is what Pieter answered. "What you were saying, means that there is no blue print for design. Design is in the essence letting go of all mental images to encourage the designer to find new associations which result in innovation."
There are several ways to free oneself of the mental images and stereotypes. For example by unlabeling, relabeling, using metaphors and similes one can reposition his or her usual viewpoint of perception to a new center."

"I would like to argue why a change in paradigm is needed. If we really understand and realize the synergy of the design situation, or in other words the embeddedness or connectedness of an object in the context, than it follows that we take this wholeness into account when we design. We even take into account that we cannot capture, measure or control this wholeness.

So if we abandon our paradigm that the world exist of stand alone objects with certain characteristics, we need to embrace the synthesis that exists.

From this it follows logically that when we design we take into account all the perspectives. Than it becomes logical to involve customer concerns, user's needs, discovering the organizational culture etc. Only than perceiving the world in a more holistic or integrative way becomes the standard, instead of dividing the world in classes, labels and concepts."

Appendix E

1. Labeling

The previous chapter showed that labeling plays an important role in perception. What we commonly see of an observed object are the things that are labeled for us, have names and stamped in our minds (McKim, 1972, p. 53). A child will recognize the wings, eyes, and beak of a bird because he knows these labels. The nostrils for example are harder to recognize without labels. Again the knowledge we get from these labels inert the discovery of new perspectives on this supposedly familiar object (McKim, 1972). Re-centering our vision demands also the ability to questions or even abandon these labels.

McKim (1972) argues that language more concrete the names of objects limit us in seeing these objects from different angles. He suggests that “instead of labeling your perceptions according to the usual object categories,” we should “label them according to qualitative categories” (McKim, 1972, p. 53). Labels provide us with a false sense of knowing the object, a feeling that opposes seeing the object from a different perspective. Abandoning labels and re-centering can result in new but seemingly contradicting perspectives. Valuing opposing ideas and perspectives is indispensable to integrative thinking.

1.1 Relabeling (McKim, 1972, p. 53)

Look at the skyline from the rooftop and do not start by labeling buildings, streets, and skyscrapers. Instead categorize according to the qualitative category color and first group all things that are red, then all things that are yellow etc. Next choose a new category for classification: first find all cubical shaped objects, followed by all the round shaped objects, and the triangular shapes. Another category can be all moving objects; objects build by man, or natural objects. Do the same exercise in you living room and notice how the room becomes new; colors get richer, new patterns and textures arise. Your perception of the view changes and becomes richer and more intense. This exercise can be practiced in every sort of context.

A second exercise in relabelling objects is a hands-on exercise. Take some picture magazines and assemble parts cut out of these magazines into new compositions. Every cut-out object from the magazines should have at least two identities in your new composition. “For example, the eye in a taped-together composite face might also be a marshmallow, a wheel, or a flower. In addition to finding pleasure in transforming the functional identity of an object, also enjoy putting the object in an unfamiliar, and even shocking context. Changing the surroundings in which the object is seen can markedly re-center the way it is seen” (McKim, 1972, p. 54).
1.2 Unlabeling
Aside from relabeling, which is an important exercise to re-center your vision, another ability for creative seeing is unlabelling. This means perceiving the environment without putting labels upon the stimuli that enter visual perception. Hereby it is the deliberate attempt to abandon all labels. The following two exercises put unlabelling in the context of social interaction and empathy. At first the exercises might seem strange, but do not judge them prematurely and be open. Aimed at re-centering the way you perceive people, the exercises make you receptive to the other person as a human being instead of an object-of-use.

Nonverbal communication (McKim, 1972, p. 55)
“Center your perception on the way people (including you) express themselves nonverbally. Attend to what is ‘said’ by eyes, eyebrows, hands, posture, and tone of voice-by clothes, personal environment, and symbols of status. Don’t label these nonverbal perceptions with words. Instead, closely attend the feelings that these often unwitting communications evoke in you.”

Beyond labels (McKim, 1972, p. 55)
“Sit opposite another person at a distance comfortable to both of you so that you have an easy view of the other’s face. Without ever talking, simply experience the other’s face. Don’t stare, staring defeats good vision. Visual attention is best sustained by moving the eyes as interest dictates. Again, don’t internalize your experience verbally. Go beyond labels to attend feelings evoked by this human encounter”

McKim (1972) suggests to experience the second exercise for at least thirty minutes to obtain its full impact and value. It might be clear that both exercises not only train the student in unlabelling, it also lead to the practice of empathy and the awareness of one’s subjective emotional life. Both are very important in creative seeing and solving complex problems.

1.3 Creative association
A final exercise that involves both seeing and problem solving, is an exercise conducted in the Executive Master in Information Management⁶. This master program is provided by the Academy for Information Management⁷, a spinoff of the University of Amsterdam. In this program the students are asked to write down a question that bothers them, may it be a personal or work related question. With this question in the back of their mind they will visit an art museum. The exercise is to find a work of art that enlightens or explains something about the personal question of the student. The question gets externalized, and is associated in a much broader context. This enables the student to find new, inspiring insights on the question and provides new directions on how to solve it.

2. Imagination
Imagination is essential to being human. Individuals frequently claim to have no imagination since they think it is the power to be creative. Imagination is much more than that; it expresses itself in everyday life. Without looking you know your surroundings, the proportions and relationships between objects around you. This is the result of imagination. The ability to create bridges between cause and effect is another result of imagination, an ability that is hardly developed in other animals. Another expression of imagination is self-awareness. Everybody has an image of himself as a student, friend and so on.

2.1 Imagining in practice

⁶ http://ienm.nl/activiteiten/opleidingen/emim/
⁷ http://ienm.nl/english/
Clouds of prejudices surround imagination. Simply said, it can be reality-oriented or illusory of which McKim (1972) states that “we correctly distrust the illusory capacity of imagination, but we need not allow this distrust to become prejudice against imagination in general” (p. 89). Imagination is often associated with insanity, day dreaming, and laziness. In a way this does not conform to social norms and social reality. Of course all these statement have some truth in them. But to discard imagination ignores the creative power of it, even though creative imagination can be socially disruptive. Imagination is essential to human operating. Should it therefore not be educated and should students not learn to control this interesting human ability? Because the awareness of one’s imagination provides one with a choice to use it creatively or destructively.

McKim (1972) argues that visual thinkers need to become aware of their imagination and control it productively (p. 92). Imagination in visual thinking is producing mental images, images that occur without sensual stimulus. In our nightly experiences, everybody produces detailed mental images in the form of dreams. But it is harder to use mental images when being awake. It is McKim’s contention, and I share this statement, that everybody can learn to use the mental images to stimulate their imagination. McKim (1972) compares it to physical training: “Failure to pass a physical fitness test is usually evidence of lack of exercise, not lack of muscular inheritance. The same goes for the apparent lack of ability to evoke mental images” (p. 90).

The student should keep in mind that the goal of imagination is not to evoke precise and detailed mental images. Imagination flourishes by abstraction, flexible manipulation and creative synthesis things that can be obstructed by detailed mental images. The student should not expect to see clear and exact images in the minds eye, especially in the beginning of the visual thinking practice. The ability to control imagery is far more important to visual thinking than the clarity of these images (Mckim, 1972).

Imagination has built in blocks that differ in every individual. These blocks are built in defenses against fear and anxiety. Also the social dimension is important, imagination flourishes in a setting that builds confidence; that permits to be foolish and childish. When blocks need to be removed, acknowledge that these blocks existed for a reason. They provided safety against fear, anxiety and other painful experiences. When removed they evoke a release in deep fearful experiences. Guidance in the removal of these built in blocks is important.

According to McKim (1972) blocks are not removed by education, indeed contemporary education inhibits the ability of inner imagery: “First [contemporary education] fails to make student aware of their inner imagery. Second, it affords no little opportunity for them to develop this inner resource” (McKim, 1972, p. 90). The mind’s eye turns blind if not used. I have showed that the current emphasis in IM education is on methods and analysis. There seems little room for the stimulation of visual thinking and complex problem solving. Therefore the first exercises are meant to stimulate and revive the inner imagery since “productive visual thinkers control their inner imagery, manipulate, transform it, and move it along toward a desired goal” (McKim, 1972, p. 105).

2.2 Exercises for imagining
The exercises for imagination are aimed to stimulate and revive the control of an individual’s inner imagery. Moreover it also practices empathy, being able to see from different angles. One of the interesting incidentals of these exercises is that it shows the student subjectivity of imagination. This will become clear when I elaborate further on these specific exercises. I have stressed that clarity is less important than controllability. The first two exercises are to see how clear and how much control you can exercise on your inner imagery. Both exercises are based on McKim (1972), but slightly altered for the context of this thesis.

1. Clarity of mental image (McKim, 1972, p. 92)
First translate the descriptions into a mental image and rate the clarity of you mental image in three categories: clear, vague, and no image at al.

1. a familiar face
2. your bedroom
3. a galloping horse
4. the characteristic walk of a friend
5. a newspaper headline

2. Control of mental image (McKim, 1972, p. 92)
More important is the ability to control your imagery than to evoke precise images. For this exercise rate the ability to control the image in three categories: controlled well, unsure, not able to control.

1. An airplane propeller, rotating clockwise as you face the airplane, and then rotating counter clockwise
2. A grey kitten that turns blue, then green, then purple
3. This thesis flying away, high into the blue sky, finally disappearing
4. An orange being cut into five equal pieces and the pieces being arranged in three different parts.
5. A car crashing head-on into a giant feather pillow

These exercises should always be done with caution, since people might have the feeling they failed. But there is no failure in mental imagery. Often the minds eye has not been stimulated for a long time, comfort people that they will be trained to develop and revive their inner imagery. Both these test can be executed again later in the process of developing visual thinking to see the progress.

3. Drawing
Drawing exhibits several qualities for creative problem solving. It can assist in working towards a solution, and meanwhile provide deeper understanding of the problem. While drawing one often gets a deeper understanding of the issue. I will not elaborate deeply on the notion of drawing. Instead several important exercises that stimulate visual thinking and problem solving are explicated. The first two exercises are concerned with relabelling as extensively explained in a previous section. Both exercises thus require re-centering of the observers viewpoint to creatively find different viewpoints.

3.1 Brick (McKim, 1972, p. 53)
Draw or list several alternative uses for a brick. Of course you can take any other common object. A creative person is able to create a long and diverse list, by recentering his viewpoint on the functionality of a brick.

3.2 Circles
Take three minutes to make something of the 30 circles below. The aim is on quantity and speed, not on quality.
When this exercise is done in a group of people, try to feel if you were restricted by concerns on what other people will conceive of your drawings. An example is shown below in which we see the multitude of possibilities in which the circles can be used.

This exercise also stimulates to view an object (here a collection of circles) from different perspectives. Re-centering is at the essence of this exercise.

3.3 Explain common object
This final exercise in drawing requires a partner. The most important part of this exercise is that you learn to communicate your visual perception to another person. The idea is to take a common object that you are confronted with on a daily basis, for example your shoe or your watch. Your partner should make a drawing of this object guided by your indications. Take your shoe and explain to your partner how the shoe looks like in such a way that he is able to draw your shoe. Notice how you have to explain your perception of the shoe in a clear and unambiguous way that facilitates your partner’s task. Normally you put your shoes on in the morning.
without really looking at them. This exercise will shine a new light on an object that you see every
day. Meanwhile ask feedback of your partner if your indications are clear enough for him to draw the
shoe. Finally let your partner describe a common object to you, and make a drawing of it.