

# Facilitating Knowledge Sharing

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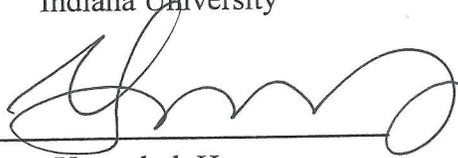
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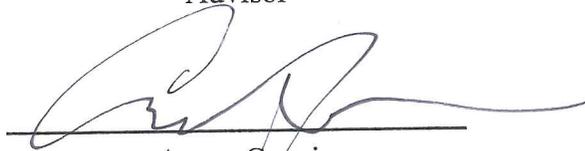
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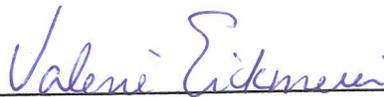


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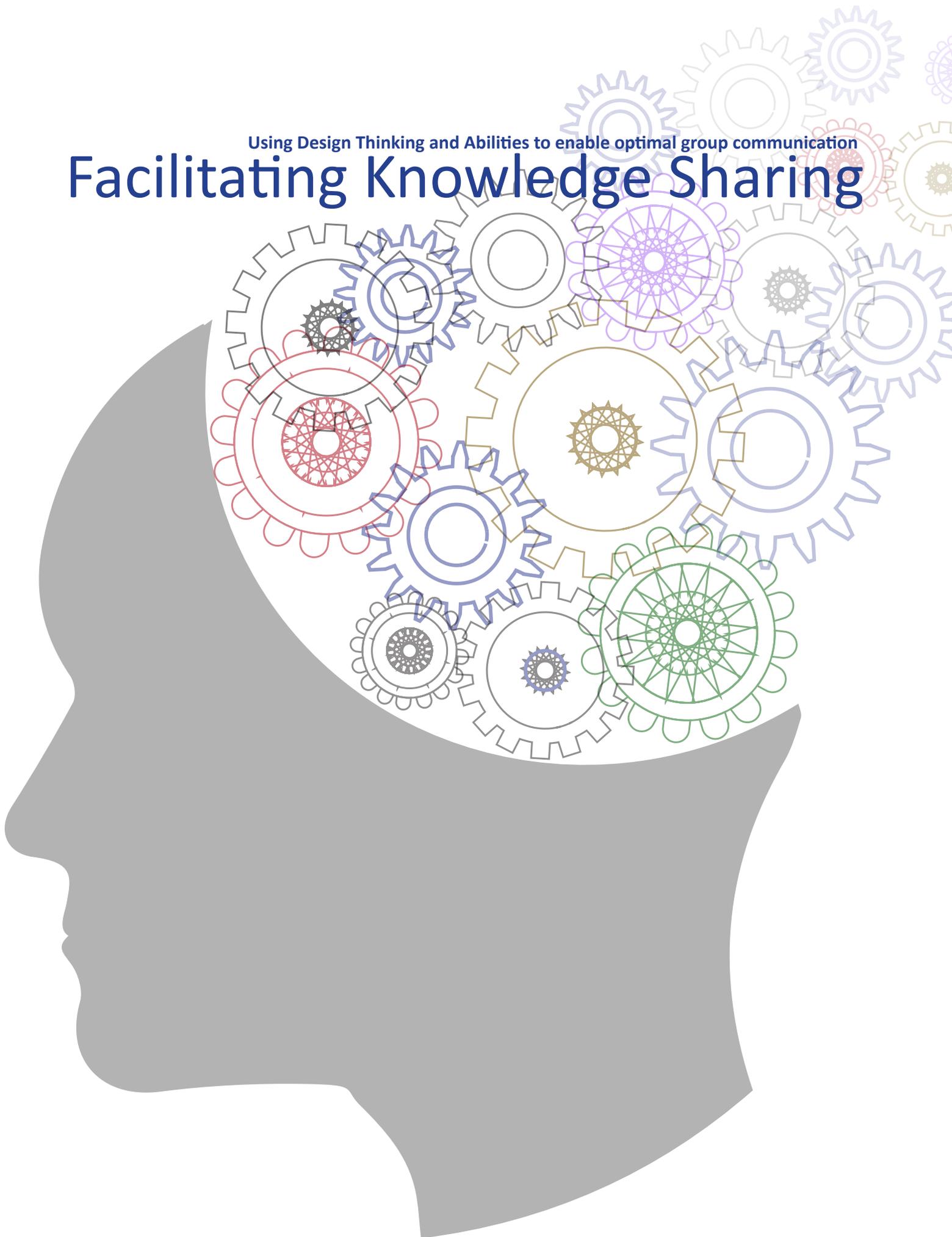
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11/21/2016

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Using Design Thinking and Abilities to enable optimal group communication

# Facilitating Knowledge Sharing



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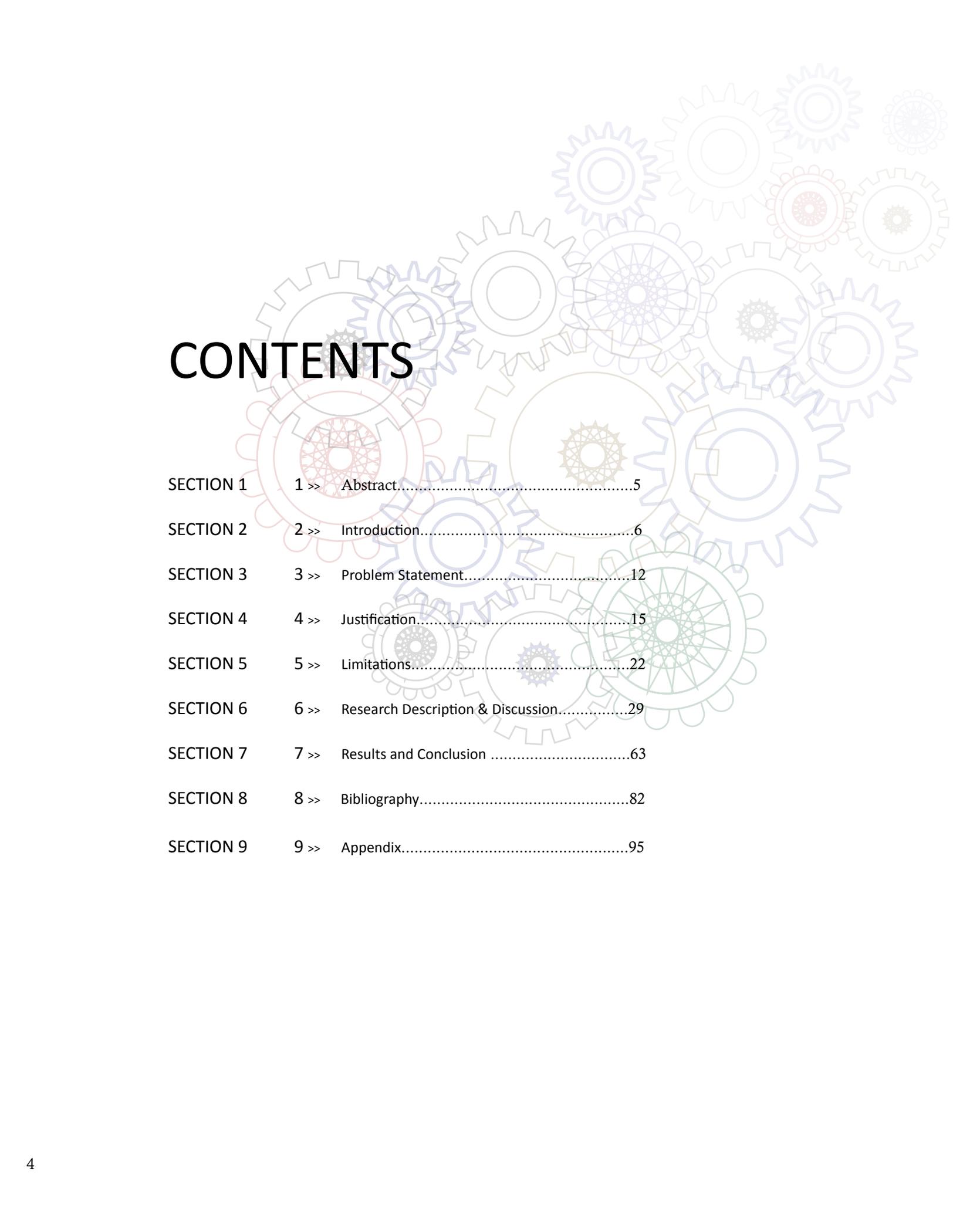
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## ABSTRACT

What is a good choice? Ideally it is a choice made deliberately and consciously based upon a full spectrum of reliable information, sound reasoning and with a firm commitment to action by all interested stakeholders. However, years of studies in group communication and performance, from a wide range of academic disciplines, have shown that groups of people working together often do not realize their potential to perform better than individuals.

One critical aspect of why these deficiencies occur was highlighted by Stasser & Titus in 1985. They demonstrated that meeting participants have a bias toward sharing information that is held in common rather than the unique knowledge that each individual holds. Meeting participants also showed a preference for only sharing information that supported their preexisting preferences. When a group is discussing and sharing data that they already all know, opportunities for innovation, new ideas for products, services or experiences are lost. Group participants are making decisions on incomplete and potentially inaccurate information thus leading to a sub-optimal group performance.

For a designer, how a group performs, especially in the information gathering stage is integral to the success of the final product, whether it be a business or service plan or a product. As Kees Dorst mentions in his book, *Understanding Design*, design is now a “social process” because designers rarely design alone. As the Design profession continues the trend toward user-centered, participatory design, all the way to co-creating and co-design, the role of the designer has expanded to include the role of facilitator. The designer (as facilitator) now has a “need to facilitate conversations across broad groups to grapple with the questions of desirability, possibility and viability. The answers to these questions do not exist in one mind.”<sup>1</sup> The designer as facilitator is “the broker of an extended conversation.”<sup>2</sup>

This research explores the intersection of social and psychological factors related to information sharing and the new role of designer as facilitator. By understanding how individual thought processes can lead to biases such as the shared information bias and preference bias in group meetings, the designer, who brings their own unique skills to the facilitation role, can use this knowledge to help mitigate these dysfunctional tendencies in group interactions. While there have been repeated studies that prove the existence of dysfunctional group performances, there are also numerous studies that show groups, when nudged with the right structure and tools, can outperform individuals. Through combining these three areas of knowledge, this research study proposes a new framework for group meeting structures that future designers as facilitators can use to enhance communication and thus enable good choices.

# INTRODUCTION



## DYSFUNCTIONAL GROUP THINKING

In their 1985 study, Stasser and Titus found that groups did not share all the information available with the group to make the optimal decision.<sup>1</sup> This was a controlled, structured group of undergraduates that were all given the same information (shared) as well as individually unique information (unshared). Their task was to discuss the different alternatives as a group and make the best possible choice. In this initial study and subsequent studies conducted by Stasser and Titus and other researchers, the groups in these experiments repeatedly exhibited a tendency to discuss only the shared information although the participants were aware that each group member did have individually unique information. Not only do the participants refrain from discussing the unshared information, they also have a tendency to share the information that benefits the preference they developed prior to the discussion.

In this first study by Strasser and Titus, the assigned task was to choose the best candidate for the president of a fictional college. There was a finite amount of information and it was clear who the best candidate was once all available information became known. In the typical business world however, determining the best candidate for a position is much more complex, especially for a higher level position. A hiring and vetting process can involve multiple people, in casual and formal settings over several days and sometimes even months. Often, the information that needs to be shared is subjective, there isn't a finite amount, and the answer is not always clear. It is easy to imagine that the stakeholders involved in this decision would arrive at the decision making meeting with a preferred candidate in mind and to focus on verifiable information such as the resume and past verifiable experience and proven results that support their candidate. Making this type of decision can be difficult and complex.

Although much more complex, even in the hiring scenario, the group is focused on data about a limited set of people and the problem is defined and is simply a matter of making a choice between some alternatives. In more undefined tasks such as discussions about immensely complex social issues, information sharing becomes increasingly important in order to build a common understanding so the problem can be defined. This is especially true for multi-disciplinary teams as the

individuals who make up the group typically only have knowledge of the 'problem' from their perspective. However, in addition to the shared information bias and preference bias, there are numerous other factors that can hinder or improve group discussions such as the culture of the company or management style, trust issues among colleagues, perceptions of status, type of task, diversity issues such as race, gender, age and financial and time pressures among others.<sup>2,3,4</sup>

Even when a group appears to be functioning well together, that too can have detrimental affects to their functioning. For example, Irving L. Janis is well know for coining the term "groupthink." He describes groupthink as "the mode of thinking that persons engage in when concurrence-seeking becomes so dominant in a cohesive in-group that it tends to override realistic appraisal of alternative courses of action."<sup>5</sup> Concurrence-seeking is also a factor in shared information bias. One reason people may seek to discuss information already known by others is because they feel validated in their knowledge and feel a sense of cohesion in the group because they are sharing something in common.<sup>6</sup> "Most individuals working in groups do not know how to solve tough problems on their own. They do not know how to build a shared framework of understanding - they seldom even recognize its significance. They dread conflict and discomfort, and they try hard to avoid it. Yet by avoiding the struggle to integrate one another's perspectives, the members of such groups greatly diminish their own potential to be effective."<sup>7</sup>

### **The Lazy Brain**

Even when group members are motivated to share information and are not inhibited by group dynamics, their attempts may be sabotaged by how the human brain functions. To say the human brain is complex is certainly an understatement. A mass that weighs approximately three pounds is in charge of processing all the information around us, making sense of it and then responding to it with extreme rapidity. In cognitive psychology the rapidity is explained by heuristics or what is commonly called "rules of thumb." For example, once a person has learned what a chair is, they don't have to actively think about it. When they see a chair, although it may vary in size, shape or color from the original chair, the brain automatically knows to classify it as a chair. Additionally, the brain knows what the chair is for and how it is used and can differentiate it from other forms of seating such as a bench, stool, armchair or rocker. Heuristics apply to other learned tasks such as driving a car, riding a bike, cooking a familiar recipe or being able to identify people, plants and animals. This systems is the basis for what is believed to be intuitive thinking. The vast majority of the time, this system works amazingly well. Daniel Kahneman, in his book *Thinking Fast and Slow* refers to this way of thinking as System 1. System 1 is the automatic and fast thinker.<sup>8</sup>

When deeper thought is required, the brain engages System 2, the slow thinker. Taking the example of the chair, System 1 can tell it is a wood chair that could be used for a dining table or desk. However, what if the task was to identify the

type of wood or the specific style of chair or identify who the designer might have been? Maybe the type of wood is easier to identify but it would require a lot of thought to try and find the answers to the other questions. The brain has to slow down and actively think about the answer. System 2 engages whenever System 1 can't find an answer right away and it takes effort to engage System 2 and effort to keep it engaged. System 2 is where the new ideas come from, where new patterns of behavior are created and engaging System 2 is where the opportunity lies for mitigating shared information bias and preference bias. What is necessary to understand for this research is how these two Systems interact and influence each other. The challenge for designers as facilitators is to engage System 2 in ways that appear effortless and yet inspires deeper thinking.

### **The Designer as Facilitator**

“The role of the facilitator was designed to help minimize wheel spinning and dysfunctional dynamics and to enable groups to work together much more effectively.”<sup>9</sup> Facilitators are “utilized to facilitate dialogue processes that surface deep assumptions and mental models about how we view our world.”<sup>10</sup> Meeting facilitation has been in existence for decades and there are many proven techniques to help individuals and groups overcome communication barriers whether the facilitator is “teaching, leading or mediating.”<sup>11</sup> To facilitate means to make “it easier, less difficult” according to Dictionary.com. A Facilitator is “an individual who enables groups and organizations to work more effectively; to collaborate and achieve synergy. S/he is a “content-neutral” party who by not taking sides or expressing or advocating a point of view during the meeting, can advocate for fair, open, and inclusive procedures to accomplish the group’s work.”<sup>12</sup> A facilitator uses facilitative skills and these skills can be learned and utilized by anybody to help and guide a group through a meeting.

As the design profession has evolved over the years, so too has the role of the designer. As mentioned in the abstract, one way of understanding design is to consider it as a social process. “It has become almost impossible for a single designer to possess all the necessary knowledge and skills to develop a complicated design.”<sup>13</sup> “Designers need to interact with groups of people that have different ways of looking at the design problem and the design solution. These people do not only bring their knowledge to the design project, they also bring their own viewpoints, expectations and ambitions. Because they represent different aspects of the design, and come from completely different knowledge fields, these groups often have trouble understanding each other.”<sup>14</sup> Designers need to use facilitation and process skills to overcome those communication barriers.

In addition to the use of facilitation skills, this research study argues that designers bring a distinctive skill set to facilitation and are uniquely suited to this new role. Designers “hold highly developed skills that are relevant at larger levels of scope and complexity. By selection and training, most designers are good at visual

thinking, conducting creative processes, finding missing information, and being able to make necessary decisions in the absence of complete information.”<sup>15</sup> Designers are naturally system 2 thinkers. “All designers intend to intervene into the expected course of events by premeditated action. All of them want to avoid mistakes through ignorance and spontaneity. They want to think before they act. Instead of immediately and directly manipulating their surroundings by trail and error until these assume the desired shape, designers want to think a course of action thoroughly before they commit themselves to its execution.”<sup>16</sup> Utilizing design thinking and their experience as researchers developing different methods of inquiry for generative thinking, designers have the potential to mitigate the many obstacles inherent in group discussions.

This research explores the complex human interactions in group meetings from the vantage point of social and psychological factors that affect information sharing. By understanding how individual thought processes can lead to biases such as the shared information bias and preference bias in group meetings, the designer, who brings their own unique skills to the new role of facilitator, can use this knowledge to help mitigate these dysfunctional tendencies in group interactions. Through combining these areas of knowledge, this research study proposes a new framework for group meeting structures that future designers as facilitators can use to enhance communication.





# PROBLEM STATEMENT

How might designers, as facilitators, mitigate shared information bias among participants during the fact-finding phase?

**SUB-QUESTIONS:**

1. What are the factors that cause shared information bias among participants?
2. What distinctive skills and expertise do designers as facilitators possess ?
3. In what ways are designers, as facilitators, appropriate for mitigating shared information bias





# JUSTIFICATION

## NEED FOR UNDERSTANDING GROUP COMPLEXITY

Groups, by their very nature of having multiple people, are complicated. Every individual in a group brings their own experiences, beliefs, knowledge and perspective to the interactions that happen within the group. This is important to consider when groups are tasked with making decisions to solve a problem. There is an old adage that “two heads are better than one” that speaks of the belief that utilizing the knowledge and expertise of multiple people will yield better results than individuals working alone. However, as many studies have detailed over the years, this is not necessarily true and small groups can actually inhibit creative decision-making or perform worse than an individual would.

In “The Wisdom of Crowds, James Surowiecki based his book on the premise that “under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them. Groups do not need to be dominated by the exceptionally intelligent people in order to be smart...when our imperfect judgments are aggregated in the right way, our collective intelligence is often excellent.”<sup>1</sup>

However, he makes an important distinction that the nature of the relationship between people in a small group is qualitatively different than those members in a large group. “A small group - even those formed for the sake of a single project or experiment - has an identity of its own. And the influence of the people in the group on each other’s judgment is inescapable.”<sup>2</sup> That is because feedback from group members is more direct and immediate.

Small groups are important to understand because “It is clear that as the accumulation and fractionalization of knowledge increases, creative solutions to complex problems will increasingly involve group processes.”<sup>3</sup> Small groups are inescapable in modern life yet they have been and continue to be extremely difficult and complex to understand. Those “right circumstances” where “collective intelligence is often excellent” when aggregated in the right way continues to elude most meetings.

### **Dysfunctional Information Sharing**

The type of study introduced by Stasser and Titus in 1985 is called the hidden profile paradigm. The hidden profile paradigm is an experiment where a group of volunteers are given a certain quantity of information that is the same for everybody. In addition each person is given their own unique information. These hidden profile paradigms describe a biased pattern that suggests group members often fail to effectively pool their information because discussion tends to be dominated by (a) information that members hold in common before discussion and (b) a bias for information that supports members existent preferences.<sup>4</sup> While the potential is there to benefit from pooling information and individual perspectives, these biases prevent the benefits from being realized. That can have serious repercussions considering the importance of some of the decisions that these groups could make.

Sharing only common information “favors a suboptimal decision alternative, whereas all the unique information combined reveals the optimal alternative and thus the optimal decision choice is hidden to the group as a whole and can be discovered only when all individual share their unique information and the group applies the information to the decision under consideration.” Since the original study by Stasser and Titus, dozens of other studies have reproduced their findings and have sought explanations and solutions to the problem.”<sup>5</sup>

### **Nominal vs. Interacting Methods**

One particular way that has been found to mitigate bias and more fully share information in small groups was to use methods where participants did not talk during the “fact-finding, idea generation, or initial subjective probability estimation in the first phase” of a group working together.<sup>6</sup> In their review of literature on studies that compared silent (nominal) vs. interacting (spontaneous) group processes, the studies repeatedly showed that not talking was the best way to get the most information and the most ideas. Some scenarios for nominal group processes might be people working individually by writing things down ideas and information is shared in a round robin format or everybody votes anonymously and discussion occurs after the votes have been tallied.

Kahneman says “the principal of independent judgments has immediate applications for the conduct of meetings, an activity in which executives in organizations spend a great deal of their working days.”<sup>7</sup> “The proper way to elicit information from a group is not by starting with a public discussion but by confidentially collecting each person’s judgment. This procedure makes better use of the knowledge available to members of the group than the common practice of open discussion.”<sup>8</sup>

Anonymously (or not) sharing an opinion or information can negate some social factors that affect group communication but sharing only in this way is very limiting and in today's collaborative, cross functional team environment, conducting information sharing in this manner is simply not practical. Additionally, when members of a group already have a preference in mind, the individuals "tend to be advocates for their preferences and use information in a way that builds support for their position."<sup>9</sup> Also, "individuals evaluate information as more credible when it is consistent with their personal opinions."<sup>10</sup> In those studies where unique information eventually emerges, it had "little effect on the group decision."<sup>11</sup> In fact, members often "simply aggregate their individual opinions to produce group decisions."<sup>12</sup> In other words, even having all the information available does not ensure an optimal group performance or decision. Cognitive bias is difficult to avoid.

### **Social and contextual influence**

The findings of Stasser and Titus have been replicated and proven over 65 times since 1985. The limitations of these studies are that they are carefully controlled experiments where the researcher controls all the variables. They decide what the information should be, how much of it, how the information gets distributed and ultimately, which decision is the most optimal. However, "decision making in human factors cannot be examined in a vacuum. It must be seen in context: Contextual variables impact people's judgment and decision processes, and the decisions, in turn, impact the context."<sup>13</sup>

The context is that in the real world, group decision making is "complex (as the task itself often is), with ambiguous cues, many sources of information, and unclear shifting or conflicting goals. Time constraints are often present as are distractions, noise or hazards."<sup>14</sup> Even when working individually, just being in a room with other people has a profound effect on group behavior. "We may think we are running the show, but most of the time it's the other way around. The situations we are in, and particularly the people around us, hold sway over our thoughts and behaviors far more than we like to imagine."<sup>15</sup> As Herbert J. Simon once wrote, "A man does not live for months or years in a particular position in an organization, exposed to some streams of communication, shielded from others, without the most profound effects upon what he knows, believes, attends to, hopes wishes, emphasizes, fears and proposes."<sup>16</sup>

Before a group even walks into a meeting, there is a large host of other influences that have an influence on an individual's disposition regarding information sharing. For example, does the organization the individual work for encourage collaboration and teamwork? What has the supervisor instructed the attending member to do? What kind of day has the individual had before the meeting that might influence their attitude and mental presence at the meeting? Once in the meeting, do any of the people know each other? Is there an obvious social

hierarchy among the group? What is the gender makeup of the group? These are just a few of the factors that affect group performance and some answers are obvious but most are unknown and yet they still need to be addressed in some way.

### **(Ir)rational or Non-coherent Behaviors by Individuals**

“The study of cognitive psychology is the study of computational capabilities in the face of diverse tasks.”<sup>17</sup> Individuals are being asked to compute incoming information, analyze and then produce some sort of output, often in short amounts of time. However, there are limits on the human brains capacity to deal with the complexity that exists in the world and in the subjects that are addressed in group settings. Said Simon, “Because of limits on their computing speeds and power, intelligent systems (including humans) must use approximate methods to handle most tasks. Their rationality is bounded.”<sup>18</sup>

Another way to look at cognitively biased behavior mentioned above is to think about them as irrational behaviors. Behaving in a rational manner in these meetings would mean focusing on the task, sharing all relevant information in order to arrive at the most optimal decision. The group would share and consider all the information because that is what makes most sense but, as proven in these multiple studies, people do not behave in this rational manner.

Sometimes the cause is social but often it is a function of the ‘bounded rationality’ and the coping mechanisms (referred to earlier as System 1 and ‘methods’ by Simon) of the brain that causes such behavior. Most people are not aware they are being irrational and believe that the opposite is true. “A recurrent finding is that people use various heuristics (shortcuts) to speed up the decision-making process. Accordingly, human judgment is declared to be, at best, an approximate process and at worst, irrational and subject to systematic biases.” “The key issue is not whether heuristics may result in accurate decisions; rather it is the notion that they exemplify the flawed nature of the human judgment process.”<sup>19</sup>

A famous test conducted by Christopher Chabris and Daniel Simons in 1999 showcases the computational limits of the human brain. They created a video with two teams (consisting of students), one team wearing white shirts, the other black shirts, moving around and passing a basketball. Volunteers were asked to watch the video and to “silently count the number of passes by the players wearing white while ignoring any passes by the players wearing black.”<sup>20</sup> The video lasted about a minute and after it was over, the volunteers were asked a series of questions. Other than the actual number of passes, the biggest question was “Did you notice the gorilla?”<sup>21</sup> Halfway through the video, another student, wearing a full size gorilla costume had walked into the middle of the ‘basketball’ players, stood there, looked at the camera, thumped her chest and walked out. The ‘gorilla’ was on scene for about nine seconds.

“Amazingly, roughly half of the subjects in our study did not notice the gorilla!”<sup>22</sup> This study has been repeated and modified many times but the findings are consistent in that about half of the people viewing the video do not see the ‘gorilla.’ For Chabris and Simons, they were more surprised that ‘people were shocked’ they missed the gorilla which was easily seen by everybody when they watched the video without having to count passes. Some subjects “accused us of switching the tape while they weren’t looking.”<sup>23</sup> While Chabris and Simons were studying the “illusion of attention: people experience far less of our visual world than they think they do,” it goes back to the System 2 mentioned earlier. In order to keep track of the number of passes, System 2 has to be engaged and it takes a lot of effort to keep it engaged. Half of the people did not have the capacity to notice anything else but the passing ball as that task took all of their cognitive effort.

In a group meeting it is difficult to focus on assimilating everything when there is so much happening beyond just the sharing of information. Anybody who has attended meetings has experienced the side conversations, people arriving late or leaving to answer a phone call, technology issues hampering the process, etc.. Should an individual even be aware that they are behaving irrationally, their ‘computational limits’ make it extremely hard for them to behave otherwise.

### **Designers as Facilitators**

One way to circumvent poor group performance is to use a facilitator. The concept of facilitation is ancient but task-oriented group facilitation has really only emerged in the last 30 years. In the literature review, multiple roles for facilitators have been identified with the most prevalent being to help groups become more effective.<sup>24</sup> Facilitators are also process leaders, not content experts, and they focus on managing the group until they arrive at the desired end. They do this by ensuring full participation, mutual understanding and fostering inclusive solutions.<sup>25</sup>

Facilitators are a great way to have productive meetings. However, ensuring participation and mutual understanding does not mean that all relevant data has been shared among participants. Inclusive solutions mean that everyone feels included at the arrived solution but it doesn’t mean the solution is the most optimal if it has been arrived at with incomplete information. Overcoming the information sharing bias is about arriving at the best solution and this is where designers as facilitators could fill that role. While designers as facilitators are also process experts, they bring a distinctive way of thinking and their experience as ‘designers’ to engage and help participants arrive at that optimal solution.

To “design is one of the basic characteristics of what it is to be human, and an essential determinant of the quality of human life.”<sup>26</sup> In the evolution of the design profession where ‘design’ is more participatory or designers are co-creating and co-designing with stakeholders, designers as facilitators are not just facilitating a conversation; they are essentially providing the necessary tools, process and

guidelines for participants to design with intent and to think like a designer. “Designers can foster creativity, community, security, effectiveness, understanding, and affection.”<sup>27</sup>

Facilitation is not easy. “Participants unpredictability is one reason why facilitation is needed in the first place. If everyone behaved the same way, getting to the right solution for any given problem would be so easy there would be no need to facilitate anything.”<sup>28</sup> Being a designer does not automatically mean that they are naturally good at facilitation. Designers, too, need to learn facilitation skills but by integrating those skills with, as Nigel Cross puts it, “designerly ways of knowing,” it is possible to mitigate biases and help groups arrive at optimal decisions.

With designers increasingly working in groups with experts and non-experts in multiple fields and also moving into a more ‘business’ type of role, it is a natural evolution to think about how designers can impact the discussion and not just the end result. Everything a designer ‘designs’ affects the way humans interact with the world and each other. Design does not exist in a vacuum and bad design can have serious repercussions but it also has the ability to improve many situations. Therefore the evolution should continue for designers to understand and integrate the research that exists on how the mind functions and how people interact with each other in group settings. It would be valuable for designers to understand the best way to bring design thinking and design skills into group information sharing processes.

# LIMITATIONS



## CREATING BOUNDARIES TO APPROPRIATELY SCALE THESIS RESEARCH PROJECT

There are many reasons people gather together for a meeting and part of the difficulty of this research project is that in almost all scenarios, some sort of discussion needs to occur where the participants share information and ideas in order to reach a decision. That difficulty alone can broaden the scope of this research to an unmanageable level given the time and resource limits of this thesis project. Therefore it is absolutely necessary to establish some boundaries that better define the area of focus.

### **Meeting Definition**

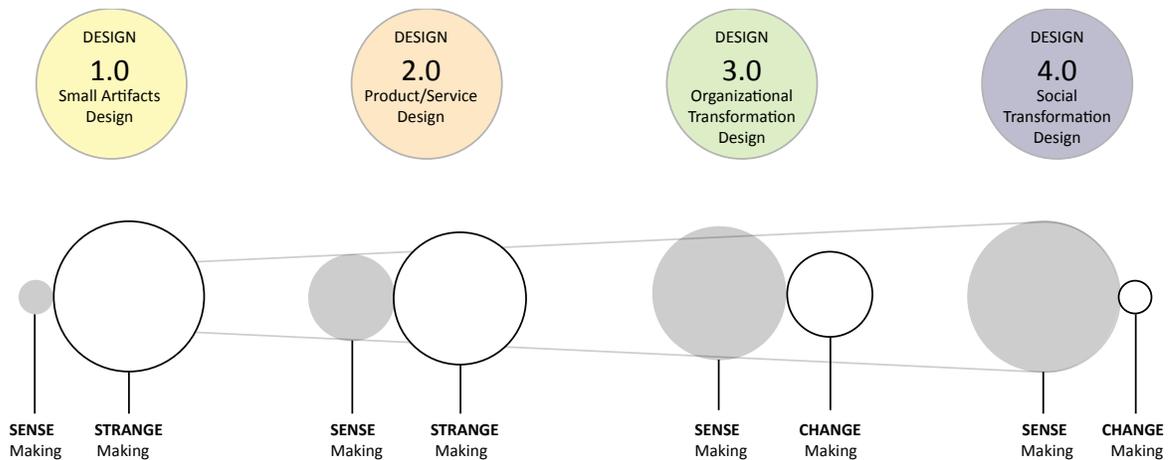
There are many aspects to a meeting beyond just the gathering of people. They exist in a physical world, bounded by time, resources and the availability of people. To begin, it is important to define what is meant by meeting. Min Basadur defines them as "...nothing more than tools for solving problems. Sharing information, figuring out how to implement new initiatives passed down from the top, handling gripes, creating new product and marketing ideas, finding ways to improve procedures, products and services, planning strategy, choosing from among options: each of these situations calls for problem solving that might take place in meetings."<sup>1</sup> While all true, a more general definition better suits this project: "Meetings (are) where people gather together for the purpose of "sharing data, information, knowledge and wisdom to garner their collective intelligence and bring it to bear to solve a problem or achieve a goal together."<sup>2</sup> Therefore meetings where people are celebrating milestones or simply giving updates or routinely scheduled meetings that confirm decisions and do not need discussion do not apply to this project.

Of those meetings that do apply, not all would need the presence of a designer. The simplest way to define when a designer as facilitator is called for is to use GK Van Patter and NextD's scale of design complexity. For this thesis, the complexity of problems and the types of issues that designers would be involved in would fall in the range of D.2 to D.4 models. In the D.2 model, the problems and opportunities are less clear but still focused on product and service design. In the D.3 model, designers are helping clients on an organizational level, helping

them determine new innovations and strategic plans. Problems are becoming increasingly fuzzy. In D.4, problems are extremely fuzzy as designers are tackling large scale social transformation issues.<sup>3</sup>

Fig. 3.1

NextD, GK VanPatter  
Scale of Design Complexity



### Components of a Meeting

With that definition of a meeting as a basis for the gathering, it is necessary to delve deeper into the meeting itself. Other parameters of a meeting include the physical properties of a meeting. A meeting can occur anywhere including outside locations such as parks or gazebos or outdoor patios should the office building have one. Other locations can include cafeterias, churches or libraries and retail locations that have become a de facto offices such as Starbucks or bookstores. The most common, of course, is a conference room or an office in a professional building where people are typically gathered around a table or desk. Location does matter because it can heavily influence behavior in the form of distractions such as traffic noise, interruptions, ringing telephones, bright sunshine, or even flying insects. However, other than acknowledging that these factors exist, this research project does not delve into whether the meeting location affects information sharing.

That also includes the physical properties of a meeting location that can affect the individuals directly such as temperature. When people are cold, they are shown to be less trusting and more selfish whereas when they are warm or given something warm to hold before discussion, they show a tendency to be more generous and trusting.<sup>4</sup> Other physical properties that can affect the ability to share information such as room configuration, furniture type, quantity of space allotted per person or how bright or dim the location is, are not within the scope of this project.

A significant factor in today's world is the use of technology to share information. Conference calls, video conferencing, Google documents, document repositories, work flow aids, project team pages, intranet, and websites and various combinations of those are used to hold meetings and access and share information. Numerous studies do exist that researches how technology affects information sharing. While technology is becoming increasingly prevalent, face-to-face encounters are still important. It is why salespeople travel to meet in person to solicit a client, it is why CEO's travel to different locations if business offices are spread out and why it is more significant when a high level government official travels to a foreign country versus talking on the telephone. Therefore, for this thesis topic, the scope is limited to meeting participants who are gathered together within a bounded physical space where they can see, hear and interact with each other.

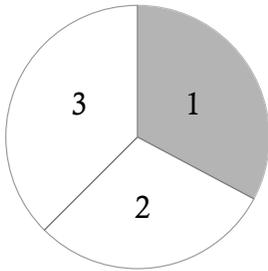
Lastly, there are the people in the meeting and the organizations they belong to. There are the project teams, the boards of directors, the group of volunteers, the executive staff of a company, sales presentations, cross-functional teams, the investigation team, social committees. In every one of these situations and many others, each person brings their individual knowledge, experiences, beliefs, prejudices and biases. They also represent the culture, beliefs and attitude of the organization they belong to unless they are an independent consultant. Examples of organizational influence can include the members belong to companies that feel proprietary about their expertise or if management discourages employees from asking questions or providing feedback or vice versa. The academic community is well known for the publishing and peer review of new studies or discoveries while a retail franchise keeps their business models and exact methods of conducting their business a secret. Because the focus of this research is on how the human mind, through the use of heuristics, has biases that affect how information is shared in a group context, who the people are that comprise the group and where they come from, while relevant, is not within the scope of this project. As with the physical properties of a meeting, acknowledging that these factors exist is important but they are not the focus of this study.

### **Designer Experience and Skill Level**

It could be assumed but it is better to articulate that in the use of the term designer, and their skills and abilities, the research is referring to experienced designers who have field experience in addition to an academic education. Most of the various books that delve into what designers know, think or how they work make a clear distinction between design students and experts and even between first year students and fourth year students. Experience and expertise matters. To clarify even further, for a designer to qualify as being good, "he has been able to develop knowledge that extends beyond the domain of a specific design sector and into the process of design."<sup>5</sup>

Fig. 3.2

Three phase process adapted from Basadur's Simplex Process



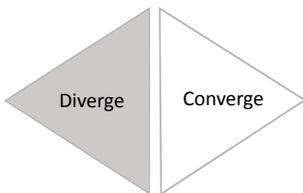
### Research Context: Fact Finding Phase

There are many different types of design processes as Hugh Dubberly showed in his publication *How do you design: A compendium of models*. The processes used often depended on the type of problem being solved. There is Basadur's Simplex model which has three phases and eight steps while others have five (CASPI) or three broad steps with sub-steps such as Creative Problem Solving Process (CPS), developed by Alex Osborn and Dr. Sidney J Parnes in 1954. Although the models vary in steps and complexity, the beginning is usually called the 'fact-finding,' 'problem,' or 'input' phase or as Min Basadur or Elizabeth Sanders calls it, the "fuzzy" front end or problem space. Although information sharing occurs all throughout a meeting, the discussion that occurs during this early stage is the focus of this research.

In the journey that meeting participants take from an undesired state to a desired state, sharing all relevant information during this beginning phase of the process is crucial. The information gathered here forms the basis for subsequent decisions throughout the rest of the decision making process. Inadequate, false, or missing information can only lead to inaccurately defining the problem which can lead to a misinformed decision. Problem solving processes can be iterative. However, in today's rapidly paced business environment, there isn't usually time or money for repetition. Parts of the findings from this project, especially the role of designer as facilitator, could have relevance to the other phases of a decision making process. Research does show that different types of interactions are needed during latter phases of the process.<sup>6,7</sup> Further research could be conducted to explore those dimensions but are out of scope for this project.

Fig. 3.3

Two-Sided Thinking Process



Another tool often used in design processes is the concept of the double diamond to represent divergent and convergent thinking. Both sides of the diamond are used in every step of most design models. Divergent means to be open, to generate and add to the pool of information or ideas. During this part, rules are often imposed in order to create an environment conducive to generating a welcoming environment for participation. These rules work to a varying degree of success which is not relevant here in the limitations section. For this thesis, because it is concerned with fact-finding and information sharing, all research will be focused on the divergent part of the double diamond. Converge is for finding ways to make sense and evaluate the information that was shared; distilling the information through analysis to a narrower focus.

## **Research Approach**

This thesis research is limited to a theoretical approach integrating knowledge from many different fields of study regarding information sharing and the cognitive psychology theory of heuristics and biases. The intent is to create a theoretical framework for mitigating certain cognitive biases and social influences within a group. As mentioned previously, the initial study by Strasser and Titus and subsequent studies are typically conducted using volunteers or assigned students in an academic setting with a quantifiable set of data to share. Their hypothesis was that bias was probable due to the quantity of information and how it was distributed among the group. Other studies that try to factor in typical office settings, cite organizational and social pressures such as those that come from supervisors, organizational culture, or personal agendas and goals. Cognitive psychology theories for biases says they are a natural result of heuristics but that there are ways around them. The only consensus among these theories is that they are all valid contributions to why these biases exist. The time necessary to analyze and synthesize the data to create the framework did not leave sufficient time to test and evaluate the framework in the real world.





# RESEARCH DESCRIPTION & DISCUSSION

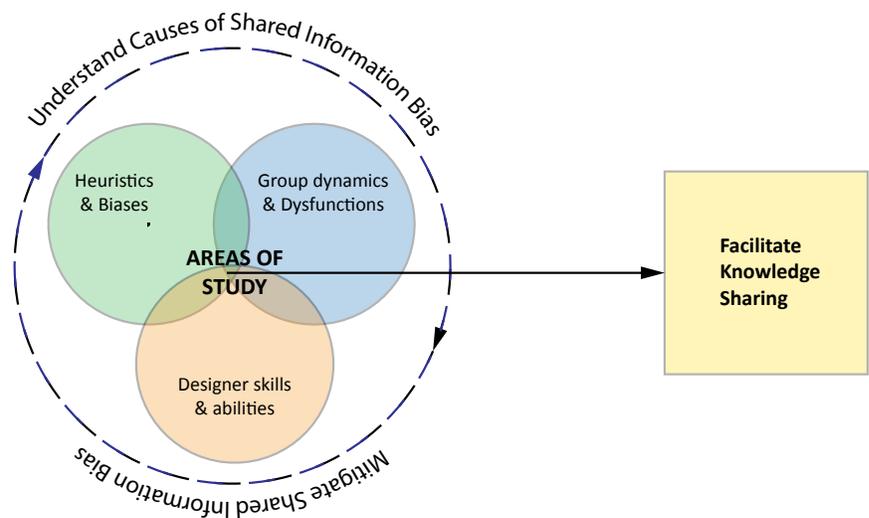
## RESEARCH OVERVIEW

Group communication encompasses a broad array of academic fields. This particular study looks at the topic from the perspective of cognitive psychology and how the cognitive functioning of the individual affect that communication and what designers as facilitators can do to influence that communication. To answer the problem statement and subquestions, it was necessary to delve into three main areas of study: 1) Cognitive psychology and the theory of heuristics and biases, 2) Social dynamics and communication in decision making groups and 3) Designer skills and abilities in the context facilitating.

The design process, like any process, is about how the final destination or outcome is reached. The process allows the research to move from an ambiguous state to a more concrete one in a somewhat orderly fashion. It provides boundaries that moves the research forward yet is flexible enough that iterations are allowed until the final conclusion is reached.

Fig. 4.1

Research Framework

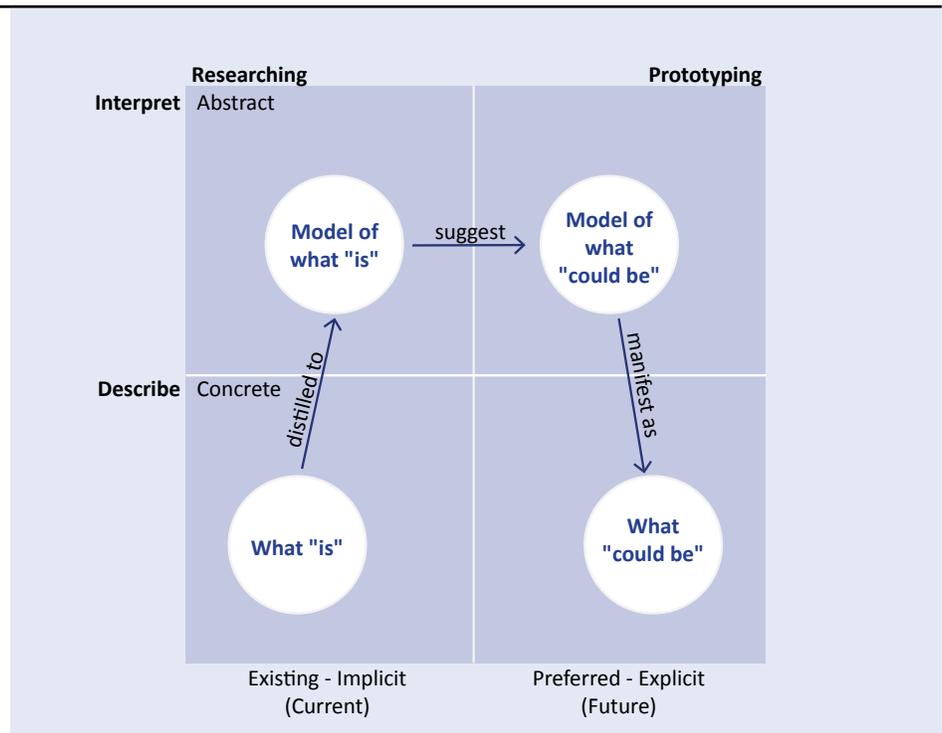


## RESEARCH PROCESS

For this research, an Analysis-Synthesis Bridge Model was used. Created by Dubberly, Evenson and Robinson, it is a four step design process divided into two phases: Analysis and Synthesis. (See figure...). 'It begins with 1. Directly observing a current situation, 2. Reflecting on observations of the current situation to create a model representing essential elements, 3. Reflecting on the model of the current situation to create a second model representing essential elements of an improved situation, and 4. Instantiating the second model in a physical form or prototype.'<sup>1</sup>This research will stop in the space between steps three and four. Due to the theoretical nature of this research study, a simpler process was the most appropriate, especially one that emphasized 'modeling' as a means to move from analysis to synthesis.

Fig. 4.2

Dubberly, Evenson & Robinson  
Analysis-Synthesis Bridge Model



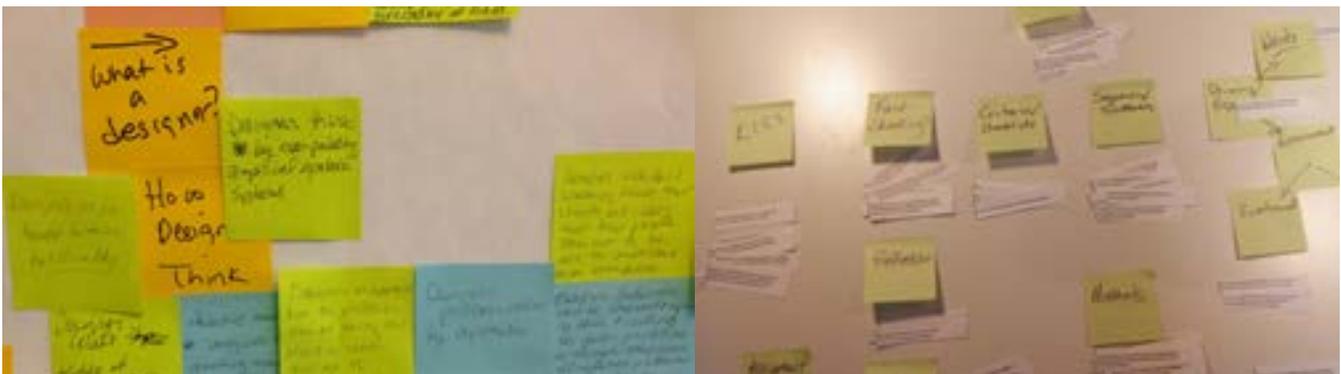
**Step 1:**

Directly observing a current situation in this context meant seeking an understanding of what current research or literature had to say about the three different areas of study. Initially, a large range of topics were investigated in the problem space. This initial literature search helped to frame the problem that narrowed the scope to a manageable level. Then a more specific literature search was conducted to delve deeply into relevant topics. Rather than tackle one subject area of time, it was necessary to run parallel research on all three topics. Collecting a wide diversity of literature created a better understanding of the problem from multiple perspectives and concurrently helped to see connections between the different areas from the very beginning.



**Step 2:**

After establishing the concrete, the process moves forward into the upper left quadrant for analysis. In this quadrant, the data from the first quadrant is externalized to make it easier to analyze and understand the existing situation. Externalizing involved writing down individual data points on post-it notes to make it easier use methods for analysis. These methods help to sort, prioritize, understand relationships, categorize, and find causal effects so the researcher can take the data to an abstract level to create the model for “what is.”



**Step 3:**

This researcher finds that analysis is never completely finished before moving into synthesis, the upper right column of the Bridge Model. Analysis for this project was very iterative and as parallel analysis was being conducted, at different rates of speed, it was a natural step to start thinking about modeling 'what could be' between subject areas. This is due to the nature of abstraction and modeling; especially when working with a theoretical context. In this zone between analysis and synthesis, it is important for the researcher to not skip ahead in the process too soon as crucial ideas can be missed. Especially given the topic of research, the researcher was cognizant of their own biases and how they might affect the final outcome. Key to mitigating the design researchers own biases was to take the time to reflect and to document the process. Reflection is accomplished much more easily when there are concrete artifacts to review such as diagrams, pictures, and each iterations of models. This documentation also helps to see the progress and enables the researcher to pinpoint where key findings occurred and or where a misdirection could have occurred.

**Step 3/4:**

The last quadrant, the bottom right is about taking the models from synthesis and creating something concrete. Concrete, in this case, doesn't mean a physical artifact that is used in some way. Concrete means something usable. A model is a representation of something, in this case, a representation of how Designers could mitigate shared information bias in the fact finding stage. "But design requires that the work return to the concrete, that we make things real, realize our models

as prototypes or even finished form.”<sup>2</sup> That means the conceptual model must be turned into a conceptual framework that will inform future actions for designers as facilitators. Just as in the synthesis phase where the models progressed through several iterations, prototyping a conceptual framework means developing one and then testing it out using design methods to evaluate. However, as mentioned in the Limitations, time constraints did not allow for this testing.

Fig. 4.3

Early model for synthesis

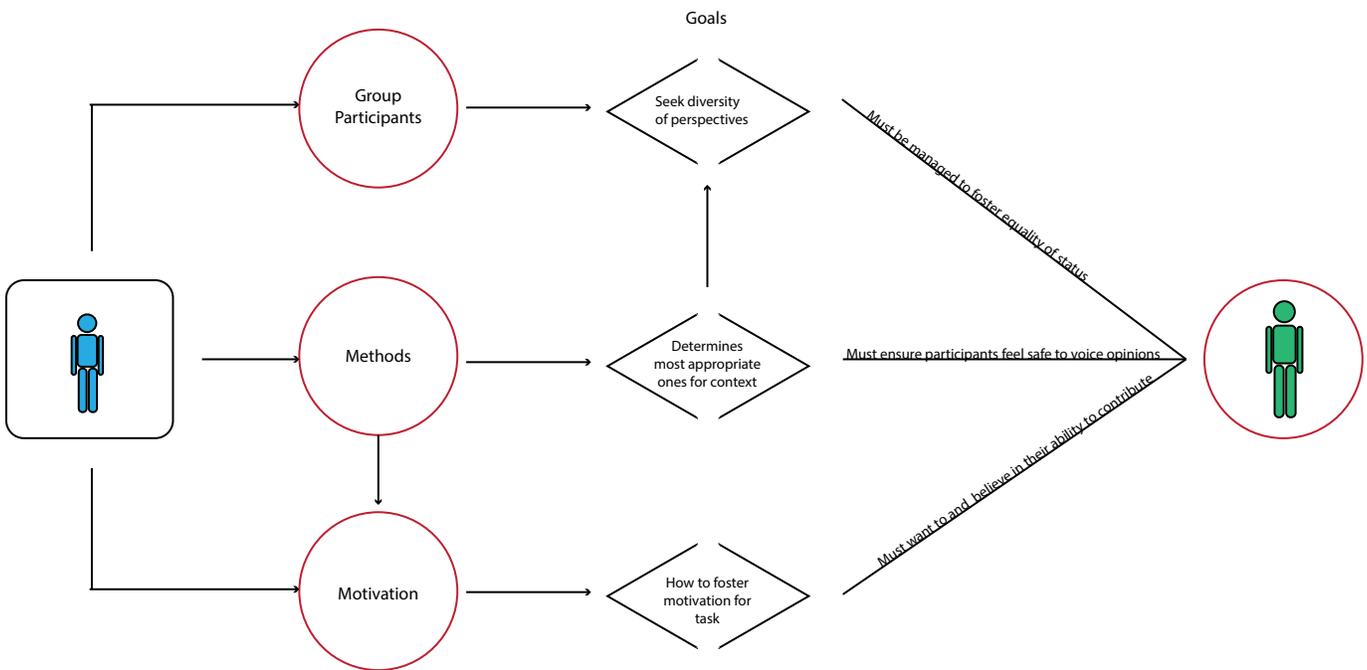
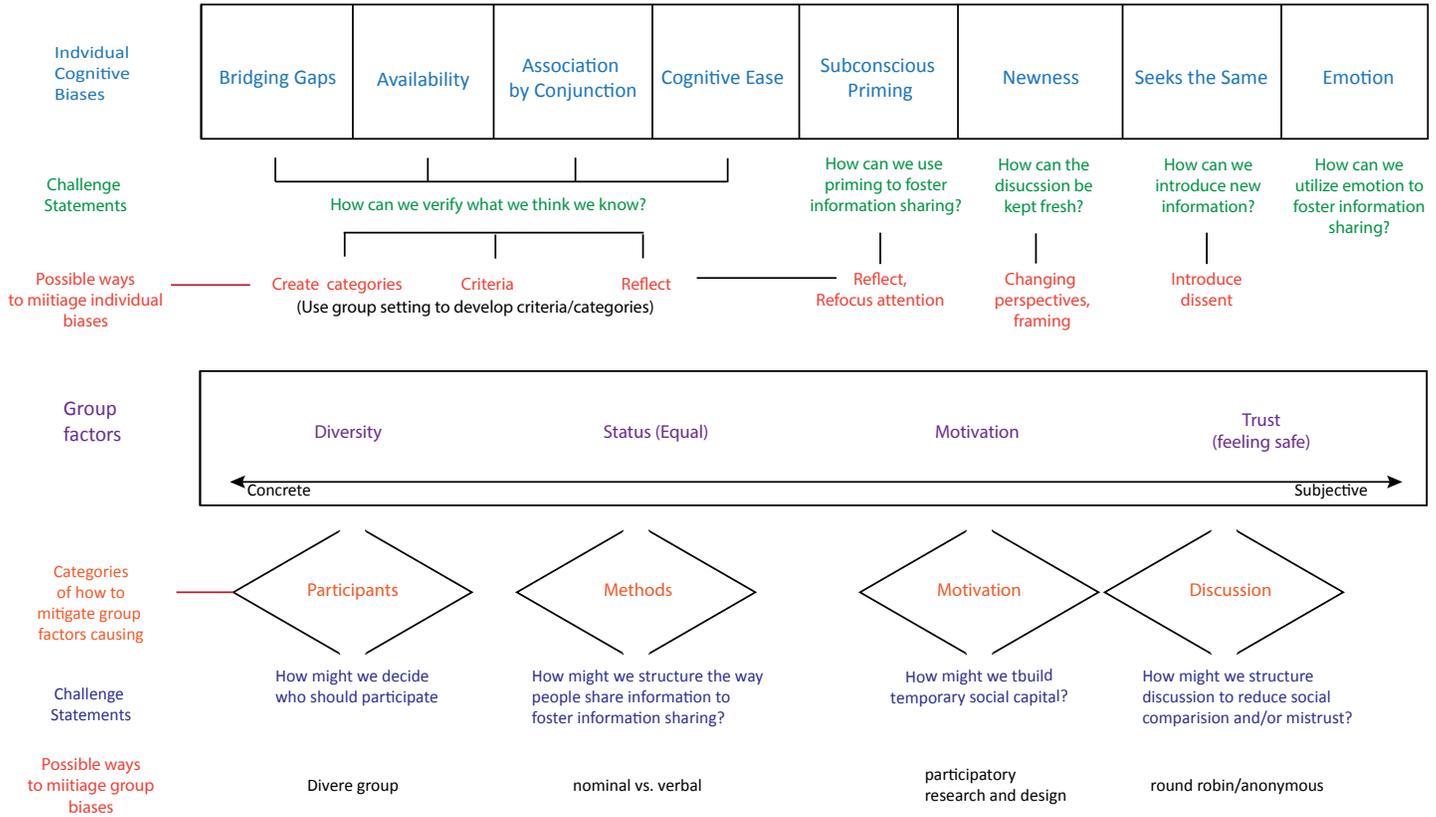


Fig. 4.4

Early framework for synthesis



The Analysis-Synthesis Bridge Model is simple to understand while the actual work involved in progressing through the steps of the process is not. Design processes are iterative, where there are no clean boundaries between each step and sometimes it is necessary to go back before further forward progress can be made. Although the three areas of study were conducted concurrently, the research will be presented sequentially with the first two areas under Sub-Question 1 and the third area under Sub-Questions 2 and 3.

“Groups work well under certain circumstances, and less well under others. Groups generally need rules to maintain order and coherence, and when they’re missing or malfunctioning, the result is trouble.”

James Surowiecki, Author  
*The Wisdom of Crowds*

## RESEARCH DISCUSSION

### SUB-QUESTION ONE

#### **What are the factors that cause shared information bias among participants?**

There are many external, social influences on how much and what information is shared in a group setting. These influences are important to understand and acknowledge. This researcher though, sought to understand if there were any cognitive factors influencing this particular bias in addition to preference bias. Although a specific heuristic was not found to cause these biases, an analysis and synthesis of how the brain functions in judgment and decision making brought the understanding that the information being shared may not be as reliable as desired. As discussed earlier, the brain functions mostly automatically (using heuristics) but has the capability to slow down and think more deeply when an answer is not immediately forthcoming. This process though is prone to being unconsciously influenced as the human mind is cognitively lazy. From a cognitive perspective, the shared information bias and preference bias is not so much about the act of sharing information but more about the information itself. It brings into question what people actually know, versus what they think they know.

#### **External Influences**

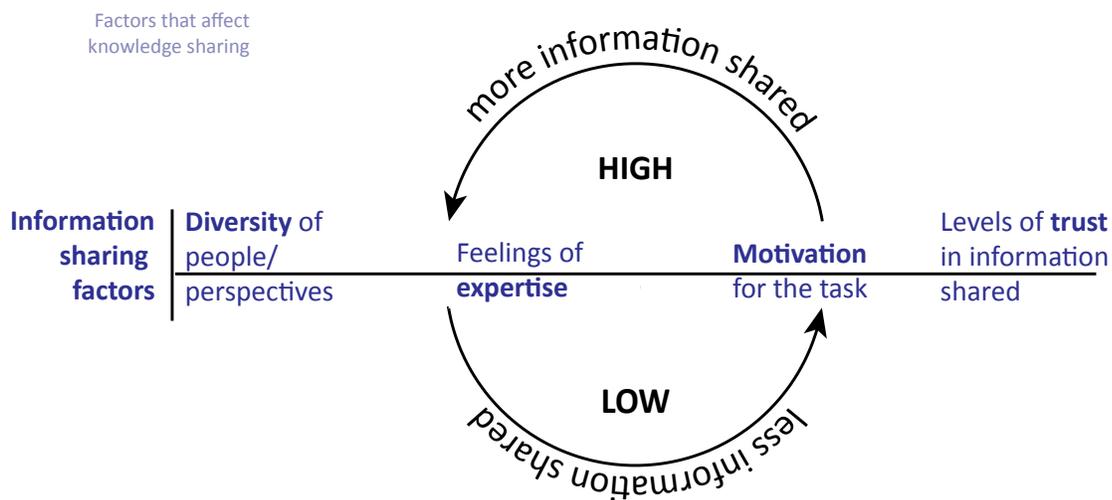
Different fields of research examined shared information bias through their respective lenses. Each study examined different variables, modifying scenarios and information distribution in the hidden paradigm model to decipher how shared information bias affected decision making. These studies also attempted to pinpoint components of group situations that influenced the bias and also what happens to the unique information that isn't shared during the initial discussion. An analysis of these studies have identified seven factors that influence information sharing:

1. **Information type and distribution:** Information type refers to whether the information is positive or negative, what it looks like (boldface, format), or pictures. Distribution refers to how and when it's distributed as well as the quantity of how much information each person received.
2. **Task Features:** What the group anticipates they will be doing affects how they discuss information. When the task is focused on intellectual (concrete) tasks, rather than judgmental (subjective) tasks, more information is shared. When the groups focus is on the task of sharing information and not discussing the topic, information sharing is increased.
3. **Group Structure and Composition:** Groups sizes, composition, norms, and roles were examined and the results were mixed. The general consensus, not theory, is that other participants awareness of another person's expertise increased the amount of information shared. This factor was better informed through the knowledge sharing research.
4. **Time:** The length of time participants had for discussion as well as when the information was shared. Studies revealed that given enough time (depending on study variables), all the relevant information was shared. Also, increasing the stress level of a group by giving time limits also increased information quantity. This factor also showed that information revealed later in the discussion was not given the same credence as information shared in the initial discussions.
5. **Member Characteristics:** Actual and perceived status of group members, actual and perceived expertise, member social hierarchy. Participants gave more credence to the information shared by leaders or people who were introduced as experts.
6. **Discussion Procedures:** If participants brought their sources of information, this increased the amount of information shared. This was also true if participants were allowed and able to access information during the discussion.
7. **Technology:** Research on the use of technology on information sharing has had mixed results (computer mediated communication). Most of the studies have been focused on communication between participants in diverse locations and not on the use of technology in a meeting with participants in the same room.

Stasser and Titus, in the identification of both shared information bias and preference bias, theorized that preference bias could be a factor that causes shared information bias.<sup>1</sup> Other studies though, cite social reasons as root causes. For example, a person feels validated when the information they just shared is confirmed as correct or good by other participants or a person may fear that anything unique they share will be rejected as being too different or they themselves might be rejected.<sup>2</sup>

Theoretical research into knowledge sharing rather than specific research into the bias revealed other factors that affect the quantity of knowledge and people's willingness to share it. Again, it is important to understand and acknowledge their influences in group communication. Analysis revealed that of the factors identified through the literature search, the factors could be grouped under four main categories. These four categories of factors that influence knowledge sharing in group situations are: a) Motivation, b) Diversity, c) Trust, and d) Status. These four and their subcategories do not exist in isolation. Rather they are all present in varying degrees depending on the context and the problem under discussion. With only a few exceptions in subcategories, the final analysis of the data shows that the higher amounts there are of the four factors, more information will be shared. The inverse is true in that the less there is of these four factors the less people will talk or participate or say anything meaningful.

Fig. 6.1



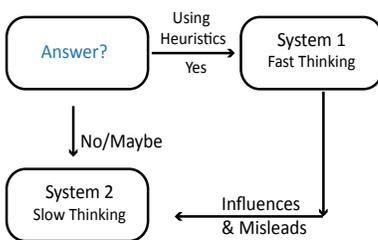
### Social Influence is Unavoidable

“We are not the autonomous ringmasters we believe we are; we are social through and through. This insight is disquieting because it challenges the way we see ourselves, and how we judge others.”<sup>3</sup> One such experiment by Solomon Asch in the 1950's demonstrated that due to pressure from others, “people will often adopt the view of the majority even when it is patently wrong.”<sup>4</sup> In these studies, the individuals formed their answer separate from the group, then changed their minds to agree with the group when in the group discussion. “Most people are convinced they can resist peer pressure. But remaining independent in the face of a majority is a great deal harder than you might think.”<sup>5</sup>

There doesn't even need to be an active discussion before members of a group start affecting each other. "Mimicry is the breath of social interaction. We do it without thinking, and without it anything beyond superficial communication would be impossible. All of us inadvertently copy the facial expressions, postures, manner of speech and other tics and quirks of those we are with all the time. And we do it at remarkable speeds."<sup>6</sup> Friedman and Riggio conducted an experiment three decades ago at the University of California that showed that "when small groups of people sit facing each other without talking for two minutes, everyone in the group ends up adopting the mood of the most expressive person - the one who exhibits feelings most visibly through facial expressions, gestures and body movements."<sup>7</sup> "The nature of relationships between people in a small group is qualitatively different. A small group has an identity of its own. And the influence of the people in the group on each other's judgment is inescapable."<sup>8</sup>

Fig. 6.2

Model of Two Types of Thinking  
System using Heuristics



### The Two Systems and Bounded Rationality:

Kahneman and Tversky did not use the term bounded rationality when they first introduced the heuristics and biases approach to human judgment and decision making. Their initial paper titled *Judgment Under Uncertainty: Heuristics and Biases* described the "simplifying shortcuts of intuitive thinking and explained some 20 biases as manifestations of these heuristics - and also as demonstrations of the role of heuristics in judgment."<sup>9</sup> Their first paper identified 20 biases and ongoing studies have identified others, some of which appear in the research regarding knowledge sharing and group communication. "Group decision making research can be enriched by explicitly considering the fact that people can and will choose among a shallow and heuristic versus a deep and deliberate information search and processing strategy."<sup>10</sup>

Herbert Simon with his theory of bounded rationality (or adaptiveness), brought heuristics into the group environment. "Human rational behavior (and the rational behavior of all physical symbol systems) is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor."<sup>11</sup> Says Simon, humans are only partly rational because the human mind is limited in its computational abilities. The more complex the task environment, the more humans must use "approximating procedures," one of which is heuristics. "Heuristics are one of many "mechanisms used by human bounded rationality to cope with real-life complexity."<sup>12</sup> He argued that because of these computational limitations, it is not possible to only study the task environment to understand how humans will behave. An unlimited ability to compute would result in always the most appropriate and logical solutions. However, "since we rarely solve our problems exactly, the optimizing strategy suggested by rational analysis is seldom available."<sup>13</sup>

Heuristics were first developed by Kahneman and Amos Tversky in 1974 as an explanation for bias. A cognitive bias is “a necessary by-product of processing limitations - because information processing time and ability are limited - humans must use shortcuts or rules of thumb that are prone to breakdown in systematic ways.”<sup>14</sup> Another way to define heuristic is as a “simple procedure that helps find adequate, though often imperfect, answers to difficult questions.”<sup>15</sup> Understanding the shortcuts can help people overcome some of the biases the result from using them.

It is not the intent here to delve into a list of heuristics that result in biases but providing examples can illustrate how what a person believes they know, and the decisions they make based on that knowledge, can clearly be misguided.

- Anchoring is the starting point from which people base their opinion. For example, if the question is to guess the population of Chicago, the answer will be based on a city that a person is familiar with. If that city is Savannah, GA, most likely the adjustment will be higher, while compared to New York City, the adjustment will be lower. A related bias happens because the amount of adjustment depends on the initial anchor. People from a smaller city will guess a much lower population for Chicago than people from medium or big cities. In the absence of actual data, the guess is based on whatever number is familiar and adjusted accordingly resulting in many different answers for the population of Chicago.<sup>16</sup>
- Availability is when people base their answer about the size or frequency of an event on how easily an example is recalled. For example, someone living in the Midwest would say chances for tornadoes are much more likely than someone who is living in Montana. Biases can occur when people decide that the frequency or size of an event is larger or smaller with no basis on actual facts. In a group project, participants generally feel they contribute more than others because it is easier to remember what they themselves contributed rather than what other members did. When planning a vacation, a person may decide to avoid certain locations if they recently saw a negative incident report such as an accident at a theme park or shark sighting although statistically, those incidents are rare<sup>17</sup> Herbert Simon used the word *satisficing* to describe a similar heuristic in which past experiences are used to determine a reasonable future outcome. However, rather than an exhaustive search to find the best past example, the search halts “as soon as a solution is reached that meets the expectation.”<sup>18</sup>
- Representativeness: This heuristic is about people comparing objects, people or situations to a representation of what they think a certain object, people or situations should be like, or in other words, people compare to their stereotypes. A bias can occur even when they know

better; people base their decision on what they think something should be like rather than comparing to actual facts or data.<sup>19</sup>

### **The Lazy Monitor**

Psychologists have been studying for decades a model that has two modes of how the brain processes incoming stimulus.<sup>20</sup> As mentioned earlier, they are usually referred to as System 1 and System 2 for ease of explanation, not because there are actually two separate processors in the brain. “System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control. System 2 allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration.”<sup>21</sup> Understanding that System 1 operates on heuristics and has biases is important but this is not enough to overcome the biases.

“Both systems are always on when a person is awake and the interaction between the two is designed to be efficient, minimizing effort while optimizing performance. The arrangement works well most of the time because System 1 is generally very good at what it does: its models of familiar situations are accurate, its short-term predictions are usually accurate as well, and its sort-term predictions are usually appropriate. System 1 has biases, however, systematic errors that it is prone to make under specific circumstances.”<sup>22</sup> “Biases cannot always be avoided, because System 2 may have no clue to the error. Even when cues to likely errors are available, errors can be prevented only by the enhanced monitoring and effortful activity of System 2. As a way to live your life, however, continuous vigilance is not necessarily good, and it is certainly impractical. Constantly questioning our own thinking would be impossibly tedious, and System 2 is much too slow and inefficient to serve as a substitute for System 1 in making routine decisions.”<sup>23</sup>

Not only is System 2 slow and inefficient but it is also limited in the amount of attention it can give to monitoring System 1 and it is lazy. It is not just System 1 that is bounded in its rationality; System 2 is as well. The brain only has so much effort making capacity and it takes effort to actively think and effort to keep thinking. There is actually a law, called “the law of least effort” that says the brain will use the minimum amount of effort needed to resolve the problem.<sup>24</sup> Solving simple multiplication problems is easy to do while walking slowly but almost impossible if trying to maintain a sprint. The gorilla experiment by Chabris and Simons is a great example of the limited mental capabilities of System 2. For half of the participants, the mental effort to count the number of passes were all they were capable of. “The maintenance of a coherent train of thought and the occasional engagement in effortful thinking also requires self-control. Even in

the absence of time pressure, maintaining a coherent train of thought requires discipline.”<sup>25</sup>

Another experiment conducted by Kahneman and Frederick illustrates the lack of proper monitoring of System 1. In this problem, more than 50% of students surveyed at Princeton, Harvard, and MIT answered intuitively (and came to the wrong conclusion). It is called the bat and ball problem:

A bat and ball cost \$1.10.  
The bat costs one dollar more than the ball.

How much does the ball cost?

Intuitively, the answer appears to be the ball costs \$0.10. The real answer is \$0.05. It takes no effort to arrive at a solution but it takes effort to arrive at the correct solution and for the lazy System 2, the answer was close enough that for those 50% +, they didn't even realize they had the wrong answer. Unless this question was on an exam, there are no consequences for getting it wrong. What matters in terms of this problem is that once people have intuitively reached a conclusion, it affects what information they share and what they believe. “This experiment has discouraging implications for reasoning in everyday life. It suggests that when people believe a conclusion is true, they are also very likely to believe arguments that support it, even when these arguments are unsound. If System 1 is involved, the conclusion comes first and the arguments follow.”<sup>26</sup>

For information sharing bias and preference bias, this certainly can give credence to the belief that preference bias is what causes shared information bias. People who read their information, but didn't have access to all the information, might have used intuition to reach a conclusion and when they gathered to discuss, shared only information that supported their choice. The unique information they have might not support their choice and thus was not shared. Especially in the 'student body president' scenario, the study participants did not have an opportunity to meet any candidates and that lack of information might push the group members to rely more on their intuition.

When placing this two system mode of thinking into a group context, it takes effort to think of what needs to be shared, effort to think about what other people are sharing and then engaging in effortful thinking to integrate that information into the context of the problem in order to make an optimal decision while dealing with the complex social dynamics occurring in the group environment. Typical meeting procedures are not conducive to giving System 2 the time and capacity to engage in this type of concerted effort but it is System 2 that must be engaged to bring forth information that people think they know.

## Unconscious Biases

A different way to study the two modes of thinking is to think about what people actually do know and how they know it. This is not to call into question the knowledge gained from years of experience or study. This line of research is about how the way the human brain is easily influenced in the way it processes information which can affect how it is stored away and how it is remembered. Chablis and Simon studied another illusion, this time calling it the Illusion of Memory. Memory does not work like people believe it does. "Although we believe that our memories contain precise accounts of what we see and hear, in reality these records can be remarkably scanty. What we retrieve often is filled in based on gist, inference, and other influences; it is more like an improvised riff on a familiar melody than a digital recording of an original performance."<sup>27</sup> The heuristic tendencies and biases listed below are some that could be the cause of those faulty memories.

- **Seeks the same:** We are quick to judge and conclude on incomplete information and then are prone to seek out information that confirms only these beliefs.
- **Cognitive Ease:** Our thinking selves are lazy - only putting as much effort as necessary until the new is old and seeking the easiest path to get there.
- **Availability:** Whatever is most easily recalled is believed to be the most important, the truth, frequent or familiar.
- **Bridging Gaps:** Our minds automatically fill in missing information based on experience, emotions, associations and cues.
- **Emotion:** Emotions have a strong influence over how our mind affects our decisions and judgment. The happier we are, the more we use and rely on our intuitive self.
- **Subconscious Priming:** We are highly susceptible to think certain ways merely by suggestion, actions, ideas or emotions, subconsciously.
- **Newness:** Only when something is new or unfamiliar do we actively engage our minds and even that is flawed. The newness is quickly assimilated into the old.
- **Association by Conjunction:** We automatically connect things together just because of their proximity to each other - whether they have any connection or not. This also causes ideas to spawn new ideas in a very coherent manner.

This list is very short compared to the many others identified through academic research. It is completely outside the scope of this research project to seek out and attempt to make sense of them all. A designer does not need to have that deep of knowledge about cognitive functioning to be effective as a facilitator. It is enough to identify and analyze those mentioned in the research literature. Initially the goal was to be able to identify which heuristic or bias might be causing shared information bias.

After identifying what they were, however, analysis showed that they all were culprits in these biases. Like the two systems of thinking, even though they are presented as two separate systems, they are not independent systems. So too, these heuristic tendencies and biases overlap and affect the others. It is not possible to tell which specific one had more prominence than the others since these are mostly subconscious activities. Further analysis though, revealed that, like the Illusion of Memory, what people think they know is not necessarily accurate. Because the human mind is so easily influenced; because it is lazy, and it does not have a robust system of fact-checking, the very knowledgeable people think they know may not be as accurate as they believe.

After this analysis, it became clear that the goal achieved in this section of research was the understanding that most likely, every individual *is* being unconsciously influenced by these heuristic tendencies and biases. “Psychologists do not believe people are stupid or infinitely gullible. What psychologists do believe is that all of us live much of our life guided by the impressions of System 1 - and that we often do not know the source of these impressions.”<sup>28</sup>

The synthesis from the research into group communication, shared information bias and cognitive psychology is that it is not possible to control every factor that influences information sharing. First, because there are too many factors that the designer may or may not be able to influence. For example, the amount of time available for the discussion or who is able to participate in the fact finding session. Also, how participants perceive each other in status or expertise. Second, because the information people do share has most likely been influenced in some way, calling into question its veracity.

What the numerous information sharing influencers show is that *how* the discussion happens matters. It also matters how group members are perceived by each other and how the individuals think others perceive them.

“If I’d asked my  
customers what they  
wanted, they’d have  
said ‘a faster horse.’”

Henry Ford



## SUB-QUESTION 2

### **What distinctive skills and expertise do designers as facilitators possess?**

Before this sub-question can be answered, the first priority is to define what is meant by the term designer. Part of the difficulty in defining who a designer is lies in the fact that defining 'Design' itself is an ongoing discussion with as many opinions as there are designers. Dictionary.com defines a designer as "a person who devises or executes designs, especially one who creates forms, structures, and patterns, as for works of art or machines" which is very narrow in its scope. It does not allow for a more abstract view of the activities of a designer in the act of designing.

A broader definition is needed and Rittel provides one sufficient for the purposes of this research project. In his attempt to understand the reasoning of designers, he looked for commonalities in the activities of design. Rather than placing an emphasis on the end product, Rittel defines a designer by the mental activity and intention of that person. Designers "are guided by the ambition to imagine a desirable state of the world, playing through alternative ways in which it might be accomplished, carefully tracing the consequences of contemplated actions."<sup>1</sup> Salustri offers an additional layer to that definition, adding that designers "Bring to bear their training, their experience, and a body of knowledge - things to which lay designers do not have access to"<sup>2</sup> which is most relevant when stepping into the facilitator role. There is a tremendous diversity in the quantity of professions that call themselves designers and subsequently there is a correlating expansion of specialties and technical language. Therefore, in researching the skills and expertise of designers, it was also necessary to look for the commonalities among the literature that discussed what designers know, how they think, their process and approach to designing.

#### **A Designerly Way of Thinking:**

Designers have their own distinct way of thinking, typically called design thinking. Depending on the source, design thinking is defined in different ways. For some, especially the novice designer, it is a defined step-by-step process that provides a guided path to solve ambiguous problems. For others that process is more of a suggestion that provides a loose structure to what can appear to be a chaotic approach that designers bring to design problems. Design thinking can also be defined by a designer's response to the design opportunity, and the actions and methods they use such as observing, sketching, and modeling. Richard Curedale references core attributes of design thinking developed by Baeck & Gremett (see Appendix B) that embraces the many views of design thinking that gets to the core of why this way of thinking is valuable for designers who facilitate. "Design Thinking starts by thinking about people rather than thinking about things."<sup>3</sup>

“The evolution from design to design thinking is the story of the evolution from the creation of the products to the analysis of the relationship between people and products, and from there to the relationship between people and people.”<sup>4</sup> Tim Brown, in his book *Change by Design*, says that it took him fifteen years as a professional designer before realizing there was a difference between being a designer and thinking like a designer.<sup>5</sup> “Design thinking taps into capacities we all have but that are overlooked by more conventional problem-solving practices. It is not only human-centered; it is deeply human in and of itself.”<sup>6</sup> For Tim Brown, design thinking is an approach to creative problem solving that is iterative, open-ended, non-linear and “fundamentally an exploratory process” to arrive at innovative solutions for his company IDEO and their clients.<sup>7</sup>

Being open-ended also means being open-minded about the landscape in which the opportunity resides. According to Don Norman “designers are trained to discover the real problems” and they do this using design thinking. Designers have developed a number of techniques to avoid being captured by too facile a solution.<sup>8</sup> “They take the original problem as a suggestion, then think broadly about what the real issues underlying this problem statement might really be. Most important of all, is that the process is iterative and expansive.

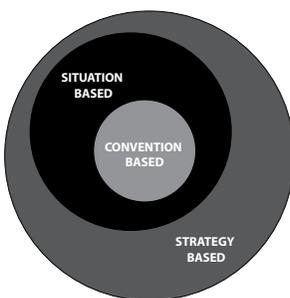
Designers resist the temptation to jump immediately to a solution to the stated problem. Instead they first spend time determining what the basic, fundamental (root) issue is that needs to be addressed.<sup>9</sup> He continues on to say that there is more to design thinking than what he has described. Other important aspects to consider is that design thinking is about “having a deep understanding of the people for whom the product is intended. The emphasis on questioning; questioning the problem, questioning the assumptions and implications.”<sup>10</sup>

Being human centered is not just about being inclusive of the end users and making sure the final solution is appropriate and sustainable. Human centered also means focusing on the interactions and dynamics of the team. “Design thinking helps structure team interactions to cultivate greater inclusiveness, foster creativity, deepen empathy, and align participants around specific goals and results.”<sup>11</sup> Mootee also says it is about “cognitive flexibility, the ability to adapt the process to the challenges.”<sup>12</sup>

Bryan Lawson and Kees Dorst presented a model for three types of design thinking: Convention based, situation based and strategy based. Within the broader definitions of design thinking, convention based thinking is Tim Brown in his first years out of school where he followed rules based on his specialty and the experience of those before him. Situation based means that designers respond to the design challenge in different ways depending on the situation. In this scenario, designers have to improvise and be appropriate to the context. Strategy based is when designers don’t wait for a design situation to arise, “they consciously design the process itself and create the design situations for themselves.”<sup>13</sup> For a

Fig. 6.4

Model by Bryan Lawson & Kees Dorst  
Three types of Design Thinking



designer who is facilitating, their thinking would need to be both situation and strategy based. During a group session, the designer would need “a keen eye for the possibilities within a complex environment and use their knowledge and skills in innovative ways to create a fitting design solution.”<sup>14</sup> However, even before the session, the designer would need to create a strategy “rooted in a general knowledge of the dynamics of a design process and an interpretation of the design situation...”<sup>15</sup> These sentiments are echoed by Body, et al who specifically addresses designers in a facilitation role needing to have a strategic perspective.<sup>16</sup>

Thinking in this manner is critical to a designer in a facilitation role. It provides a loose structure for a participatory session, focuses on people, questions the assumptions and guides the designer in asking the right questions of the stakeholders, the participants or team members.

### **An Ability to Externalize Thinking:**

One of the skills that designers use to actualize design thinking is through sketching, creating prototypes, and models. Multiple authors talk about the importance of how integral this mode of working is to how designers design. Bryan Lawson calls it ‘representing’ in his model of the nature of design activities. “Although it is perfectly possible to imagine design taking place without any externalization at all, in practice designers almost always externalize their thoughts prolifically. Indeed, designers are often characterized by their habitual use of these activities.”<sup>17</sup> Nigel Cross describes sketching as a tool that helps designer think,<sup>18</sup> Sketching not only helps the designers think but is used as a conversational tool with themselves as they work through different iterations and possibilities of solutions. “Drawing is important in design. Not so much as a medium for making pretty pictures, but as the medium for visual and spatial thinking.”<sup>19</sup> Often sketching is just the beginning and the conversation is further continued with models of the product. In addition to mock ups of products there are also mock-ups of a potential experiences or system diagrams or story boards to externalize what is in the designers head. Designers choose whichever medium best helps them think through their developing ideas.<sup>20</sup>

Much of the literature regarding sketching has to do with product design and architecture whereas in today’s landscape of designers working with cross-disciplinary teams on complex business or social issues, the externalization of information begins much earlier in the process (fact finding) and there may never be a physical manifestation of the final solution. Designers who are also researchers often externalize their data by writing down individual pieces of data on post-it notes. There are two obvious reasons for this form of externalization. First, it is much easier to physically move the information around as designers seek to make sense of the information that is gathered. Second, the externalized information is a physical manifestation of the information that everybody can see. Especially when multiple disciplines are involved, having the information

written out creates a “group memory”<sup>21</sup> and individuals no longer have to rely on individual notes or what they ‘think’ they remember. Herbert Simon used the fact that “human memory can hold only a half-dozen chunks”<sup>22</sup> as proof that the human brain is limited in its ability to retain and understand larger amounts of information. Externalizing the data provides a way for the individual and group to not rely as much on heuristics.

With this particular skill, designers can either simply externalize the data for the participants or they can enable participants to visually think and express themselves. They can do the latter either by visually representing information graphically, using visual prompts to elicit information or providing the appropriate tools to participants; letting them think about what they know in different ways. When interpreting and displaying shared information through pictures and diagrams, participants see their knowledge represented in a new way which can create new understanding or perspectives on what they thought they already knew. “Designers in the future will make the tools for non-designers to use to express themselves creatively.”<sup>23</sup> Especially when topics of conversations are large scale and complex, designers will need to provide tools for conversation (communication artifacts) aimed at facilitating social interaction on some given contents. Some of them are simple and traditional, some more sophisticated, and some quite original, specifically conceived to improve users’ participation.<sup>24</sup>

### **Ability to Frame**

Before information is shared, participants must know for what purpose they are sharing it for. Are they providing an opinion, sharing technical knowledge, or contributing an idea? Of all they know, how do they know what they are supposed to share and the answer is dependent on the question that is put to them. For example, in the original hidden profile model by Stasser and Titus, participants were simply asked to make the best choice for president based upon the data given to them. An alternative question could have been to choose the best candidate for growing the school 25% in the next 10 years or to choose the candidate that can best manage the fiscal operations of the school. The participants would have looked at the data through those lenses, thus affecting the discussion and the final answer could have changed even with all shared and unshared information presented. In the real-world, the decision (solution) is dependent on how the question was framed and the ability to frame is considered a core design competency.<sup>25</sup>

Designers are used to the task of ‘framing’ in order to elicit the appropriate information. “In the actual practice of designing, the designer starts with a quasi-subject matter which is an “indeterminate subject waiting to be made specific and concrete.”<sup>26</sup> Before a designer is ever brought in, a situation is recognized that is undesirable and which is then taken to a designer. Designers call these ‘briefs.’ They can range from a very specific request to a more ambiguous outline of the

#### Chris Conley’s Core Competencies of Design

1. The ability to understand the context or circumstances of a design problem and frame them in an insightful way.
2. The ability to work at a level of abstraction appropriate to the situation at hand.
3. The ability to model and visualize solutions even with imperfect information.
4. An approach to problem solving that involves the simultaneous creation and evaluation of multiple alternatives.
5. The ability to add or maintain value as pieces are integrated into a whole.

current situation and hopes for the future and they rarely respond directly to the problem as presented in the brief. “One of the essential characteristics of design problems then is that they are often not apparent but must be found. Unlike crossword puzzles, brain teasers or mathematical problems, neither the goal nor the obstacle to achieving that goal are clearly expressed. In fact, the initial expression of design problems may often be quite misleading. If design problems are characteristically unclearly stated, then it is also true that designers seem never to be satisfied with the problem as presented.”<sup>27</sup>

Nigel Cross quotes Schon (1988) as saying: “In order to format a design problem to be solved, the designer must frame a problematic design situation: set its boundaries, select particular things and relations for attention, and impose on the situation a coherence that guides subsequent moves.”<sup>28</sup> A frame is an active perspective that both describes and perceptually changes a given situation. “A frame is, simplistically, a point of view.”<sup>29</sup> In a group setting, each individual will bring their own ‘frame’ of what they perceive the problem to be and be inclined to share information from that viewpoint. An senior executive will have a different viewpoint than a manager or experts who see the issue through the lens of their specific field. The frame matters because it can serve as the anchor from which individuals share their information. If the anchor is not correct or shared by all, the information gathered can be biased. With the knowledge that is necessary to solve complex issues residing in multiple heads, having the ability to frame appropriately is essential. “When you frame a problem, you impose a view on the problem that implies a solution, or at least a direction to follow. This is often the only way to achieve a design solution, design problems are so ill-structured and difficult that you must propose a frame (impose some kind of order) and experiment with it.”<sup>30</sup>

Designers begin framing even before the actual group meeting. In the design process, this happens during what Sanders and Strappers call the ‘fuzzy front-end’ or more non-technical terms are the pre-consult or pre-design. What happens in this phase describes “the many activities that take place in order to inform and inspire the exploration of open-ended questions. The goal of this exploration is to define the fundamental problems and opportunities and to determine what is to be, or should not be, designed and manufactured.”<sup>31</sup> In Min Basadur’s Simplex process, the entire first three steps are about learning information in order to frame the opportunity correctly. Starting with the pre-consult “he (the designer) begins by assuming that how the client initially states his problem might not reflect what he actually wants.” The designer views the stated problem as nothing more than a starting point and gathers information to try and define the problem. The resulting definition is the initial ‘framed’ problem with which the group session starts and the designer knows that based upon the information shared, the defined problem can shift again.<sup>32</sup>

Horst Rittel & Melvin Webber  
Ten distinguishing properties of  
wicked problems:

1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no stopping rule.
3. Solutions to wicked problems are not true-or false, but good or bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every solution to a wicked problem is a one-shot operation; because there is no opportunity to learn by trial and error, every attempt counts significantly.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered to be a symptom of another problem.
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choices of explanation determines the nature of the problem's resolution.
10. The planner has no right to be wrong.

The first steps to framing is the use of constraints. These constraints are learned through the initial brief, the knowledge the designer brings and also in real-time during the group session. Constraints provide boundaries and a narrower scope from which the designer can start the conversation. Constraints might be concrete such as the physical boundaries for a building or weight limitations. They can also be subjective such as the solution must make people feel welcome or comfortable or fresh and youthful. In addition to constraints, the designer can use what Buchanan calls 'placements' to position and reposition the problems and issues at hand. "Placements are the tools by which a designer intuitively or deliberately shapes a design situation, identifying the views of all participants, the issues which concern them, and the invention that will serve as a working hypothesis for exploration and development."<sup>35</sup> The designer is able to view the opportunity from multiple perspectives and help group participants do this as well. This can not only broaden the scope of information people share but also be more open to what others share. This ability to frame is considered a core design competency.<sup>34</sup>

### **Ability to Handle Complexity and Ambiguity:**

When the subject matter itself is complex and ambiguous, then logic dictates that the act of engaging in that subject is fraught with complexity and ambiguity. "No single definition of design, or branches of design, adequately covers the diversity of ideas and methods gathered together under the label. Indeed, the variety of research reported in conference papers, journal articles, and books suggests that design continues to expand in its meanings and connections, revealing unexpected dimensions in practice as well as understanding."<sup>35</sup> A designer therefore automatically starts from a place of complexity and ambiguity. S/he inhabits a professional world where what they do is sometimes not clearly defined, especially in today's context where psychologists and cognitive and social scientists and business executives can also call themselves designers. From that starting point, the designer must then tackle the design problem.

Some authors call design problems ill-defined and others defer to Horst Rittel and his ten properties of social planning type problems (wicked problems).<sup>36</sup> To paraphrase, design problems are never simple nor straightforward because there is not a "definitive formulation" of them or a definitive solution.<sup>37</sup> Designers must be willing to deal with and embrace uncertainty,<sup>38</sup> even when the problem seems straight forward. Bryan Lawson gives an example of a client of his in his book, *Design Expertise*, who wanted to expand his house. The clients had a list of issues that expanding the house would resolve. Lawson was uncertain because it seemed that the house already provided all the items the client was requesting. In seeking information to properly define the problem, Lawson learned that the most appropriate solution had nothing to do with a lack of space but was more about

finding ways to peacefully integrate different interests and habits among the family members.<sup>39</sup> This example showcases how it appears as though there is one client (the homeowner) when in actuality there were multiple (the family). The resulting solution for this example was very simple but including the family increased the complexity of the problem and thus problem formulation. When the information to define a problem must come from a group, a seemingly simple problem can easily turn complex as group members have other perspectives on the issue.

In design problems “problem understanding and problem resolution are concomitant to each other. Therefore, in order to anticipate all questions (in order to anticipate all information required for resolution ahead of time), knowledge of all conceivable solutions is required.”<sup>40</sup> Designers do bring expertise from their own specialty and experience, but it is not possible for them to have all the necessary information for an optimal resolution. This is another aspect of ambiguity within wicked problems that designers need to handle. To define the problem, designers must have, at the minimum, some vague idea of a solution(s) and within that vague idea, use what they themselves know while simultaneously recognizing what they think they don’t know and seek to acquire that knowledge. They seek this information knowing that “a design problem keeps changing while it is treated, because the understanding of what ought to be accomplished, and how it might be accomplished is continually shifting.”<sup>41</sup> Designers therefore must simultaneously think of a solution(s), know what information to search for, while being open to a resolution that might be completely different than anything they initially envisioned.

Yet another ambiguous and complex component of wicked problems is the information itself that designers need to know. Sometimes the information is concrete such as the physical constraints that the final solution must be bounded by and therefore much easier to learn. For example, city building codes may say buildings can’t be taller than 6 stories or the client says the product cannot weigh more than two pounds and of course, there are the natural laws of science. Other information designers must know is much less concrete and subjective such as tacit knowledge or information that elicit certain emotional reactions from people. For example, red is universally accepted as a color representing danger or to convey evil but it can also convey boldness, excitement, and speed and that perception of the color depends on the context in which it is used. Designers must not only know how to gather these various types of information but they must also know how to integrate them. The activity of design involves a sophisticated mental process capable of manipulating many kinds of information, blending them all. “If there is one single characteristic which could be used to identify good designers it is the ability to integrate and combine.”<sup>42</sup> Conley concurs as he believes “the ability to add or maintain value as a pieces are integrated into a whole” a core competency of design.<sup>43</sup>

Being able to integrate a diversity of information itself is interwoven into the ability to frame the problem. One of the ways to frame problems is to look at it from the perspective of not just the client, but the various stakeholders and ultimate users of the solution. There may be solutions unique to each stakeholder for the same problem. As designers gather information, they use this acquired knowledge to re-frame, using the information appropriately to arrive at one integrated solution that works for all stakeholders. “One cannot design by simply creating individual partial solutions for all the issues that the stakeholders might have and then building together all of these sub-solutions.”<sup>44</sup> Integrative thinkers “allow complexity to exist, at least as they search for solutions, because complexity is the most reliable source of creative opportunities.”<sup>45</sup> As the field of design permeates into more and more areas of business as well as government and community entities, design problems become increasingly complex attaining even higher levels of ambiguity.

“We are designers, and as designers, we think about how people interact with the world around them. We love to do research and we love to watch users doing their thing because these are the activities that help us perform the actual design activities that shape our work, which we like to think we’re already good at. It takes skill and practice to be able to facilitate people, and facilitation is truly the foundation of an effective design practice. Facilitation skills help us collaborate with and lead others to ensure that their ideas have been heard and have contributed to the design process.

Russ Unger, Brad Nunnally, and Dan Willis  
*Designing the Conversation:  
Techniques for Successful Facilitation.*

### SUB-QUESTION 3

#### **In what ways are designers, as facilitators, appropriate for mitigating shared information bias?**

At the abstract level, shared information bias is about people reacting reflexively to the perceived problem and the people around them. People do not consciously think unless they come across the unfamiliar or make a concerted effort to do so and it is taxing mentally and physically. People are usually not aware that this is the way in which they interact with the world and everything in it and in fact are “blind to their blindness.”<sup>1</sup> Kahneman also recognized how hard it is to not react in this manner and although he would recognize biased behavior in himself at times, he based his entire book on the premise that it is “easier to see other people’s mistakes than one’s own.”<sup>2</sup> If that is the case, then relying on individuals to be self-aware is not the most consistent way to increase information sharing.

This research does not assume that designers are exempt from being influenced by heuristics and biases. Designers, as human beings, also react to the world and their professional tasks in this instinctual way. “An examination of protocols obtained from closely observed design sessions reveals that most designers adopt strategies which are heuristic in nature.”<sup>3</sup> There are multiple publications that attempt to distinguish the knowledge, thinking methods and working habits of professional designers vs. the design abilities of all human beings. One distinction that is often repeated is how designers are solution focused. However, from a cognitive perspective, it turns out that being solution oriented is something that all people in general tend to do. “It appears to be a human tendency to seek solutions even before the problem is understood. This tendency to be “solution minded” seems to become stronger when there is anxiety over the nature of the decision.”<sup>4</sup>

This is not a contradiction of what Lawson concluded in his study of the way architecture students tackled problems vs science students. In that case, the conclusion was that the difference was the result of how the students were educated.<sup>5</sup> The length of time in school also showed that there was an impact in how design students approached problem solving. First year design students immediately worked on testing various solutions while senior design students sought information to better define and understand problems in addition to finding solutions. If designers are prone to the same biases and heuristic behavior as everybody else, then there must be something else that is distinctive about the profession of design that calls for this emerging role of designers as facilitators. In the process of trying to analyze what designers do and how they go about solving the vast range of problems presented to them, from a cognitive perspective, what became apparent was that the act of designing is inherently a System 2 function. No matter the profession or specialty, if engaging in the act of designing, a designer cannot help but engage in System 2 type thinking.

Take for example design thinking. When looking at design thinking as a process, a step by step approach provides a path for designers (and others) to follow. The steps themselves are a reminder to slow down, make sure proper procedures are followed, and they act as a milestone marker for how far into the process the designer is and how far they need to go. It acts as a big picture agenda and having an agenda has shown to increase meeting effectiveness as it keeps people on track when distracted and also acts as a reference for what the topic is. Design thinking is also about questioning assumptions; questioning the design problem and the assumptions around it. It's iterative nature means the first possible solution may or may not be accepted and that testing and prototyping will be used to check the final resolution before execution. In design thinking, the process and the mindset underlying the process brings the new into System 1 thinking which then engages System 2 thinking.

In cognitive psychology, framing is discussed in the context of choices. How people see risk depending on how the question is framed. In the initial study by Kahneman and Tversky, they showed that aversion to risk is significantly higher when a question is framed in such a way that the loss is highlighted. An example is if a patient is told about a potential life saving surgery. Those who are told that 90% of patients survive are much more likely to elect to have the surgery vs. those who are told that 10% of patients experience complications or die. Even though the risk is the same, the latter almost always choose to not have the surgery.<sup>6</sup> "Framing works because people tend to be somewhat mindless, passive decision makers. Their reflective system does not do the work that would be required to check and see whether re-framing the questions would produce a different answer."<sup>7</sup>

From a design perspective, framing in the fact finding stage is about increasing the choices. How to ask questions or look at problems from multiple angles to generate more information and insights. When designers start framing a 'wicked problem' they do so from many different perspectives. They use 'placements' to instigate fresh viewpoints of the situation. Designing also requires different methods of inquiry depending on the problem. It is one thing to simply ask how often a person may use a specific product but quite another to have them keep a diary of their interactions with the product. Creating appropriate methods of inquiry requires conscious, System 2 thinking.

Framing is a key component of divergent thinking. This was not included in the ability section because it is a tool used by designers and others to shape the conversation. To diverge means to "move, lie or extend in different directions from a common point." (Dictionary.com) Divergent thinking in design means being open to and exploring other possibilities beyond what seems obvious; a free flow of ideas, non-linear thinking to generate new possibilities. It is often associated with generating new ideas and creative thinking. In the execution of divergent thinking, it means ensuring there is no criticism, judgment or restrictions around

the sharing of ideas and information. In the fact finding phase, designers use framing to facilitate divergent thinking; asking why, what if, and other methods to explore the areas related to the problem to generate more information. Cognitively, what divergent thinking does is focus the amount of effort the brain is making solely onto information sharing and off of other mentally draining tasks. As mentioned, the brain does not have the ability to compute multiple effortful tasks and simultaneously trying to evaluate what is said by other people or calculating the social ramifications of who is in the room takes away from the available pool of conscious thinking effort. The more effort it takes to do one thing, the more the brain relies on heuristics to complete the other tasks it is asked to do. Divergent thinking does not engage slower thinking; rather it facilitates the brains ability to do so.

Externalization of thoughts is yet another way in which slow thinking is triggered. First, for drawings, it is a visual representation of what the designer is thinking. This visual representation serves as a check for designers internal, heuristics processes. If the output does not correlate how they envisioned it, they not only create multiple iterations but also learn from each iteration, incorporating that knowledge into the next sketch. Doing this over and over is slow thinking in progress. Graphic visualization, such as the mind map that Tim Brown created as an alternative table of contents in his book *Change by Design*, is another way that externalizing thought processes engage conscious thinking.

When individual data points are externalized on sticky notes, having a visual reminder bypasses many of the biases such as association bias or availability bias. The data can't be skipped over, forgotten or unconsciously prioritized in the head. The designer has to make deliberate choices of where the data should go, how to make sense of it, how to organize it, etc. It is easier to create new connections, associations and patterns when the data no longer only resides in the cerebrum. It is also easier to formulate new ideas and make new connections when the data can be physically manipulated. Remember that the brain is lazy and System 2 will accept the first 'approximate' answer to whatever the question is. Having the data visible mitigates the brains natural tendency to function that way.

### **Designers are Choice Architects**

In their book *Nudge*, Thaler and Sunstein advocated for libertarian paternalism or to paraphrase, providing free choice to people while gently 'nudging' them toward choices that are better for them. A nudge "alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives."<sup>8</sup> A choice architect is someone who "indirectly influence the choices other people make." A good choice architect will build "architecture to reflect a good understanding of how humans behave."<sup>9</sup> Examples included placing food choices in school cafeterias so the healthier options are placed for easiest access and at eye level or having the default be opting into the company sponsored retirement plans rather having to choose to enroll. It takes more effort to opt out of a choice and having automatic enrollment as the default dramatically

increases participation.<sup>10</sup> This ‘nudging’ occurs through framing choices in such a way that the better choice is easier. Designers are not indirect influencers, they are direct influencers. Don Norman shows that plainly in his book the *Design of Everyday Things*. How a stove top is laid out, where the handle is placed on a door, light-switch placements and design clearly show how much harder it can be for a person to get through a day if proper thought is not placed into the design of these objects.<sup>11</sup>

It would be easy at this point to digress into a designers ethical and moral responsibilities or sustainable design but that is not the focus at this time. What is relevant here is that designers are in this role, whether by accident or intent. “Design is not neutral” and “...small and apparently insignificant details can have major impacts on people’s behavior.”<sup>12</sup> A classic example, often cited, of a design flaw with major implications is the voting ballot in Palm Beach County in Florida in the 2000 Presidential elections. Dubbed the ‘butterfly ballot’, the two page design was confusing for many people and was a major contributor to the necessity of vote recounting that decided the election. Viewing the designer as a choice architect broadens the view of a designer’s role and underscores why a designer is appropriately placed as a facilitator. As the world becomes increasingly complex, “choice architects have more to think about and more work to do, and are much more likely to influence choices...and as choices become more numerous, good choice architecture will provide structure, and structure will affect outcomes.”<sup>13</sup>

### **Designers are Communicators**

A key component of designing is communicating. It starts with the design brief and communicating with the client about the initial problem or opportunity. Then it progresses to communicating with the design team, users, experts or others who should and could provide input into the development of the problem and solution. Designers are not limited in how they communicate. They use whatever tools and methods available (paper and pencils, dry erase boards, sticky notes, cameras, computers, recorders, cardboard and tape, etc.) to communicate their thoughts, gather information and test ideas. A large part of a designer/researchers role is observation and understanding non-verbal communication. During testing or prototyping of the solution, the designer has to clearly communicate their vision for the solution and also be good listeners to what the testers are saying. This vision is created in many ways beyond the slide show. Examples include storyboards, models, mock-ups of websites, flow diagrams, etc. They have to be active listeners so they can not only hear, but understand what people are saying. They have to think about what the solution is going ‘communicate’ to the user or what they want it to communicate and ways to achieve that. Don Norman calls these signifiers or “...any mark or sound, any perceivable indicator that communicates appropriate behavior to a person.”<sup>14</sup>

Although he is referring to products, this can also be applied to designing experiences, processes or business models. Finally, the “designers aim is the

communication of a specific design proposal.”<sup>15</sup> Designers do not create the solution, they only provide the solution and must be able to communicate their thoughts and intent in a manner well enough for stakeholders to comprehend and accept. Good communication skills are also necessary when the constraints that designers have to work with are not compatible. Whether physical, financial, emotional, cultural or spatial, designers are sometimes confronted with contradictory constraints that have to be addressed in some manner. Designers must have the ability to negotiate with the client when design paradoxes cannot be resolved.<sup>16</sup>

Designers, as facilitators, bring structure to the conversation, good communication skills and tools and processes that not only slow down thinking but help participants to think more deeply.





# RESEARCH RESULTS & CONCLUSION

## RESEARCH RESULTS

### PROBLEM STATEMENT

#### **How might designers, as facilitators mitigate shared information bias among participants during the fact finding phase?**

According to Don Norman, good design tames complexity not by simplifying but by managing it and providing structure.<sup>1</sup> Unfortunately, “the human mind is immensely complex, having evolved over a long period with many specialized structures.”<sup>2</sup> How is it possible to manage and provide structure to something that is barely understood? “Because much of human behavior is subconscious, we often don’t know what we are about to do, say, or think until after we have done it.”<sup>3</sup> Not only does behavior emerge from the subconscious, it is also often not rational which means it can be and is often unpredictable. For designers, mitigating shared information bias among participants during the fact finding phase is about managing complexity.

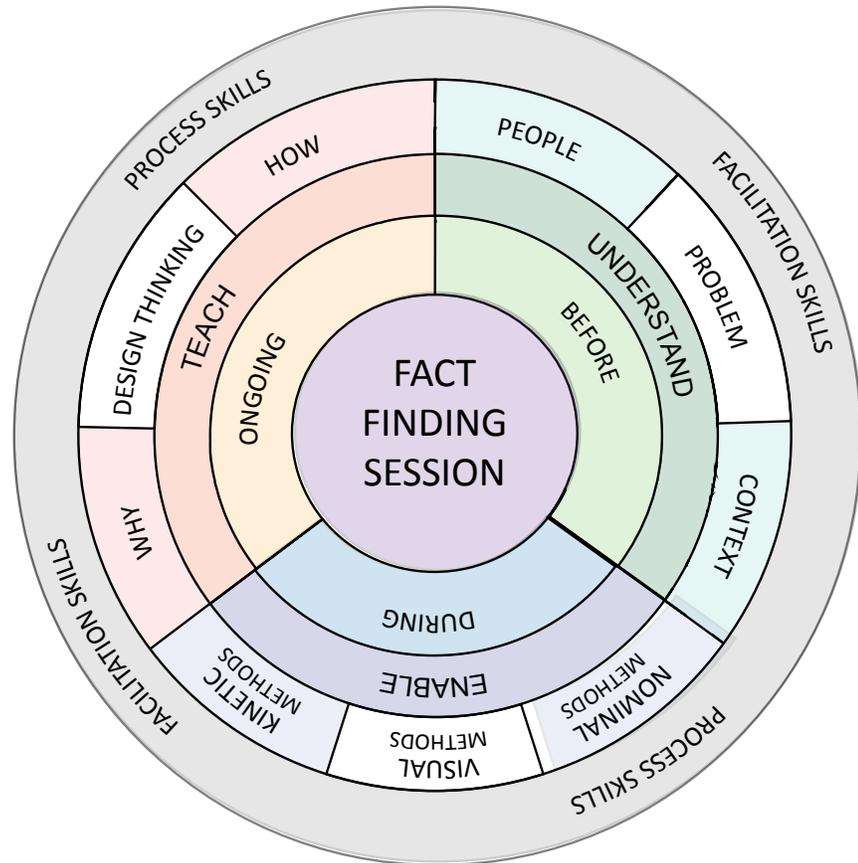
The framework developed from this research provides a theoretical structure for managing the complexity that is a group of people coming together to discuss a topic and share information. That conversation is the ‘wicked’ design problem and the designer will need to plan the conversation to manage the discussion for optimal information sharing. There are three main components to that theoretical framework: Understanding, Enabling and Teaching.

#### **Understand**

It is, of course, crucial to know as much about the design problem as possible. Equally important are who the participants will be. Min Basadur speaks about this briefly when addressing the initial meeting with the client.<sup>4</sup> The designer needs to know who is the ultimate decision maker as sometimes it is not the person(s) who is discussing the problem as they could just be the messenger. Just as important is understanding who the people are that will be involved in the group session and what their roles are. When thinking about the multitude of factors that can affect how a group behaves, understanding the people involved is the most important

Fig. 7.1

Synthesis: Conceptual Model for Mitigating Shared Information Bias during the fact-finding session



step to developing the structure of the conversation. In addition to asking questions about the problem, the designer needs to ask questions about the people. What are their professions, what roles do they have in the company, do they know each other, how familiar are they with the situation, are there any known personality conflicts, etc.?

By understanding the context of the people involved, the better the designer can prepare for what could hinder or enhance information sharing. Herbert Simon called the human mind an adaptive system and this can easily also be applied to a group of human minds. Body, et. al. concurs and calls groups complex adaptive systems.

“A key characteristic of complex adaptive systems is that they comprise many individual agents who act independently, and this makes these systems inherently hard to predict and hard to reverse. The study of complex adaptive systems suggests ways to work with complexity, rather than against it. A reductionist approach to complex

adaptive systems does not work. Breaking systems down into smaller and smaller parts is not an answer for dealing with complexity because it does not allow the interdependencies between the parts to be observed. Complex adaptive systems are more sustainable when they can demonstrate more variety than other systems because this means they have more capacity to adapt and change. Complex adaptive systems, because they cannot be accurately predicted, can give rise to unintended consequences from planned interventions. Unintended consequences are often negative consequences. They can never be eliminated but through a strategic approach, involving multiple perspectives and extrapolation of time, they can be reduced.”<sup>5</sup>

There is an overwhelming amount of information about group behavior and it is not the intent here to turn designers into social or psychology experts (although there are designers who are) and be able to account for every scenario. As Lawson says “there are too many perspectives of the group for us to deal with such an idea more than very briefly here.”<sup>6</sup> Despite that, it is essential for designers to investigate not only how and which people are involved in the design process but also how they might affect each other. Design is not neutral because at some point the solution always has to integrate the human factor. Lawson continues on to say “...it seems at least sensible that designers should be aware of the way their thinking might be affected by group behavior, and of the way in which they can influence the thinking of other members of groups within which they work.”<sup>7</sup>

Being familiar with the unpredictability of human factors, designers should also know that no matter how prepared, they need to be prepared for unpredictability. “...participants unpredictability is one reason why facilitation is needed in the first place. If everyone behaved the same way, getting to the right solution for any given problem would be so easy there would be no need to facilitate anything.”<sup>8</sup> When the designer learns what they can about the potential people involved in the group session, they can take appropriate steps to start structuring the conversation. It may be that there will not be enough diversity in opinions or professions or ages or ethnicities.

Whatever scenario of people the designer thinks best for that particular design problem, they should try to influence the client to incorporate it and if it is outside of their control, adapt the conversation structure. Once the group participants are set, the designer can then move on to thinking about the various ways in which to initiate information sharing. It could be that the designer needs to prime the participants before the fact finding session even begins by sending homework to do or to build anticipation. It is up to the designer to determine the best foundation on which to start that session and this can only be completed by seeking to know the participants in that group.

## **Enable**

The first part is the designer needing to understand the context and the participants to begin building the structure of the conversation. The structure is then built with appropriate methods that enable the conversation to happen in a manner to maximize information sharing. As shown in the research analyzed in sub-question 1, there are a large quantity of variables that affect how and what people communicate and that free flowing, open type discussions are shown to reveal the least amount of information. This is due in large part to societal pressures and individual biases as detailed in Sub-Question 1. For these fact finding sessions, the designer can learn about past behaviors and use these, at best, to predict future behaviors. And those future behaviors are unpredictable because people are not rational. Rational in this case meaning logical in addition to having limited capacity to compute multiple difficult problems.

When faced with an overwhelming number of variables, the best course is to approach the discussion by focusing on methods that enable thinking rather than methods for mitigating. This can be done through three categories of methods plus facilitation skills. The first is through non-verbal methods (nominal). Although mentioned in several studies, the emphasis placed on these methods was about not talking to avoid group or social pressure, feelings of inadequacy or fear of negative feedback. Sometimes people just dominate the discussion and others don't get the opportunity to talk or express themselves.

Other times people fear being ridiculed, rejected or don't believe they have anything worth contributing. Nominal methods do provide sanctuary for those who feel those pressures but they also provide a space of calm and quiet for those who are introverts or just think better at a slower pace. It is much more difficult to engage deeper conscious thought when surrounded by multiple conversations or other distractions. There are many more nominal methods than the round robin process or casting a vote before the discussion as mentioned in some studies. It is the designer's responsibility to devise the most appropriate nominal method for the type of problem and group they are working with.

Just as there are different type of learners there are different types of thinkers. For example, artists are usually considered visual thinkers and designers could also be categorized that way. As mentioned in sub-question two about designers abilities, designers use drawing, sketching and modeling as a conversation tool with themselves and others. In a fact-finding session, they can develop and use methods that allow visual thinkers in the group to also think this way. In a typical office setting, the normal way of handling any type of conversation is through words. Either in meetings, emails, phone calls, memo's or slideshows with bullet lists, sketching or the use of pictures is considered a tool only for 'creative' types. This is not to say visual thinkers cannot communicate with words but providing a visual means of expressing themselves during the fact finding session may enable deeper thought and new ideas or the ability to express themselves and their

“We are visual creatures. When you doodle an image that captures the essence of an idea, you not only remember it, but you also help other people understand and act on it - which is generally the point of meetings in the first place. “

Tom Wujec, Author

*Imagine, Design, Create: How Design, Architects, and Engineers are Transforming our World*

opinion in a manner more compatible with their thought processes. For those who are not visual thinkers or would have never thought to have to express themselves this way, the newness will automatically engage System 2. Visual methods can include having people draw or try to represent graphically what they mean. It can also mean using visual prompts such as pictures or signs to initiate thought or to act as physical reminders of what perspective or frame they are using to answer the question of the moment. “With visual creativity, researchers have found that groups beat out solo workers - a finding that group researchers did not discover until recently.”<sup>9</sup>

The third type of method are physical methods or methods that involve getting up and moving around. These methods are not about having the type of movement be specific to the topic (although there is nothing wrong about that if it is possible). There are two reasons to have methods that involve movement. Just as with visual learners and thinkers, there are kinetic learners and thinkers and therefore people who think better when moving around will have that opportunity (sometimes called kinesthetic thinking). The other reason is because people embody their thoughts. In fact, it is believed that a person will react physically to their thoughts before even being able to acknowledge it.

Physical sensations of an emotion can precede their representations in their brain or in other words, physiology determines feeling.<sup>10</sup> Physical movement can also influence a person's thoughts and emotions. It is well known that faking a smile will actually make a person feel happier. Another study had participants make common gestures while listening to editorials. They were all told that they were helping to test out headphones. One group had to nod while the other group had to shake their head while listening. Those who were nodding were much more likely to accept the opinions in the editorials than those shaking their heads.<sup>11</sup>

When sitting around a table or facing someone, it is natural to mimic that person's emotions if they are stronger than yours. A study at the University of California over thirty years ago showed that if people sit facing each other with no one talking, within two minutes everybody will start feeling the same as the person in the group who is exhibiting (through facial expressions, body posture or gestures) the strongest emotions.<sup>12</sup> The takeaway is that what is happening physically to group participants matters. Sitting and facing the same people through a session will have some type of influence on each other. Using a method that enables people to move provides a break from the people next to them, wakes them up (physically and mentally) and literally gives members a different perspective of the discussion.

These three types of methods to enable conversation do not have to be autonomous. As stated before, it is the responsibility of the designer to develop the most appropriate methods for the fact-finding session and all three types could be

combined into one. Each of these methods provides different types of learners and personalities the opportunity to consciously think about what they know and share in a manner that works best for them. For others, having to think in a new way opens up the possibility of slowing down and thinking differently about the issue at hand. There is one more type of thinking style not yet mentioned, the auditory. For those who learn and think best by talking and listening, open discussion does work but it doesn't mean they aren't influenced by biases and social pressures or that open discussion is the best way.

The purpose of the three types of methods referenced here is not to suppress discussion but to provide structure to the discussion. During the session, as information is being shared in these multiple ways, in the transition from method to method, the designer will need to use facilitation skills to encourage proper behavior among the participants. Due to the unpredictability of people, these skills are essential to keep the fact-finding session progressing and members participating and sharing.

These methods also serve another purpose. They take participants attention away from each other and onto the task of completing the method. In studies where groups were asked to guess the correct answer, individuals were more accurate when attention was taken off of what other group members were saying and doing and the focus was on what they themselves knew. Surowiecki posited that there were four characteristics of wise crowds:<sup>13</sup>

1. Diversity of opinion: each person should have some private information, even if it is just an eccentric interpretation of the known facts.
2. Independence: people's opinions are not determined by the opinions of those around them.
3. Decentralization: people are able to specialize and draw local knowledge.
4. Aggregation: some mechanism exists for turning private judgments into a collective decision.

Methods, designed appropriately for the discussion, can create the environment where all four of these characteristics are present. Aggregation is more about convergence so it not relevant here other than to say that discussion should also be managed but in a different way. By diverting attention away from other members and onto the task, the importance of factors such as status, motivation, and trust are reduced as the importance of who is sharing the information is reduced and each piece of it is equally valued at this point. "One key to successful group decisions is getting people to pay much less attention to what everyone else is saying."<sup>14</sup>

“Independence is important to intelligent decision making for two reasons. First, it keeps the mistakes that people make from becoming correlated. Errors in judgment won’t wreck the group’s collective judgment as long as those errors aren’t systematically pointing in the same direction. One of the quickest ways to make people’s judgments systematically biased is to make them dependent on each other for information. Second, independent individuals are more likely to have new information rather than the same old data everyone is already familiar with. The smartest groups, then, are made up of people with diverse perspectives who are able to stay independent of each other.”<sup>15</sup>

Brian Lawson found “five distinct and fundamentally important conversational roles” adopted by designers in a design studio...these roles serve to structure and organize creative conversations which would otherwise become chaotic and confusing.”<sup>16</sup> These roles are not the exclusive purview of design studio teams. It is easy to imagine these roles being adopted by other types of teams working together on a project. These roles are:

1. Learner - one who absorbs what other say and remembers or learns
2. Informer - answers other queries
3. Critic - checks the validity of what others have said and makes comment on it, giving warning occasionally
4. Collaborator - tries to elaborate and build on what others have said rather than criticizing.
5. Initiator - begins a new conversational thread or develops a new perspective on the subject when others have no more to say.

As the designer progresses through the fact finding session, moves from method to method and more information is shared, they will need to adopt some or all of these conversational roles. Considering the context of this research, the designer may or may not be with other designers. Therefore, the designer could assign these roles to other group members explicitly through methods such as Personas, Idea Advocate or Role Playing to bring diversity into the conversation or indirectly through general questions or as prompts for thought during reflection. Although some group members may be naturally inclined to converse in a particular way, having to adopt an unfamiliar role pushes them to think about the topic in new and different ways.

The three types of methods mentioned here engage participants in different ways but they are also opportunities for the designer to frame the problem or opportunity in new ways. Framing the discussion from different perspectives brings diversity into the group should it be lacking. If a group is gathered together to discuss public transportation in a city, the discussion would miss a valuable

viewpoint if none of the group participants had ever used public transportation. For example, the methods could incorporate conversation prompts by asking participants to think about the problem as if they were a bicyclist, or if they were physically impaired, or a parent with a stroller or even the bus driver. Framing the question in addition to providing different ways of communicating can mitigate shared information bias as the group members engage System 2 thinking.

## **Teach**

The first component for the theoretical framework was about understanding the context in order to properly prepare before the actual fact finding session. The second component was to think of appropriate methods to enable discussion during the fact finding session. This third component is about continuing the mitigation of biases and enabling better discussion for future fact finding sessions, with or without a designer.

For the designer as facilitator, every group session is a teaching opportunity. The designer leads the discussion and with the introduction of the agenda, the methods, the process, the designer has a teaching moment available. By explaining and teaching the how and why of each action, the goal is to have group members learn new patterns of behavior. In the various studies, the ones where participants were given explanations always resulted in a higher quantity of information being shared. Research participants also became more self-aware of their own behavior as well as more observant of others.

The designer could just facilitate the session, gather information and move forward in the design process. That however, is not the purpose of this emerging role for designers. Tim Brown sums up why designers should be in this new role: “The designer must not be imagined as in intrepid anthropologist, venturing into an alien culture to observe the natives with the utmost objectivity. Instead we need to invent a new and radical form of collaboration that blurs the boundaries between creators and consumers. It’s not about “us vs. them,” or even “us on behalf of them.” For the design thinker, it has to be “us with them.”<sup>17</sup> Through training and experience, designers are naturally system 2 thinkers and they have the opportunity to teach others to be that way as well.

As mentioned previously, it is easier to recognize other people mistakes than ones own. This doesn’t mean that people can’t learn. Often, throughout his book, Kahneman would provide examples of when he would catch himself behaving in a biased way. One such example was in grading papers. He found that he was behaving under the influence of a halo bias which is a bias toward liking something more because of it’s association with something else he likes. This bias is the foundation of endorsement deals for celebrities and athletes. Just because

the athlete is well liked, the fan is much more likely to purchase the product they endorse even though without that association, they had always bought a different product. For Kahneman, his students had written two papers that were stapled together.

He started grading by grading both papers for the same student before moving on to the next student. After a while he realized that when grading the second paper of the same student, if he had given the first paper a high grade, he was giving the second paper a higher grade than some deserved. He mitigated this by grading all the first papers first and putting the grades on the inside of last page rather than on the front page so he wouldn't see them. Then he started over with grading the second papers. The result was that the grades ended up being very different than the initial round of evaluation.<sup>18</sup>

Because he is a psychologist, professor and this is his field of study, it makes him more prone to being self-aware and devising ways to circumvent the influence of heuristic biases. For those who are not Kahneman or other in those fields, being self-aware is a much harder task. Through the numerous iterations of the hidden profile paradigm and other studies, one repeated finding was that participants who were told about the bias before, during and after in various studies all increased the amount of information shared. Training participants about the bias took on the form of distributing information about the bias beforehand, training participants about typical group dysfunctions in general or asking participants beforehand to plan how they were going to approach their discussion before they actually had the discussion. All of these methods increased the amount of information shared but it did not expose all of the hidden information all of the time.<sup>19</sup>

Another example Kahneman gave about catching himself operating under a bias (this time the planning fallacy) was in the development of a text book. The planning fallacy is a behavior bias where people, despite all evidence to the contrary, underestimate the time it will take to complete a task. For Kahneman, he and a team of other experts developed a plan for writing a text book. They met regularly, felt they were making good progress and all believed that they would finish in two years. Well into the first year, it occurred to Kahneman to ask one of his team mates if he knew of or had ever participated in a similar group and how long it had taken them to finish. Everyone was very surprised to learn that some teams never finished and for the ones who did, the shortest amount of time to finish was seven years!

Despite learning this and knowing that the source of the information was very credible and had first hand experience, the group continued on the belief that they would finish in two years. They kept working and ultimately, and with many changes to the team members, they completed the work in eight years.<sup>20</sup> As a

facilitator, designers bring the much needed outside view so that the information of 'seven years' would have been incorporated from the beginning rather than after multiple people had already committed many hours into the implementation of the plan.

As smart and as experienced and knowledgeable as that textbook writing team was, their major fallacy was they never questioned their assumptions. They were not thinking like a designer. They started on the belief that they should create a textbook better than the ones currently out there and never wavered from that goal. The designer would have first asked questions about the existing textbooks, what they lacked or didn't, what parts were better than others, what should be included and why, and why they felt the new one would be better than the existing before even thinking about how long it would take to finish. Essentially, they would have questioned the assumptions of the premise altogether before any work was started.

Another scenario in which assumptions influence behavior is in a typical corporate office meeting. In these meetings, the same people usually gather together and they all know each other and meeting behavior is a habit. The positions people take and what people are expected to say are already anticipated in some way. Everybody knows who will talk about the budget or who will not actually say anything or the two people who always sit together and have side conversations. Knowing this before entering the meeting, people are primed to react in a predetermined way and this does not bode well for gathering unbiased information.

A study that highlights this is one Kahneman was involved in as a graduate student. He and his colleague were studying how pupils changed sizes depending on the difficulty of the problem the research participant had to solve. The more difficult the problem, the larger the pupil became. What really interested Kahneman was when he learned that 'small' talk did not make the pupil change in size. Casual conversations did not require any cognitive effort.<sup>21</sup> Meetings like these corporate ones are much like small talk. When participants have ingrained meeting behaviors, the chances that people will engage in deeper thinking is minimal. That is why companies hire outside consultants like IDEO. They bring the outside perspective, they bring in new, diverse thinking, they break the behavior pattern of the meeting participants and they engage System 2 thinking.

For optimal information sharing, the designer must engage participants System 2. Without that deeper engagement, design thinking cannot happen. While the first goal is to share all information necessary to appropriately frame and solve the problem, the designer is teaching group members to think like a designer. Armed with the understanding behind the design process and the why and how of the methods of conversation, participants can hopefully structure future conversations

for the better. People will learn to reflect and new behaviors and habits will be learned and design thinking will become the default way to think about problems. With repetition, this type of thinking will start being applied to other aspects or problems without the aid of the designer. Continuing on with this line of inductive reasoning, issues such as Kahneman had with the text book work group can be approached differently and more realistically saving time, effort and money.

This third component of mitigating information bias sounds idealistic when in actually it is based in rationality. It is rational because it is the same reasoning behind why designers are moving into the business side of companies and why design consultant companies like IDEO are expanding beyond the creation of a product into designing experiences and services and even business models. It is the same reasoning behind why Don Norman retracted his article on calling design thinking a useful myth.

Although he maintains that design thinking is not exclusive to designers, “in design, there is an attempt to teach it as a systematic, practice-defining method of creative innovation. It is intended to be the normal way of proceeding, not the exception.<sup>22</sup> A designer taking the opportunity to teach design thinking should be the normal way of proceeding. In the *Power of Design*, the two main ideas put forward by Richard Farson is that everybody can design and that designers have an enormous opportunity to change the world for the better. This third component speaks directly to that effort.

Fig. 7.2

Synthesis: Conceptual Framework for mitigating Shared Information Bias during the fact-finding session

<b>Current State</b>	Social and Group Influences are unavoidable	Not all relevant information is being shared due to cognitive and other influences	Sub-optimal behaviors are repeated in other meetings
<b>Designer Facilitator Role</b>	Understand	Enable	Teach
<b>Purpose</b>	To understand who the participants are and their interconnectedness if any. To understand the problem space and the relationship that the participants have to it.	To design appropriate methods to create an environment and structure the conversation so it enables and fosters conscious thinking.	To teach design thinking to enable future optimal group conversations.
<b>How</b>	By gathering information about the problem space, interviewing the client and determine who should be involved in the fact finding session.	By creating methods that are visual, kinetic and/or nominal to allow for different type of thinkers to fully engage in System 2 thinking.	By providing explanations for the what and why of the methods and by explaining and modeling process skills.
<b>Why</b>	Learning as much information about participants and the problem space provides the opportunity to engage the appropriate participants, anticipate potential irrational behavior, design the conversation and methods.	Enabling participants to think in a manner that works best for them and yet provides new ways of thinking for others focuses effort and engages System 2 thinking.	Because to design is a basic human capacity and that can be trained to higher levels of expertise.
<b>When</b>	Before fact-finding session	During fact-finding session	Ongoing
<b>Results</b>	Openness to other opinions and options.	More thinking before talking, better quality and quantity of information.	More information, opportunity for learning.



“You cannot hold a design in your hand. It is not a thing. It is a process. A system. A way of thinking.”

Bob Gill, Designer, Author  
*Graphic Design as a Second Language*

## RESEARCH CONCLUSION

### **Managing Complexity**

Don Norman says, “the keys to coping with complexity are to be found in two aspects of understanding. First is the design of the thing itself that determines its understandability. The second is our own set of abilities and skills: Have we taken the time and effort to understand and master the structure?”<sup>1</sup> Norman gives the example of a electronic keyboard and the incomprehensible layout of the numerous buttons. The design is not understandable. He and his wife made a concerted effort to understand it but between the physical layout and the badly written instructions, the complexity could not be managed. For a fact-finding session, the complexity to manage is the wicked problem of the group and the information they need to share. The designers needs to take the time to understand the participants of the group. The group is a ‘complex adaptive system’ that the designer might or might not be able to influence the composition of. Can the designer understand it? To a certain extent they can as long as they understand they need to prepare for the unpredictable. As much of an oxymoron as that may be, people also tend to be unpredictable in predictable ways. That is the first step for managing this complexity.

The second step is for the designer to understand their own abilities and what they can do for this fact-finding (or any other type) session. What skills are the most appropriate? What is relevant for this particular session? How good are their process skills or their facilitation skills? What biases might the designer unknowingly or knowingly be under the influence of: personal biases of behavior toward certain people or preference biases for specific solutions that could be affecting their behavior and choices? By acknowledging their own strengths and weaknesses, being self-aware of their own biases, they can capitalize on their strengths to help manage the groups complexity.

“One of the essential difficulties and fascinations of designing is the need to embrace so many different kinds of thought and knowledge.”<sup>2</sup> One area of thought that is at the root of design and that cannot be ignored is the attempt to understand people. There is no greater complexity to manage than people and design cannot ever separate itself from people. It is interesting to note that two highly respected

designs authors are very much concerned with human behaviors and the need to design while factoring those in: Richard Farson and Don Norman. Dr. Norman is a cognitive scientist and philosopher by education and Dr. Farson is a psychologist. In chapter 24 of his book *The Power of Design*, Dr. Farson lays out guiding principles of human behavior for design teams. These guiding principles are assumptions that designers should make about people because it “will help make the behavior understandable even if it is seemingly irrational at the outset... so that we enter the communication design process with a checklist of reminders about the counterintuitive aspects of human behavior.”<sup>3</sup> Dr. Norman, devotes two chapters to explaining human behavior and why this knowledge needs to be incorporated into the design of everyday things. Without that knowledge, bad design is what results. In *The Magic of Design* by Jon Kolko, he says “the text presents a framework of synthesis, borrowing heavily from research related to human behavior.”<sup>4</sup> Clearly understanding humans is a necessary endeavor for designers.

### **Future Research Opportunities**

In this new role of facilitation, designers are interacting with people at earlier and earlier stages of the design process. The fact finding stage is the least glamorous because the problem is at its messiest stage. Everything is open, there are multiple parallel lines of thought, confusion and discord and disagreement with no clear solution. Emotions are at their most intense as people fight to have ‘their’ solution to the problem be the right one and are not being open minded to other perspectives. The more structure and clarity a designer can bring to this stage, the easier the rest of the design process can be.

There are many opportunities for future design students to explore regarding the interaction of social science and design. Some examples that come to mind is investigating ways to control emotions in participatory groups to generate ideas. Another could be trying to quantitatively explore the differences if any between the three types of methods mentioned above for mitigating shared information bias. Or focusing even more on the differences of information generated within one type or category of method. These could be just the beginning of future research that this thesis topic did not have time to fully explore.

One last thought regarding designers as facilitators. For Russ Unger and his colleagues, there wasn’t any confusion or creative leap to why designers would be facilitators. “We are designers, and as designers, we think about how people interact with the world around them. We love to do research and we love to watch users doing their thing because these are the activities that help us perform the actual design activities that shape our work, which we like to think we’re already good at. It takes skill and practice to be able to facilitate people, and facilitation is truly the foundation of an effective design practice. Facilitation skills help us collaborate with and lead others to ensure that their ideas have been heard and have contributed to the design process.”<sup>5</sup>





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1. Dubberly, Hugh, and Shelley Evenson. *On modeling The analysis-synthesis bridge model*. interactions 15, no. 2 (2008): 57.
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1. Stasser and Titus, *Pooling of Unshared Information in Group Decision Making* 1467
2. Lu, et al., *Twenty-Five Years of Hidden Profiles in Group Decision Making* 56
3. Michael Bond, *The Power of Others*, xiii
4. Bond., 68.
5. Ibid., 70.
6. Ibid., 7.
7. Ibid., 10.
8. James Surowiecki, *The Wisdom of Crowds*, 176
9. Kahneman, *Thinking Fast and Slow*, 8.
10. Dreu, et al., *Motivated Information Processing in Group Judgment and Decision Making*, 24.
11. Herbert Simon, *Invariants of Human Behavior*, 7.
12. Simon. 8.
13. Ibid.
14. Haselton, et al., *The Evolution of Cognitive Bias*, 970.
15. Kahneman, 98.
16. Ibid., 119.
17. Ibid., 129
18. Simon, 9.
19. Kahneman, 151.
20. Ibid., 20.
21. Ibid., 21.
22. Ibid., 25.
23. Ibid., 28.
24. Ibid., 40.
25. Ibid.
26. Ibid., 45.
27. Chablis and Simon, *The Invisible Gorilla*, 65.
28. Kahneman, 65.

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1. Horst Rittel, *The reasoning of designers*, 1
2. Eng and Salustri, *Design as... Thinking of What Design Might Be*, 8.
3. Robert Curedale, *Design Thinking process and methods manual*, 13
4. Tim Brown, *Change by Design*, 42
5. Brown, 4.
6. Ibid.
7. Ibid., 16.
8. Don Norman, *The Design of Everyday Things*, 218.
9. Norman, *The Design...* 219.
10. Don Norman, *Rethinking Design Thinking*, [www.Core77.com](http://www.Core77.com)

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11. Idris Mootee, *Design Thinking for Strategic Innovation*, 63.
12. Mootee, 32.
13. Lawson and Dorst, *Design Expertise*, 70.
14. Lawson and Dorst, 70.
15. Ibid.
16. Body, et al., *Design Facilitation as an Emerging Design Skill: A Practical Approach*, 65.
17. Brian Lawson, *How Designers Think*, 52.
18. Nigel Cross, *Designerly Ways of Knowing*, 54.
19. Kees Dorst, *Understanding Design*, 134.
20. Dorst, 134
21. Kaner, et al., *Facilitator's Guide to Participatory Decision-making*, 66.
22. Herbert Simon, *Invariants of Human Behavior*, 7.
23. Sanders and Strappers, *Co-creation and the new landscape of Design*, 15.
24. Sanders and George, *A Social Vision for Value Co-Creation in Design*, 212.
25. Chris Conley, *Leveraging Design's Core Competencies*, 46.
26. Richard Buchanan, *Wicked Problems in Design Thinking*, 17.
27. Lawson, *How Designers Think*, 56.
28. Cross, 102
29. Kolko, 13.
30. Dorst, 132
31. Sanders and Strappers, 3.
32. Min Basadur, *Simplex, A Flight to Creativity*, 270.
33. Buchanan, 17.
34. Conley, *Leveraging Design's Core Competencies* 46.
35. Buchanan, 5.
36. Rittel, 135.
37. Rittel, 136.
38. Dorst, 111.
39. Lawson, *Think*, 57.
40. Rittel and Webber, *Planning Problems are Wicked Problems*, 137.
41. Rittel, *The Reasoning of Designers*, 2.
42. Lawson, *Think*, 62
43. Conley, 46
44. Lawson and Dorst, *Design Expertise*, 42.
45. Brown, *Change by Design*, 86.

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1. Kahneman, *Thinking Fast and Slow*, 24.
2. Kahneman, 28.
3. Lawson, *How Designers Think*, 184.
4. Delbecq and Ven De Ven, *Nominal Versus Interacting Group Processes*, 207.
5. Lawson, *How Designers Think*, 43.
6. Tversky and Kahneman, *The Framing of Decisions and the Psychology of Choice*, 454.

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2. Don Norman, *Design of Everyday Things*, 45
3. Norman, *Everyday Things*, 47
4. Min Basadur, *Simplex, A Flight to Creativity*, 270.
5. Body, et al., *Design Facilitation as an Emerging Design Skill: A Practical Approach* 62.
6. Brian Lawson, *How Designers Think*, 243.
7. Lawson, 243.
8. Unger, et al., *Designing the Conversation*, 34
9. Keith Sawyer, *Group Genius, The Creative Power of Collaboration*, 69.
10. Michael Bond, *The Power of Others*, 12.
11. Kahneman, *Thinking Fast and Slow*, 52.
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14. Surowiecki, 65
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16. Brian Lawson, *What Designers Know*, 89.
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18. Kahneman, 83.
19. Diane Baker, *Enhancing Group Decision Making*, 255.
20. Kahneman, Chapter 23.
21. Kahneman, 34.
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2. Brian Lawson, *How Designers Think*, 13.
3. Richard Farson, *The Power of Design*, 163
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# APPENDIX

Appendix A

Appendix B

## APPENDIX A

# LITERATURE REVIEW

Sanders, Elizabeth, and Peter Strappers. "Co-creation and the New Landscapes of Design." *CoDesign* 4, no. 1 (2008): 5-18

This article covers many aspects of design with a focus on co-creation. For the interests of this research, the relevant information is about the changing role for designers and researchers to act as facilitators in the evolving landscape of design. Taken broadly, the designers and researchers are working with groups who will have different levels of ability and engagement that must be considered during the design process.

Kahneman, Daniel. *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, 2011. Print.

Dr. Kahneman is Emeritus Professor of Psychology at Princeton University and Nobel Peace Prize Winner for Economics. In this book, he details the two systems that drive the way we think. System 1 is fast, intuitive and emotional. System 2 is slower, more deliberate and logical. We learn about the capabilities and faults of both systems and most startlingly, how little control we have over the way we think. We learn about how much attention we are able to give to something, how lazy our brain is (cognitive ease) and the excessive confidence in what we believe we know and the inability to acknowledge the full extent of our ignorance and uncertainty of the world we live in.

The speed at which we are called upon to respond to the stimulus in the world does not allow for deep thinking or we would not be functional as human beings if there was a constant need to re-learn what we need to know. Through numerous studies and collaborations with a longtime colleague Amos Tversky, Dr. Kahneman developed the theory of heuristics and biases. Biases being tendencies to think or behave in certain ways due to the nature of heuristic thinking.

That doesn't mean we are helpless and have a total lack of control over our minds. There are techniques and insights into how to prevent or protect ourselves from the mental glitches these two systems run into. This book along with *The Wisdom of*

Crowds by James Surowiecki and the initial study by Stasser and Titus serve as the foundation for developing the problem statement. The biggest takeaway from learning about the two systems of thinking was how easily we are influenced and how little control over our thoughts we have.

Stasser, Garold, and William Titus. "Pooling of unshared information in group decision making: Biased information sampling during discussion." *Journal of personality and social psychology* 48.6 (1985): 1467.

Garold Stasser is Professor Emeritus at Miami University in Ohio and William Titus is a Professor of Psychology at Arkansas Tech University. This particular study on the effects of biased information sampling in group decision making serves as a benchmark for other studies on shared information bias. Through their research, Stasser and Titus created a model of research called the hidden profile paradigm that identifies several sources of bias in unstructured, face to face discussions when a consensus decision is required. Two of the biases they uncovered was shared information bias and preference bias.

The amount of replication of these studies and the variety of fields who do their own studies give credence to the long lasting importance of trying to understand this behavior.

Body, John, Nina Terrey, and Leslie Tergas. Design Facilitation as an Emerging Design Skill: A Practical Approach. *Proceedings of Design Thinking Research Symposium 8* (2008): 61-70.

John Body is the founder and partner of ThinkPlace, a strategic design consultancy firm that specializes in complex design work that delivers public value. His expertise is in strategy, service and organizational design and he is recognized as a facilitator of high-level forums. He draws upon this expertise and experience to explore what he recognizes as an emerging role for designers: Design facilitation. In this paper, he details why this new role is becoming necessary, then lists the specific competencies required for this role and then concludes with specific actions to consider a facilitation session. Body holds an M.A. in Chaos and Complexity Theory from the University of Western Sydney.

Delbecq, Andre L., and Andrew H. Van de Ven. "A group process model for problem identification and program planning." *The Journal of Applied Behavioral Science* 7.4 (1971): 466-492.

This paper is required reading for MBA students in the MBA program at the Carlson School of Management at the University of Minnesota. This paper provides instruction for MBA students on how to identify problems and create solutions using a five step process called PPM. Each phase of the process involves gathering different stakeholders together and utilizing certain methods for gathering information and making decisions. They also provide theoretical explanations of why the methods they use are appropriate for the particular phase of PPM.

Delbecq, Andre L. "The effectiveness of nominal, delphi, and interacting group decision making processes." *Academy of Management Journal* 17.4 (1974): 605-621.

For this particular paper, some of the methods that are used in the previously discussed PPM model for problem finding and program planning are discussed in depth. Nominal decision making is when participants do not talk with each other. Interacting is the typical discussion group where ideas and information is shared verbally. Delphi is when group participants are scattered and ideas and information are collected via surveys and other technological methods. Results proved that the nominal proved the most effective at eliciting the largest quantity of ideas.

Kerr, Norbert L., and R. Scott Tindale. "Group performance and decision making." *Annu. Rev. Psychol.* 55 (2004): 623-655.

Kerr and Tindale are both professors of psychology at Loyola University and Michigan State University, respectively. This article reviews theory and research on small group performance and decision making. They provide a good overview of the classic topics, newer areas of research and new ways of researching classic topics. They then detail some of the findings from their reviews that identified additional factors to consider regarding group performance. The article concludes with an overview of different methods groups make decisions and the consequences of such. Of most interest was the information on brainstorming and their conclusion that group processes for decision making matter as the same process in different contexts can lead to both good and bad results. Additionally good results are not always the best results as groups tend to satisfice.

Mosier, Kathleen L., and Ute M. Fischer. "Judgment and decision making by individuals and teams: Issues, models, and applications." *Reviews of human factors and ergonomics* 6.1 (2010): 198-256.

Mosier and Fisher both have PhD's in psychology and are authors of a book titled "Informed by Knowledge" which is about "how experts adapt to complexity, synthesize and interpret information in context, and transform or "fuse" disparate items of information into coherent knowledge." (Amazon) This article is about decision making divided in two sections, the front end and the back end of a problem solving process. For purposes of this thesis proposal, the front end is the most relevant. Mosier and Fisher investigate how decisions are made relative to the environment, the use of heuristics, and then provide multiples models of decision making such as the lens model, decision ladders and others. They start with individuals making decisions and then differentiate that from how this information applies to team decision making.

Stasser, Garold. "The uncertain role of unshared information in collective choice." *Shared cognition in organizations: The management of knowledge*(1999): 49-69.

Expanding on the work Stasser conducted with Titus in 1985, this article talks more explicitly about what happens to the information that isn't shared in small group decision making. Now that they know why this information is not shared, they explore methods to enable this unshared information to be shared. In this process they identify more small group decision making biases such as rehearsal effect and social validation. These biases impact why the newly shared information is often ignored.

They also discovered that oftentimes, the later in the meeting the unique information is shared, the more likely it will be ignored by the other. Therefore, the timing of entry when sharing the information matters with the most optimal time being during the initial discussion period.

Wittenbaum, Gwen, Sandra Vaughan, and Garold Stasser. "Coordination in task-performing groups." *Theory and research on small groups* (2002): 177-204.

This study about task-performing groups focus on how a group coordinates getting together and how they coordinate themselves once they are together and how this affects the task they have to perform and the decisions they have to make. Part of the coordination of preparing to gather is the dissemination of information and the resulting knowledge that group members arrive at the gathering with. This has implications for designers to handle pre-consults or the way they set up a design event.

Milliken, Frances J., and David A. Vollrath. "Strategic decision-making tasks and group effectiveness: Insights from theory and research on small group performance." *Human Relations* 44.12 (1991): 1229-1253.

Designers as facilitators often work with groups/companies to help define strategy. This article focuses on the tasks necessary to create a strategy and tries to integrate the research on small group performance in order to maximize the effectiveness of these tasks. They use a model where there are three inputs that affect group interactions; individual factors, group-level factors and environmental factors.

Lu, Li, Y. Connie Yuan, and Poppy Laurretta McLeod. "Twenty-Five Years of Hidden Profiles in Group Decision Making A Meta-Analysis." *Personality and Social Psychology Review* 16.1 (2012): 54-75.

This article is a meta-analysis of 65 different studies that are based on the original Stasser and Titus 1985 study on hidden profile group decision making. The meta-analysis confirmed, once again Stasser and Titus findings but also uncovered variables that can affect group decision making in this type of research. Of the five

variables, group size, total information load and the percentage of unique information out of the total information available were documented as influencing an individual's ability to bring up hidden information. In other words, these variables are about the individuals within a group and their ability to be able to process only a certain amount of information at one time. The overall conclusion is that group decision quality is negatively affected when information stays hidden.

Houghton, Susan M., et al. "No Safety in Numbers: Persistence of Biases and Their Effects on Team Risk Perception and Team Decision Making." *Group & Organization Management* 25.4 (2000): 325-353.

In this article, the authors explore how individual cognitive biases persist when individuals become part of a team. They cover three biases in their study; the law of small number bias, illusion of control and overconfidence and their effect on a team risk perception. Small number bias is when an individual systematically relies on a small sample of information to make judgments. Illusion of control is when an individual overestimates their ability to control whether something is a success or not. Overconfidence is when an individual believes they know more than they do. The main interest is not the results but how individual cognitive processes affect team behavior.

De Dreu, Carsten KW, Bernard A. Nijstad, and Daan van Knippenberg. "Motivated information processing in group judgment and decision making." *Personality and Social Psychology Review* 12.1 (2008): 22-49.

This article takes the point of view that groups are information processors that are motivated by the mixed individual motivations of group members. They expand on prior research about groups as information processors and investigate how social motivation and epistemic motivation of the individuals that make up the group affect group decisions. They show their results through a model (MIP-G). This article is particularly useful for its in-depth look at the social and epistemic motivation.

Tversky, Amos, and Daniel Kahneman. "The framing of decisions and the psychology of choice." *Science* 211.4481 (1981): 453-458.

Kahneman, a psychologist who won the Nobel Prize for economics and Tversky, also a psychologist often collaborated together on cognitive science and decision making research. In this paper, Tversky and Kahneman show that individuals rely heavily on preference to frame their decisions which has large consequences for the theory that human beings make rational choices. This preference is dictated by imperfections of human perceptions and the fact that when choices are framed differently, people change their decisions even if the consequences of all choice options remain the same.

Baker, D. F. Enhancing Group Decision Making: An Exercise to Reduce Shared Information Bias. *Journal of Management Education* 34, no. 2 (2009): 249-79. doi:10.1177/1052562909343553.

Diane F. Baker, is a Professor in the Else School of Management, Millsaps College. In this white paper, Baker replicates the original Stasser and Titus study with students from her classes. The effort was not only to see if her experience replicated it but also for the implications of teaching the students prior to the study about the shared information bias and other group dysfunctions. The goal was to see if knowing beforehand increased the amount of pooled information, which it did although again, not all information was shared. The students, in the debrief after the exercise was over did reflect that having that knowledge beforehand did increase their awareness of their own behavior and also helped them be more aware of when others started exhibiting dysfunctional behavior.

Basadur, Min. *Simplex, a Flight to Creativity*. Creative Education Foundation, 1994.

As the main textbook for the M.F.A. in Visual Communication and Design at Herron School of Art and Design, this book was interesting and useful for several reasons for this thesis study. First, there is no language in this book at all about design. This was an instructional book on how to increase creativity using an eight step process with detailed instructions on the step by step process developed by Dr. Basadur. Because it didn't reference design, it was interesting to see the parallels and differences between this book and others books that focused on design. These similarities and differences speak to how often the same subject and its supporting information is framed differently depending on the audience.

This book also served a what could be referred to as a middle ground book. Middle ground meaning this book stands in the middle between books about design where they are focused mostly on designers who are interested in design and books that focus heavily on Design Thinking as an innovation tool that, while champion design thinking, does so from an outsider perspective with more of an emphasis on showcasing their own work vs. teaching how to integrate it into the normal corporate environment.

*Simplex*, while still full of examples of product design, tells its story from the perspective of the business side rather than the 'creative' side. It also advocates for not just learning the *Simplex Process* but also teaching it to other within the individual's organization.

Body, John, Nina Terrey, and Leslie Tergas. *Design Facilitation as an Emerging Design Skill: A Practical Approach*. *Proceedings of Design Thinking Research Symposium 8* (2008): 61-70.

Bond, Michael Shaw. *The Power of Others: Peer Pressure, Groupthink, and How the People around Us Shape Everything We Do*. London: Oneworld Publications, 2014.

Michael Bond is a journalist who specializes in reporting and writing about psychology and behavior. He has written two books and his works appear regularly in major news publications worldwide.

What was most fascinating and informative about this book was how it showcased how much other people influence us even when alone for months on end. This book is full of interesting stories with research from academia on interpersonal and group interactions and how they affect behavior. It also had interviews with people such as a person who spent over five months alone in the frozen tundra of Greenland and the scientists who spent months together, pretending they were isolated while traveling to Mars. The conclusion was that no matter the circumstances, humans are social through and through and the influence other people have on us is inescapable.

Brown, Tim. *Change by Design*. New York: HarperCollins, 2009.

Tim Brown is the CEO of IDEO which is a well known and celebrated design consultancy firm. From its early ties to Apple and the first mouse and its connection to Stanford and its DSchool through David Kelley; IDEO is sometimes looked upon as the standard for bringing design thinking into the business world.

This book was informative on IDEO processes and what works well for them. It was full of great stories of successes and Tim Brown tried to break down how they did it so other companies and people could be design thinkers as well. It was a great cheerleader book for how well design thinking can and does work. IDEO has a great diversity of professions in its design teams who know how to follow process rules and work together in multi-disciplinary teams.

While he talked about design thinking in terms of innovation, Tim Brown also talked about how human centered this way of thinking is.

Chabris, Christopher F., and Daniel J. Simons. *The Invisible Gorilla: And Other Ways Our Intuitions Deceive Us*. New York: Crown, 2010.

Christopher Chabris is a Professor of Psychology at Union University and Daniel Simons is a Professor of Psychology at the University of Illinois. While this book overlaps a little bit with *Thinking Fast and Slow*, the latter broadly encompasses not only the decades of research Kahneman and Tversky did but studies done by others that delved more deeply into cognitive psychology. Chabris and Simons focus and highlight how limited we are in our capacity to pay attention.

From the invisible gorilla test to another where they switched people in the middle of a conversation without one person, failure to notice big errors in movies, this book showed how easily people can miss things even when it is something right in front of them. Taking this into the group meeting context, there is a lot happening and this book showed how hard it is to listen, think, remember and compute, especially during open discussion where distractions abound.

Cross, Nigel. *Designerly Ways of Knowing*. London: Springer, 2006.

This book, while small, is heavy in the depth of detail about the distinctive ways of design. With many examples of dialogue, this book had a very academic, text book feel to trying to understand and distinguish design from other fields of study.

This book, along with those by Bryan Lawson and Kees Dorst, served as the literature foundation for research into design abilities and expertise. In the academic world, research and opinions and theory have to be verifiable and quantifiable to give itself validity and credence. In the design world that is a tougher task due to the nature of the problems designers work on and the subjective nature of design itself. This book along with those written by Lawson, Dorst are the closest that come to having that academic rigor expected of a cited work.

Dorst, Kees. *Understanding Design*. Amsterdam: BIS, 2006.

See above review of *Designerly Ways of Knowing*. Although Dorst is mentioned above, this book is not combined with those that lean more toward academic texts. Not because what is written is not valid or informative. It is simply because the style and content is meant to be more anecdotal and provide a broad view of the different way to look at Design rather than an in-depth look at any particular area of design. This format helped to form the thesis problem by first providing that broad perspective and then being able to decide which ones were more relevant than others to narrow the scope of research.

Dubberly, Hugh, and Shelley Evenson. On modeling The analysis-synthesis bridge model. *interactions* 15, no. 2 (2008): 57-61.

There is detail in the text about this paper but it should be mentioned that another model mentioned also strongly influenced the research process: The Kaiser-IDEO model. The Kaiser-IDEO model is very similar to the bridge model but rather than the emphasis on models to move through the different sections, it is storytelling and brainstorming that is used. When starting and then conducting the thesis research, the process evolved. First it was the five step CASPI model that then evolved to this bridge model. Then when it reached the bridge between analysis and synthesis, the researcher found that it was more helpful to create scenarios and stories about what could be rather than creating multiple iterations of models.

In the end, the decision was made to tell the story of the process through the analysis-synthesis bridge model while telling stories in the text better illustrated the meaning behind the models. That is the beauty and advantages of the design process: there isn't any one right way.

Farson, Richard Evans. *The Power of Design: A Force for Transforming Everything*. Norcross, GA: Greenway Communications, 2008.

Richard Farson is a psychologist, author and educator. This book is an argument for that design, when done right, with the best intentions can transform the world. Although the content in this book did not heavily contribute to the research, it did contribute in that Dr. Farson is a psychologist who understands not only the impact of design but the need to understand people in order to create good design. He and this book is an argument for the intersection of social sciences and design, not just business and design.

Janis, Irving L. Groupthink. *Psychology Today* 5, no. 6 (1971): 43-46.

Irving Janis was a research psychologist at Yale University and a professor emeritus at the University of California at Berkeley. His theory of 'groupthink' has become the 'go to' word and excuse for when groups behave in a strongly dysfunctional way. Examples include the group that decided to not worry about the damage to space shuttle Columbia that happened during takeoff and the group that decided invading the Bay of Pigs was a great idea. What was most interesting and why it is included in the literature review is that in several books regarding methods, when given an explanation for why a particular method will work, negating 'groupthink' is often cited as an example which speaks to the importance of diversity and using nominal methods to reduce social influences.

Kaner, Sam, Lenny Lind, Catherine Toldi, Sarah Fisk, and Duane Berger. *Facilitator's Guide to Participatory Decision-making*. 3rd ed. San Francisco: Jossey-Bass, 2014.

There are many books about how to facilitate but this one was most interesting in that it uses the double diamond, divergence and convergence thinking model to increase participation. It was a well written book with large text, lots of diagrams and effectively used pictures other visual cues emphasize certain points or expand upon ideas. This is relevant in that the book was formatted to model the very things that they were writing about in what makes a good facilitator.

This book also echoed many of the points that Min Basadur was saying in his book *Simplex*.

Lawson, Bryan, and Kees Dorst. *Design Expertise*. Oxford, UK: Architectural Press, 2009.

This book, more so than any others, provided a lot of great information about designers. It echoed a lot of what Lawson said in *How Designers Think* but from a slightly different perspective, delving more deeply in some areas than others.

Manzini, Ezio, and Francesca Rizzo. *Small Projects/large Changes: Participatory Design as an Open Participated Process*. *CoDesign* 7, no. 3-4 (2011): 199-215. doi:10.1080/15710882.2011.630472.

This paper was informative because it was one of the few that spoke directly about designers as facilitators. What was most interesting about this article was the role of designers being strategic as facilitators. Rather than just facilitation being necessary and a part of the problem solving process, they spoke about how designers can be the leaders in creating these facilitation events and actively looking for opportunities to find problems to solve.

Mootee, Idris. *Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School*. Hoboken, NJ: John Wiley & Sons, 2013.

Idris Mootee is CEO of Idea Couture which is a multi-national design firm much like IDEO. The book was similar to *Change by Design* in that it is about using design thinking as a tool for innovation but the focus was more on business strategy rather than product development. It did contain success stories but the main story was an argument for why companies need to use design thinking as they develop their strategies and also provided information for how to do so.

The layout was visually very different than Tim Browns' book and a welcome addition to the use of design thinking in the business context.

Norman, Donald A. "1." In *Living with Complexity*. Cambridge, MA: MIT Press, 2011.

Only the first chapter of this book was used for this research but it was a very informative chapter. The research for this thesis was complex because the depth of topics was so vast and nothing can be more complex and attempting to study a topic that is complexity itself. This chapter provided guiding words to conduct research by and a different way of looking at the research and being able to synthesize and resolved the conclusion.

Norman, Donald A. *The Design of Everyday Things*. New York: Basic Books, 2013.

This book about the good and bad design of everyday products and this thesis research project is not about everyday products. This book though, is also about the interactions of people and products and those are human factors and they are relevant to this thesis topic. Don Norman is also a cognitive scientist by education and though the book is about the design of products, it was highly informative to read about the section on the psychology of everyday products. Those chapters, along with his words on what design thinking made an important connection between what at times seemed like disparate pieces of research areas.

Root, Robert and Root-Bernstein, Michele *Sparks of Genius: The Thirteen Thinking Tools of the World's Most Creative People*. Boston, MA: Houghton Mifflin, 1999.

Robert Bernstein is a professor of Physiology at Michigan State University and Michele Root-Bernstein is a historian and teacher of history and creative writing. Like *Simplex*, this book is about creativity and not design but the language and topics are very much align with literature regarding design. It was an interesting intersection of design, science and art since the book uses examples of creative people from all different fields. Much of the examples of the thirteen tools used language that was very similarly to aspects of cognitive science and design such as framing, observation, embodied feelings and making assumptions. This book provided a fresh perspective for looking at the combination of art, design and the sciences.

Surowiecki, James. *The Wisdom of Crowds: Why the Many Are Smarter than the Few and How Collective Wisdom Shapes Business, Economies, Societies, and Nations*. New York: Doubleday, 2004.

James Surowiecki is a staff writer at *The New Yorker*, where he has been since 2000, and writes *The Financial Page*. Although this is not an academic book, his argument regarding the wisdom of crowds is based upon scientific studies to that effect.

As mentioned in the review of *Thinking, Fast and Slow*, this book is one of the foundations for the initial problem space. In his book, different types of crowds are spoken of. Crowds such as random people at country fairs, the people who participate in the stock market, in addition to the small groups who meeting for a variety of reasons. In regards to the small groups, he talks of the group members needing to work together as a cooperation problem. Individuals need to cooperate in order to achieve group success.

For this group, it is tougher to be wiser than the larger crowds because the feedback is so immediate and the members themselves typically do the aggregating. In a larger crowd such as anonymous contests for the stock market, an entity unknown or not influenced by the people providing the input does the aggregating making the chances that the outcome will be more fair or balanced or wise.

An example he gives is viewpoint on why talking or giving opinions sequentially doesn't really work because after a while, those who follow start forgetting their own opinion and begin to believe and follow those who went prior. This is much like why brainstorming as developed by Alex Osborn didn't work as well as intended. People still felt judged and they sometimes fell into what is called production blocking (where they started to ideate only on one type of idea). In an open discussion, there are all three conditions that promote unwise decisions. Sequential order of speaking, tendency to focus on a narrow slice of information and the aggregation of information happening in a very biased, immediate manner.

Thaler, Richard H., and Cass R. Sunstein. *Nudge: Improving Decisions about Health, Wealth, and Happiness*. New Haven, CT: Yale University Press, 2008.

Richard Thaler is the Ralph and Dorothy Keller Distinguished Service Professor of Behavioral Science and Economics and the director of the Center for Decision Research at the University of Chicago's Graduate School of Business. Cass Sunstein is Felix Frankfurter Professor of Law at Harvard Law School.

The beginning of this book is about what they mean about Nudging people and why they should be nudged. Then the rest of the book is about in what areas of life government or companies could and should start being libertarian paternalists. This book was yet another one that was really about design without ever referencing design. From the creation of forms, processes for enrolling in this or that to cafeteria layouts and visual communications used to change behavior such as littering in Texas, this book was a design book written by economists. Every example used was a case for the need for human factors research and as they liberally used the heuristic and bias approach for why people are nudgeable, it was again, a great intersection of science and design and the need that understanding the way people think and behave will lead to better design.

Unger, Russ, Brad Nunnally, and Dan Willis. *Designing the Conversation: Techniques for Successful Facilitation*. New Riders, 2013.

Unger, et al., are all designers who have found themselves needing to facilitate groups of people as they went about being designers and doing what they do. This is a relatively new book and the only one that could be found that explicitly spoke about designers being in this role the need for it. Cody, et al., and Mazzini and Rizzo also meshed designers and facilitation but it was for very specific cases.

The first for community wide government projects, the latter for larger scale social projects.

Unger, et. al. gave examples and many anecdotes from designers who are living in this role in their daily professional life. The instructions they give for how to be a facilitator are very similar to those found in Kaner's book and other instructional facilitation books. This one though has the distinction that because they are designers, they are there to create solutions and to use design thinking along with facilitation skills to do so.

APPENDIX B

<b>Ambiguity</b>	Being comfortable when things are unclear or when you do not know the answer	Design Thinking addresses wicked = ill-defined and tricky problems
<b>Collaborative</b>	Working together across disciplines.	People design in interdisciplinary teams.
<b>Constructive</b>	Creating new ideas based on old ideas, which can also be the most successful ideas.	Design Thinking is a solution-based approach that looks for an improved future result.
<b>Curiosity</b>	Being interested in things you do not understand or perceiving things with fresh eyes.	Considerable time and effort is spent on clarifying the requirements. A large part of the problem solving activity then, consists of problem definition and problem shaping.
<b>Empathy</b>	Seeing and understanding things from your customers' point of view.	The focus is on user needs (problem context).
<b>Holistic</b>	Looking at the bigger context for the customer.	Design Thinking attempts to meet user needs and also drive business success.
<b>Iterative</b>	A cyclical process where improvements are made to a solution or idea regardless of the phase.	The Design Thinking process is typically non-sequential and may include feedback loops and cycles.
<b>Non Judgmental</b>	Creating ideas with no judgment toward the idea creator or the idea.	Particularly in the brainstorming phase, there are no early judgments.
<b>Open Mindset</b>	Embracing design thinking as an approach for any problem regardless of industry or scope.	The method encourages "outside the box thinking" ('wild ideas'); it defies the obvious and embraces a more experimental approach.

Core attributes of Design Thinking from Baeck & Grenett, 2011 found in design thinking by Robert Curedale



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